35th Annual Meeting

American Association of Clinical Anatomists

www.clinical-anatomy.org



2018 JULY 8–12

ATLANTA GEORGIA

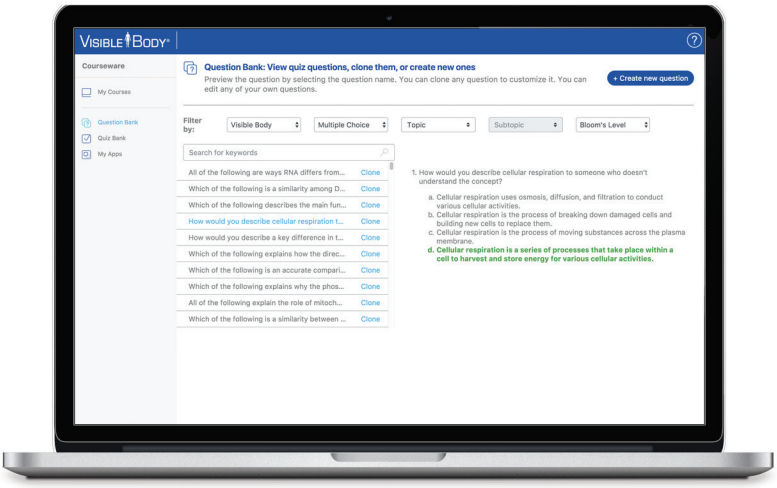
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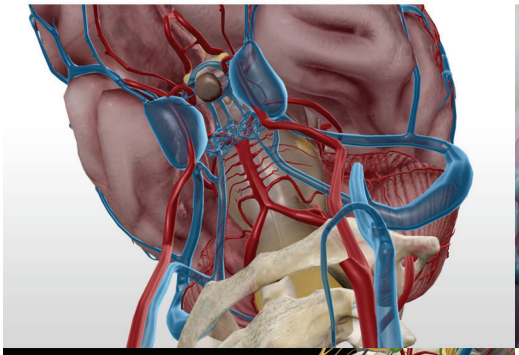
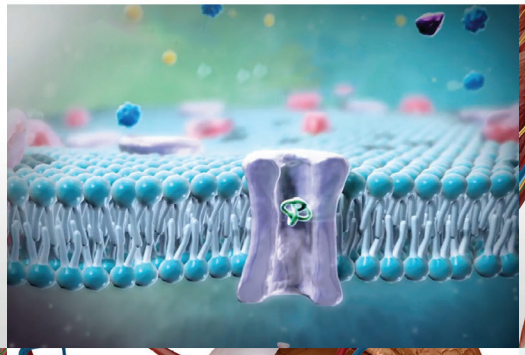
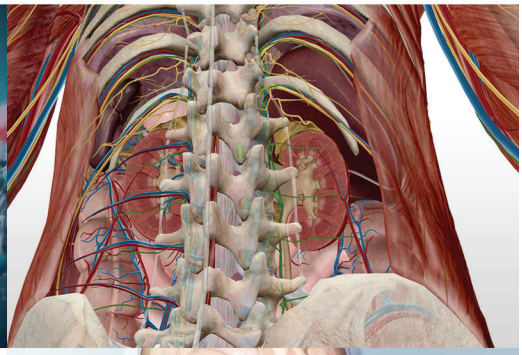
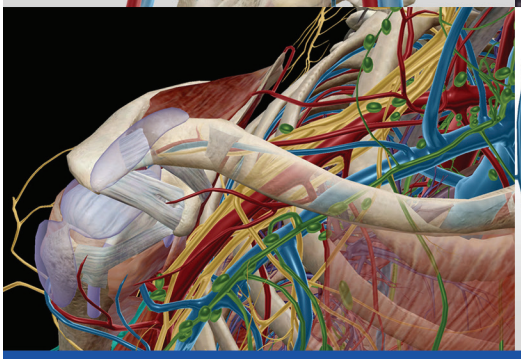
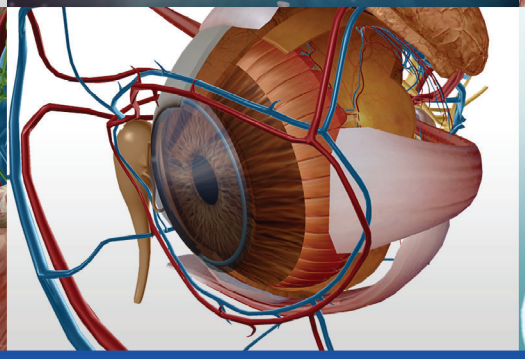
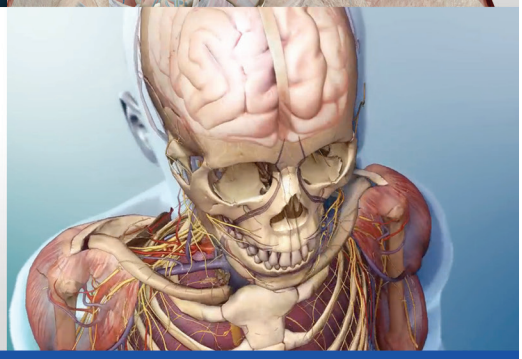


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Dear Fellow AACA Members,

The Morehouse School of Medicine is proud to be the host institution for the 35th annual meeting of the American Association of Clinical Anatomists, July 8 through 12, 2018. We look forward to seeing our friends and colleagues during conference events and to welcome you all to the beautiful city of Atlanta. The meeting scientific sessions will take place in the Buckhead district, near downtown Atlanta. The post-graduate course will be close by on the campus of the Morehouse School of Medicine. For those of you attending, as well as for those who wish to partake in some sightseeing while you are in town, the following information may help you plan your visit.

Weather- July can bring warm, humid conditions to Georgia. Daytime temps average in the mid- to high 80's, and evening temps may fall into the mid 70's. There is always the chance of pop-up afternoon thunderstorms, but those tend to pass quickly.

Transportation-
Hartsfield-Jackson International Airport (ATL) is conveniently located south of downtown Atlanta. There are many transport options to get you to the Grand Hyatt Atlanta. (the conference hotel)

MARTA is the primary public transportation system in Atlanta. A light-rail train runs from the airport main terminal to about a block from the conference hotel. Take the red line (northbound to North Springs) to the Buckhead station. The entire trip will take approximately 30 minutes and costs $2.50. Multi-use passes are available at any terminal.

Taxis are the fastest option and cost approximately $50. The airport also supports other ground transportation services (Uber, Lyft, etc).

Renting a car is very convenient. The airport supports all the usual rental car companies. However, you may want to consider other options due to Atlanta's notoriously challenging traffic.

Most of the local attractions are easily accessible via MARTA, by walking, or by biking.

Atlanta has a bike-sharing program. There are relay bike stands available through the area (if you are brave enough to bike through Atlanta traffic).

Atlanta Sites of Interest-

Come early to celebrate July 4th and cheer for the 60,000 runners (including Sarah Greene) in the world's largest 10k – the Peachtree Road Race!

The hotel is in the heart of the Buckhead district, which is packed with restaurants, bars, and shopping. Lenox Square and Phipps Plaza are upscale malls that are within easy walking distance.

Atlanta has many museums including the High Museum of Art, Fernbank Museum of Natural History, the Atlanta History Center, and the National Center for Civil and Human Rights. Atlanta also has numerous venues for the performing arts, including the Fox Theatre, Cobb Energy Performing Arts Center, Alliance Theatre, Woodruff Arts Center, and the Center for Puppetry Arts. Smaller theaters and clubs abound.

Other major attractions in the downtown area include the World of Coke, Georgia Aquarium, College Football Hall of Fame, CNN Center, Zoo Atlanta, and the Atlanta Botanical Garden.

Attendees can purchase a CityPass online (https://www.citypass.com/atlanta) or at any of the individual attractions, which can be found on the website. This offers discounted admission to many of the above attractions.

For those up for a longer trip, Six Flags Over Georgia is only 20 miles away (keeping in mind the challenging traffic).

Breweries (and tours) are plentiful in Atlanta. Some of the better known include SweetWater Brewing Company, Orpheus Brewing, Scofflaw Brewing, and the Gordon Biersch Brewery and Restaurant.

Although there are many sporting events in the Atlanta area, only the Braves baseball team will be playing in town during the conference. Tickets are available through the Braves website (https://www.mlb.com/braves/tickets).

Post-Graduate Course – July 12, 2018. The post-graduate course will take place on the campus of the Morehouse School of Medicine on Thursday. The course is designed to appeal to anatomists, clinicians, and anatomical services staff. Attending this course will give participants the opportunity to observe and perform various orthopedic procedures. Faculty and staff from Nth Dimensions and Zimmer Biomet will lead interactive, hands-on laboratory exercises utilizing current orthopedic technology.

We hope you will be able to join us.

Sincerely,

Larry Wineski and Sarah Greene
The Morehouse School of Medicine
AACA 35th Annual Meeting local hosts

American Association of Clinical Anatomists

President's Report

July 8-12, 2018

Grand Hyatt Buckhead
Atlanta, Georgia

PO Box 2945
LaGrange, Ga 30241
Ph: 706-298-0287
www.clinical-anatomy.org

Dear Colleagues and Friends,

It is an honor and pleasure to welcome each of you to the AACA's 35th Annual Scientific Meeting in Atlanta! We are very lucky and privileged to have Sarah Greene and Larry Wineski from Morehouse School of Medicine as our local hosts in Atlanta. They have given countless hours of their time organizing the meeting. Also, no welcome to the meeting would be complete without expressing our gratitude to our Program Secretary, David Porta. He has worked tirelessly to make each AACA Annual Meeting the best it can be. Additionally, the meeting Co-chairs, Jennifer Burgoon and Sarah Greene, deserve special recognition for their hard work and efforts to create an outstanding meeting. As always, the AACA Committees alongside with the Special Interests Groups have created a spectacular scientific program that I believe everyone will enjoy. I cannot overstress our gratitude to our Executive Director Caitlin Hyatt for her contributions to all aspects of preparation and implementation of the Annual Meeting, as well as the running of the Association. Please make an effort to thank each of these members personally for their dedication and efforts for putting together an enjoyable and memorable meeting.

Our Regional Meeting initiatives continue to be successful. In 2017, the 3rd Regional Meeting took place on October 7th in Mesa Arizona at A.T. Still University. The hosts were Wayne Cottam, Kellie Bliven, Chandler Cottam, Chelsea Lohman, Jay Crutchfield, John Olson, Anna Campbell, William Robinson, Adam Raffoul, Starr Matsushita, and Raghu Kanumalla. The hosts put together a fantastic program and 45 participants attended.

Our highest AACA honor this year has been awarded to an outstanding friend and colleague. The recipient of this year's Honored Member Award is Dr. Anne Agur. I have personally known Anne for the past 20 years and she has been one of the pillars of the AACA. She has served on almost every committee of the AACA, organized a memorable meeting in Toronto, served as the President of AACA during 2012-2013, presents at every AACA meeting with her students and has served as a great mentor and friend to many AACA members. Please join us and congratulate Anne Agur during the meeting for these great achievements.

One of my objectives has been to promote new members and younger anatomists and we are already realizing this goal. Thanks to Dr. Kazzara Raeburn and the members of the Nominating Committee for presenting an excellent slate of 11 candidates for our 2018 ballot. We congratulate all who were on the ballot for their commitment to the AACA, and we welcome the following newly elected members of Council: Jennifer Burgoon (Program Secretary), Maira Du Plessis (Councilor-at-Large), Joe Iwanaga (Councilor-at-Large) and James Coey (Special Councilor-Anatomical Services). I would also like to thank the outgoing Council Members for their contributions to the Council and the AACA: David Porta (Program Secretary), Stephen Carmichael (Councilor-at-Large), Alan Detton (Councilor-at-Large) and Angela McArtur (Special Councilor-Anatomical Services).

As past Past-President, Neil Norton attended last year's BACA winter meeting in the UK. The 2018 BACA winter meeting is being co-organized by Dr. James Coey who is a newly elected member to the AACA Council. It is hoped that such representation will further strengthen relationships with our sister organization - the BACA.

Dr. Shane Tubbs, the editor-in-chief of *Clinical Anatomy* continues to enhance the quality and prestige of our Journal, the editorial office and editorial board. A testament of his dedicated work was last year's record high Impact Factor of Clinical Anatomy of 1.824.

AACA finances are the best in the Association's history. Much of this is due to Wiley's renewal contract for the Journal last year and Neil Norton's ability to reshape the finances of the Association as Treasurer and President. We are already reaping the benefits of such solid financial growth and I am excited to provide you with information regarding the management of the endowment funds at our upcoming State of the Association presentation in Atlanta.

In closing, I would like to thank all members of the AACA for their continued support and hard work towards enhancing our field of Clinical Anatomy.

Marios Loukas, M.D. Ph.D.

The AACA believes that each conference attendee should be treated with respect and dignity and that any form of sexual harassment is a violation of human dignity. The AACA condemns sexual harassment and maintains a "zero - tolerance" for sexual harassment. All conference attendees have the right to participate and learn free of sexual harassment. The AACA will take all reasonable efforts to prevent and promptly correct instances of sexual harassment. Any conference attendee who believes himself or herself to be a victim of sexual harassment is encouraged to report the information to the Program Secretary.

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American Association of Clinical Anatomists

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American Association of Clinical Anatomists

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Using a simple and sustainable model for publishing daily tweets, we strive to increase engagement with our Membership, professionals in related fields, and the public.

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Save the Date!

2018 AACA Regional Meeting
Saturday, October 6th, 2018
Georgetown University - Washington, D.C.

GEORGETOWN UNIVERSITY
Georgetown University Medical Center
1789

More information can be found online at www.clinical-anatomy.org

2019 AACA & HAPS Joint Meeting
Saturday, March 30th, 2019
Bellarmine University - Louisville, KY



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American Association of Clinical Anatomists

ANNUAL MEETING

Hosted by The University of Tulsa

THE UNIVERSITY of TULSA











JUNE 11-15, 2019

HYATT REGENCY | TULSA, OKLAHOMA

Floor Plan of the Hotel

3-D FLOOR PLAN

24th Floor



Garden Level

Lobby Level

Lower Lobby Level

Block Schedule

As of 06/13/18

	Sunday July 8th	Monday July 9th	Tuesday July 10th	Wednesday July 11th	Thursday July 12th
7:30	Registation OPEN 7:30 am - 5:00 pm	**Career Development Comm** Sarah Greene Buckhead Ballroom 7:30 - 9:00 am	**Educational Affairs Comm** Lela Giannaris Buckhead Ballroom 7:30 - 9:00 am	**Clinical Anatomical Terminology Comm** Evan Goldman Buckhead Ballroom 7:30 - 9:00 am	
7:45					
8:00					
8:15					
8:30		Breakfast/Poster/Exhibitors Grand II & III	Breakfast/Poster/Exhibitors Grand II & III	Breakfast/Poster/Exhibitors Grand II & III	**Postgraduate Course:** The Anatomy of Orthopedic Trauma (Add'l Reg $ Req) 8:00 am- 3:30 pm Morehouse School of Medicine *Buses load from 6:45 - 7:15 am outside the lower lobby level of Grand Hyatt.*
8:45					
9:00	**AACA Council Meeting Invitation Only** 9:00 am - 5:00 pm Veranda Rm	Welcome, Program Comm, & State of the Assn by Marios Loukas Grand I 9:00 - 9:45 am	Opening Announcements	Opening Announcements	
9:15				**Poster Session 3 Torso & Lower Limb** **Grand II & III** 9:15 - 10:30 am	
9:30			**Platform Session 3 Torso, n=4** Grand I 9:30 - 10:30 am		
9:45		**Presidential Speaker Dr. Rodriguez** Grand I 9:45 - 10:45 am			
10:00					
10:15					
10:30			**Poster Session 2 Education & Anatomical Svcs** Grand II & III 10:30 - 11:45 am	**Anatomical Svcs Comm** David Conley & Brandi Schmitt Grand I 10:30 am - 12:00 pm	
10:45		**Platform Session 1 Tech Fair, n=7** Grand I 10:45 - 11:30 am			
11:00					
11:15					
11:30		**TECH FAIR & Lunch Break on your own** Buckhead Ballroom 11:30 am - 1:00 pm (*Clinical Anatomy* Editorial Board Lunch Mtg in Casade Room)			
11:45			**Lunch Break On your own** 11:45 am - 1:00 pm		
12:00				**Lunch Break On your own** 12:00 - 1:00 pm	
12:15					
12:30					
12:45					
1:00		**EAC Symposium** InterProfessional Education in Anatomy Grand I 1:00 - 2:30 pm	**ASC Symposium** HIPAA & PHI in Anatomical Donation, Education & Research Grand I 1:00 - 2:30 pm	**Platform Session 6 Lower Limb, n=3,** Grand I 1:00 - 1:45 pm	
1:15					
1:30					
1:45				BREAK	
2:00				**Business Mtg** **Everyone is encouraged to attend!** Grand I 2:00 - 3:30 pm	
2:15					
2:30		BREAK	BREAK		
2:45		**Poster Session I Head, Neck & Upper Limb** Grand II & III 2:45 - 4:00 pm	**Platform Session 4 Education 1 - n=5** Grand I 2:45 - 4:00 pm		
3:00					
3:15					
3:30				**Mtg of the New Council** Invitation Only Library Room 3:45 - 4:45 pm	
3:45					
4:00		**Platform Session 2 Head, Neck & Upper Limb n=6** Grand I 4:00 - 5:30 pm	BREAK		
4:15			**Platform Session 5 Education 2 - n=6** Grand I 4:15 - 5:45 pm		
4:30					
4:45					
5:00	**Judges Meeting** Library Room 5:00 - 6:00 pm			**Reception** Grand Ballroom Foyer 5:00 - 6:00 pm	
5:15					
5:30		**Mentor Reception** East & West Terraces 5:30 - 6:30 pm			
5:45					
6:00			**Georgia Aquarium (optional trip on your own)** 5:45 - 9:00 pm	**Awards & Banquet** Honored Member Talk Grand I & II 6:00 - 8:00 pm	
6:15					
6:30	**Welcome Reception** East & West Terraces 6:30 - 8:30 pm				
6:45					
7:00					
>7 pm					

Sponsors/Commercial Exhibitors

Generous donations and/or commercial exhibitor fees paid by the following companies and organizations have substantially reduced the Association's expenses in presenting this meeting.

You are encouraged to visit the exhibits available for viewing in Ballroom II & III

Exhibit hours:

7:30 am – 12:00 pm and 1:00 pm – 5:00 pm Monday

7:30 am – 12:00 pm and 1:00 pm – 5:00 pm Tuesday

7:30 am – 11:00 am Wednesday

TEAR DOWN is from 11:00 am – 4:00 pm on Wednesday (all exhibitors must be vacated from the hall at 4:00 pm)

The hall will be closed for lunch for one hour each day (12:00 – 1:00 PM).

LIST OF EXHIBITORS *as of 6-13-18*

1
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Anatomy Equipment.

continued on next page

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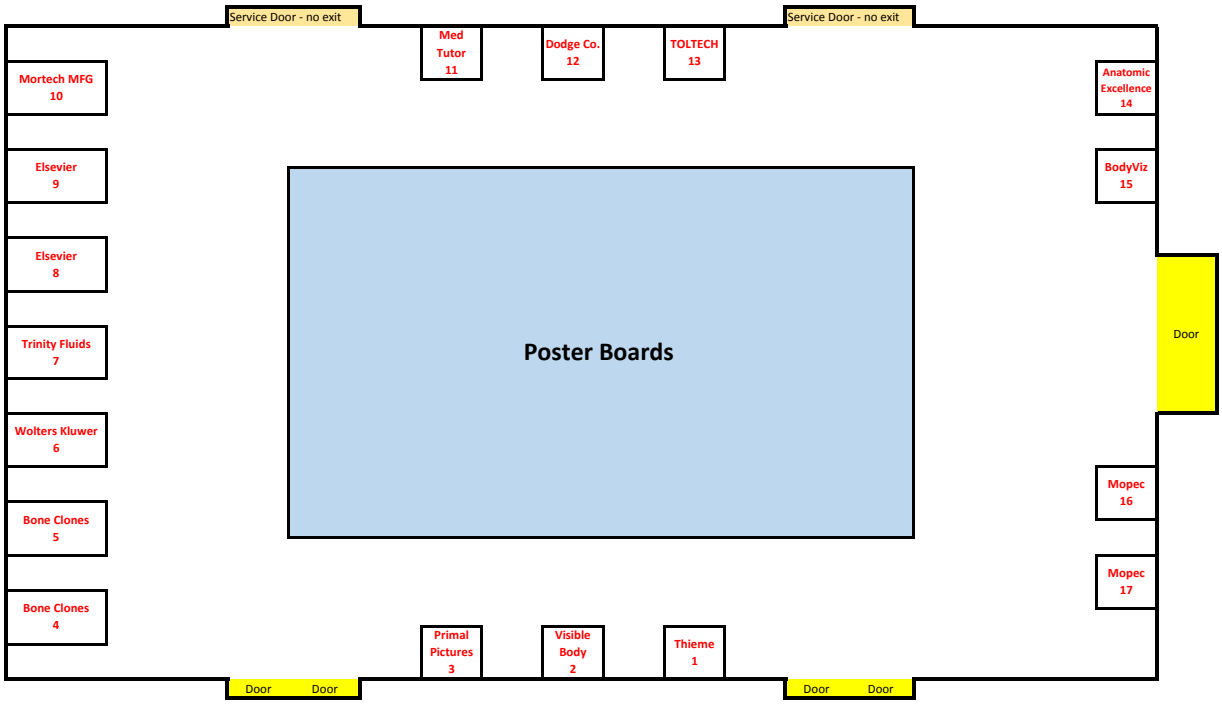
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Casual Dress
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Pre Meeting Events

Sunday, July 8th

9:00 AM – 5:00 PM	AACA Council Meeting	Library Room
8:00 AM – 5:00 PM	Exhibitor Set-Up	Ballroom II & III
12:00 PM – 5:00 PM	Poster Presenter Set-Up	Ballroom II & III
12:00 PM – 5:45 PM	Registration	Meeting Planner Office I
5:00 PM – 6:00 PM	Judges' Meeting	Ivy Room
6:30 PM – 8:30 PM	Welcome Reception Sponsored by ELSEVIER	East & West Terraces

Scientific Program

Monday, July 9th

7:30 AM – 9:00 AM	Career Development Committee Breakfast Meeting – Open to all	Buckhead Ballroom
8:00 AM – 5:00 PM	Registration	Meeting Planner Office I
8:00 AM – 12:00 PM	Poster Presenter Set-Up	Ballroom II & III
8:30 AM – 9:00 AM	Breakfast with Exhibits/Posters	Ballroom II & III
9:00 AM – 9:45 AM	Opening of Scientific Session - Welcome Marios Loukas, M.D. President, American Association of Clinical Anatomists	Ballroom I
9:45 AM – 10:45 AM	Presidential Speaker: Dr. Eduardo Rodriguez - *Transforming the Face of Reconstructive Surgery* Sponsored by WILEY	Ballroom I
10:45 AM – 11:30AM	Platform Session I: Tech Fair Moderator: Greg Smith	Ballroom I
10:45 AM	Practical 3D Printing: For All the Things You Can't Buy On Amazon. **CARTER**, Yasmin[1,2], Daniel J. MANGIAMELI[2], and Hillary E. MULLAN[2]. [1]Division of Translational Anatomy, Department of Radiology; [2]Innovations Lab at the interprofessional Center for Experiential Learning and Simulation (iCELS), University of Massachusetts Medical School, Worcester, MA 01655, USA.	
10:50 AM	Perceptions and Utilization of Three-Dimensional Printing in Human Anatomy Courses: A Pilot Study. **RICHTER**, Saskia D. and Chelsea M. LOHMAN BONFIGLIO. Department of Interdisciplinary Health Sciences, Arizona School of Health Sciences, A.T. Still University, Mesa, AZ 85206, USA.	
10:55 AM	XR Model of Sciatic Nerve Variant and Spinal Nerve Contributions, and Piriformis Mass Relationship. **TAKHAR**, Jaskirat S, Jesse THOMPSON, and Scott LOZANOFF. Department of Anatomy, University of Hawaii at Manoa, John A. Burns School of Medicine, Honolulu, HI 96813, USA. **(GER)**	

continued on next page

Monday, July 9th continued

11:00 AM — Mixed Reality Tracking of Anatomical Plastinations using X-Reality Visualization Devices. **LOZANOFF**, Scott, Jesse THOMPSON, Jessica GRAZZIOTIN, Beth K. LOZANOFF, & Steven LABRASH. Department of Anatomy, Biochemistry & Physiology, John A. Burns School of Medicine, University of Hawaii at Manoa, Honolulu, HI 96813, USA.

11:05 AM — Virtual Reality: Bringing Cadaveric Education into the Next Dimension. **GOLDMAN**, Evan M., Timothy D RENZI, Nicholas A RUSSO, Sneha KOLLA, and Maha ELGAWLY. Cooper Medical School of Rowan University, Department of Biomedical Sciences, Camden, NJ 08103, USA.

11:10 AM — The New Active Learning: Converting Large Group Lectures into Interactive Sessions Using Nearpod. **JONES**, Vivien, and Darren SALMI. Division of Clinical Anatomy, Stanford University School of Medicine, Stanford, CA 94305, USA.

11:15 AM — Introduction to Osteology and Radiology of the Back. **WINESKI**, Lawrence E., and Lionel WILLIAMS. Department of Pathology and Anatomy, Morehouse School of Medicine, Atlanta, GA 30310, USA.

11:30 AM – 1:00 PM — Lunch on your Own – See page 6 for options

11:30 AM - 1:00 PM — Tech Fair Hands On ..... Buckhead Ballroom

12:00 PM – 1:00 PM — Exhibit Hall closed for lunch ..... Ballroom II & III

11:30 AM – 1:00 PM — *Clinical Anatomy* Editorial Board Lunch ..... Library Room

1:00 PM – 2:30 PM — Educational Affairs Committee Symposium ..... Ballroom I
"InterProfessional Education in Anatomy"

2:30 PM – 2:45 PM — Break with Exhibits/Posters ..... Ballroom II & III

2:45 PM – 4:00 PM — Poster Session 1: Head, Neck & Upper Limb ..... Ballroom II & III

4:00 PM – 5:30 PM — Platform Session 2: Head, Neck & Upper Limb ..... Ballroom I
Moderator: Natalie Langley

4:00 PM — Clinical Implications of Age-Related Changes in the Articulations of the Apical Petrous Bone. **CARTER**, Melinda L., Eric EMERY, Byron BERRY, Thomas LINDSEY, Frank ABENE, and Kevin HAYES. Alabama College of Osteopathic Medicine, Dothan, AL 36303, USA.

4:15 PM — Recurrent Laryngeal Nerve and its Vulnerability during Surgical Procedures of the Neck. **THOMAS**[1], Alison M., Jickssa M. GEMECHU[2], and Daniel K. FAHIM[3]. [1]Oakland University William Beaumont School of Medicine, Rochester, MI 48309, USA; [2]Department of Neurosurgery, Beaumont Health System, Royal Oak, MI 48073, USA; [3]Department of Biomedical Sciences, Oakland University William Beaumont School of Medicine, Rochester, MI 48309, USA. **(GER)**

4:30 PM — Assessment of Anatomical Variation of the Glenohumeral Joint in Swimmers. **WALTON**, Chase M[1], Paula JOHNSON[1], Ulrike H. MITCHELL[1], Iain HUNTER[1], and Jonathan J. WISCO[1,2]. [1]Brigham Young University, Provo, UT 84604, USA; [2]University of Utah School of Medicine, Salt Lake City, UT 84132, USA. **(GER)**

4:45 PM — The Impact of Shoulder Position on Arterial Flow through the Upper Extremity. **GUERRA**, Jorge D., Isaac FERNÁNDEZ, Eric POTTER, Christina A. ALVARA, Heather A. BALSIGER, Thomas GEST, and William M. WEISS. Department of Orthopaedic Surgery and Rehabilitation, Texas Tech University Health Sciences Center El Paso - Paul L. Foster School of Medicine, El Paso, TX 79905, USA. **(GER)**

continued on next page

Monday, July 9th continued

5:00 PM — Comparison of the Morphology of Infant and Adult Flexor Digitorum Superficialis and Profundus. **DUONG**, Allen[1], Zhi LI[1], Ngaire S. STOTT[2], Seyed A. MIRJALILI[3], and Anne M.R AGUR[1]. [1]Division of Anatomy, Department of Surgery, Faculty of Medicine, University of Toronto, Toronto, ON, M5S 1A8, Canada, [2]Department of Surgery, School of Medicine, Faculty of Medical and Health Sciences, University of Auckland, Auckland, 1023, New Zealand; [3]Anatomy and Medical Imaging Department, School of Medicine, Faculty of Medical and Health Sciences, University of Auckland, Auckland, 1023, New Zealand. **(GER)**

5:15 PM — Cadaveric Simulation of Abductor Pollicis Brevis-Based Versus a Thenar Raphe-Based Opponensplasty. **FOGG**, Quentin A. Department of Anatomy and Neuroscience, The University of Melbourne, Melbourne, Victoria 3010, Australia.

5:30 PM – 6:30 PM — Mentor Reception .....East & West Terraces

Scientific Program

Tuesday, July 10th

7:30 AM – 9:00 AM — Educational Affairs Committee Breakfast Meeting– Open to all .....Buckhead Ballroom

8:30 AM – 9:15 AM — Breakfast with Exhibits/Posters.....Ballroom II & III

8:00 AM – 5:00 PM — Registration.....Meeting Planner Office I

9:15 AM – 9:30 AM — Opening Announcements..... Ballroom I

9:30 AM – 10:30 AM — Platform Session 3: Torso..... Ballroom I
Moderator: Jennifer Burgoon

9:30 AM — The Developing Lumbar Sympathetic Trunk: Its Comparison with Adult Configuration. **KAPOOR**, Kanchan, Ramandeep KAUR, Jyotsna SINGH, and Rupinder SINGH. Department of Anatomy, Government Medical College & Hospital, Chandigarh, UT, 160030, India.

9:45 AM — Discovery of a New Ligament of the Lumbar Spine. **SIMONDS**, Emily[1], Joe IWANAGA[1,2], Charlotte WILSON[1], Marc VETTER[1], Mayank PATEL[1], Rod J. OSKOUIAN[1], and R. Shane TUBBS[1,3]. [1]Seattle Science Foundation, Seattle, 550 17th Ave, James Tower, Suite 600, Seattle, WA 98122, USA. [2]Division of Gross and Clinical Anatomy, Department of Anatomy, Kurume University School of Medicine, Kurume, Fukuoka 830-0011, Japan. [3]Department of Anatomical Sciences, St. George's University, St George's, Grenada, West Indies.

10:00 AM — Muscle Layer Structure in Anterior Wall of Anorectal Canal in Females. **MURO**, Satoru[1], Yuichiro TSUKADA[2], Masayo HARADA[1], Masaaki ITO[2], and Keiichi AKITA[1]. [1]Department of Clinical Anatomy, Tokyo Medical and Dental University, Tokyo, 1138519, Japan. [2]Department of Colorectal Surgery, National Cancer Center Hospital East, Chiba, 2778577, Japan. **(GER)**

10:15 AM — Origins of the Levator Ani with Special Reference to the Tendinous Arch. **YABUUCHI**, Tomonori, Satoru MURO, and Keiichi AKITA. Department of Clinical Anatomy, Tokyo Medical and Dental University, Tokyo, 1138519, Japan. **(GER)**

10:30 AM – 11:45 AM — Poster Session 2: Education & Anatomical Services .....Ballroom II & III

11:45 AM – 1:00 PM — Lunch break on your own – see page 6 for information

12:00 PM – 1:00 PM — Exhibit Hall closed for lunch .....Ballroom II & III

continued on next page

Tuesday, July 10th continued

1:00 PM – 2:30 PM — Anatomical Services Committee Symposium ..... Ballroom I
"*HIPAA & PHI in Anatomical Donation, Education & Research*"

2:30 PM – 2:45 PM — Break with Exhibits/Posters ..... Ballroom II & III

2:45 PM – 4:00 PM — Platform Session 4: Education 1 ..... Ballroom I
Moderator: Bobbi Morgan

2:45 PM — Interprofessional Teaching and Learning: Anatomy Graduate Students and Cardiology Fellows. **QUINN**, Melissa, M.[1], and Quinn CAPERS, IV[2]. [1]Department of Biomedical Education & Anatomy, College of Medicine, The Ohio State University, Columbus, OH 43210, USA. [2]Division of Cardiovascular Medicine, The Ohio State University, Columbus, OH 43210, USA.

3:00 PM — Targeted Nerve Biopsy: An Evolving Concept/Technique. **MAREK**, Tomas[1], Kimberly K. AMRAMI[2], and Robert J. SPINNER[1]. Department of Neurologic Surgery[1] and Radiology[2], Mayo Clinic, Rochester, MN 55905, USA. **(GER)**

3:15 PM — An Insight into the Medical Dissectors' Mind: Physician's Views of Organ and Body Donation. **COEY**, James[1,2] and Sara SULAIMAN[3]. [1]St. George's International School of Medicine Keith B. Taylor Global Scholars Program, Northumbria University, Newcastle-Upon-Tyne, NE1 8ST, UK. [2]Department of Anatomy, St. George's University, Grenada, West Indies. [3]Department of Applied Sciences, Faculty of Health and Life Sciences, Northumbria University, Newcastle-upon-Tyne, NE1 8ST, UK.

3:30 PM — The Anatomy-Intensive Elective: A Rotation Highlighting Anatomy and Effective Communication. **WARD**, Peter J. West Virginia School of Osteopathic Medicine, Lewisburg, West Virginia, USA.

3:45 PM — Considering Anatomy Pedagogy through the Lens of Second Language Learning. **LANGFORD**, Sydney J.[1] and Jonathan J. WISCO[1,2]. [1]Brigham Young University, Provo, UT 84604, USA. [2]University of Utah School of Medicine, Salt Lake City, UT 84132, USA. **(GER)**

4:00 PM – 4:15 PM — Break with Exhibits/Posters ..... Ballroom II & III

4:15 PM – 5:45 PM — Platform Session 5: Education 2 ..... Ballroom I
Moderator: Lela Giannaris

4:15 PM — Bodies for Science, 1860 to 1940: A Long History of Unexpected Altruism. **LAWRENCE**, Susan C.[1] and Susan E. LEDERER[2]. [1]Department of History, The Ohio State University, Columbus, OH, 43210, USA; [2]Department of Medical History & Bioethics, University of Wisconsin-Madison, Madison, WI 53706, USA.

4:30 PM — Use of Prosection Anatomy Labs and Clinical Cases to Improve Outcomes in an Integrated Curriculum. **PARRY**[1], Mark J., Heather A. BALSIGER[2], Diana L. PETTIT[2], Thomas GEST[2], and Dolgor BAATAR[2]. [1]MD Program, Paul L. Foster School of Medicine, Texas Tech University Health Sciences Center El Paso, El Paso, TX 79905, USA. [2]Department of Medical Education, Paul L. Foster School of Medicine, Texas Tech University Health Sciences Center El Paso, El Paso, TX 79905, USA. **(GER)**

4:45 PM — Tissue Solidification in Heart, Lung, and Brain in Soft-Embalmed (Modified Thiel Method) Cadavers. **BOAZ**, Noel T.[1,2,3], Caroline ABERCROMBIE[4], Joy Y. BALTA[5], Robert BECKER[4], Raymond BERNOR[2,6], Tony CLARY[1], Craig GOODMURPHY[7], John GRAHAM[1], Eileen L. KALMAR[8], Thomas KWASIGROCH[4], Jon KRIMSIER[7], Carrie ROBINSON[1], Dana SIKON[9], Richard SIKON[10], and Michael WESSELS[11]. [1]Emory and Henry College School of Health Sciences, Marion, VA 24354, USA; [2]Laboratory of Biological Anthropology and Anatomy, Integrative Centers for Science and Medicine, Martinsville, VA 24112, USA; [3]Anthropology Program, Virginia Commonwealth University, Richmond, VA 23284, USA; [4]Department of Biomedical Sciences, Quillen College of Medicine, East Tennessee State University, Johnson City, TN 37614, USA; [5]Department of Anatomy and Neuroscience, University College Cork, Cork T12 K8AF, Ireland; [6]Department of Anatomy, Howard University College of Medicine, Washington, DC 20059, USA; [7]Department of Pathology and

continued on next page

Anatomy, Eastern Virginia Medical School, Norfolk, VA 23506, USA; [8]Department of Biomedical Education and Anatomy, Ohio State University, Columbus, OH 43210, USA; [9]Surgical Skills Training Center, University of Virginia School of Medicine, Charlottesville, VA 22908, USA; [10]Virginia State Anatomical Program, Richmond, VA 234219, USA; [11]Trinity Fluids, Lapeer, MI 48446, USA.

5:00 PM — Quizlet-Online Learning/Review Tool to Study Medical Histology. **MISHALL**, Priti L.[1,2], William B. BURTON[3], and Michael S. RISLEY[1]. [1]Department of Anatomy and Structural Biology, [2]Department of Ophthalmology and Visual Sciences, [3]Department of Family and Social Medicine, Albert Einstein College of Medicine, Bronx, NY 10461, USA.

5:15 PM — Clinically Oriented, Asynchronous Undergraduate and Graduate Medical Histopathology Education. **LEE**, Lisa M.J[1,3], Brian MOORE[2], and Ian STEWART[3]. [1]Department of Cell and Developmental Biology, University of Colorado School of Medicine, Aurora, CO 80045, USA. [2]Department of Pathology, University of Colorado School of Medicine, Aurora, CO 80045, USA. [3]Master of Science in Modern Human Anatomy Program, University of Colorado School of Medicine, Aurora, CO 80045, USA.

5:30 PM — Creating a Fetal Image Database. **GILROY**, Anne M. and Amanda J. COLLINS. Division of Translational Anatomy, Department of Radiology, University of Massachusetts Medical School, Worcester, MA 01655, USA.

5:45 PM — Group Outing (on your own for transportation) to Georgia Aquarium.

Scientific Program

Wednesday, July 11th

7:30 AM – 9:00 AM — Clinical Anatomical Terminology Committee Breakfast Meeting - Open to all .....Buckhead Ballroom

8:30 AM – 9:00 AM — Breakfast with Exhibits/Posters.....Ballroom II & III

8:00 AM – 4:30 PM — Registration.....Meeting Planner Office I

9:00 AM – 9:15 AM — Opening Announcements..... Ballroom I

9:15 AM – 10:30 AM — Poster Session 3: Torso & Lower Limb .....Ballroom II & III

10:30 AM– 12:00 PM — Anatomical Services Committee Meeting – All invited ..... Ballroom I

11:00 AM – 4:00 PM — Exhibitor Tear Down/Poster Tear Down.....Ballroom II & III

12:00 PM – 1:00 PM — Lunch Break own your own – See page 6 for information

1:00 PM – 1:45 PM — Platform Session 6: Lower Limb ..... Ballroom I
Moderator: Sarah Greene

1:00 PM — A Cadaveric Study of the Nerve Supply of the Posterior Knee Joint Capsule. **TRAN**, John[1], Philip W.H. PENG[2], and Anne M.R. AGUR[1]. [1]Division of Anatomy, Department of Surgery, Faculty of Medicine, University of Toronto, Toronto, ON, M5S 1A8, Canada; [2]Department of Anesthesia, Faculty of Medicine, University of Toronto, Toronto, ON, M5T 2S8, Canada. **(GER)**

1:15 PM — Morphological Analysis of Gluteus Medius Tendon and Its Insertion Sites. **TSUTSUMI**, Masahiro[1], Akimoto NIMURA[2], Keiichi AKITA[1]. [1]Department of Clinical Anatomy, Tokyo Medical and Dental University, Tokyo, 1138519, Japan; [2]Department of Functional Joint Anatomy, Tokyo Medical and Dental University, Tokyo, 1138519, Japan. **(GER)**

Wednesday, July 11th continued

1:30 PM — Architecture of the Infant Gluteus Medius: A 3D Modelling Study. **BREINHORST**, Ethan M.[1], Luke R. BRADSHAW[1], N. Susan STOTT[2], Anne M.R. AGUR[3], and Seyed A. MIRJALILI[1]. [1]Anatomy and Medical Imaging Department and [2]Department of Surgery, School of Medicine, Faculty of Medical and Health Sciences, University of Auckland, Auckland, 1023, New Zealand; [3]Division of Anatomy, Department of Surgery, Faculty of Medicine, University of Toronto, Toronto, ON, M5S 1A8, Canada. **(GER)**

1:45 PM – 2:00 PM — Break

2:00 PM – 3:30 PM — Business Meeting – Everyone is encouraged to attend! ..... Ballroom I

3:45 PM – 4:45 PM — New AACA Council Meeting ..... Library Room

5:00 PM – 6:00 PM — Reception ..... Pre-function outside Grand Ballroom

6:00 PM – 8:00 PM — Banquet ..... Ballroom I & II



The 2018 Presidential Speaker

Monday, July 9th at 9:45 AM

Dr. Eduardo Rodriguez



Transforming the Face of Reconstructive Surgery

Experience gained in the treatment of complex congenital and acquired facial deformity has provided a unique platform for advancing the field of facial reconstruction. Fundamental principles of aesthetic, craniofacial, and microsurgery have also blended together to improve the quality of life for our patients. Additionally, innovative technologies including the combination of computer-assisted planning and intraoperative navigation has provided innovative solutions to previously unpredictable problems. The advance of medicine and dentistry has allowed facial transplantation to become a clinical reality; however, immunotherapy remains one of the leading obstacles to its widespread acceptance. The creation of a comprehensive and multidisciplinary team provides the avenue for the restoration of human appearance and function for individuals with devastating composite facial disfigurement.

Objectives:
1. Define the current state of facial reconstruction
2. Describe the role and indications for facial transplantation
3. Define the requirements for creating a comprehensive and innovative facial transplant program

Dr. Rodriguez was born and raised in Miami, FL, the son of Cuban immigrants. He earned his B.S. in Neurobiology from the University of Florida in 1988, followed by a DDS degree from New York University in 1992. He completed his residency in Oral & Maxillofacial Surgery at Montefiore Medical Center/Albert Einstein College of Medicine in 1997. He then went on to earn his MD from the Medical College of Virginia in 1999, then completed general surgery training at Johns Hopkins Hospital in 2001 and then a combined plastic surgery program at Johns Hopkins Hospital/University of Maryland Medical Center in 2003. He also completed an International Reconstructive Microsurgery Fellowship at Chang Gung Memorial Hospital in Taipei, Taiwan in 2004. He is dually boarded by the American Board of Oral and Maxillofacial Surgery and the American Board of Plastic Surgery.

An internationally recognized leader in plastic and reconstructive surgery, Dr. Rodriguez joined the NYU Langone faculty in November 2013 as the Helen L. Kimmel Professor of Reconstructive Plastic Surgery and chair of the Hansjörg Wyss Department of Plastic Surgery. Dr. Rodriguez joined NYU Langone from the Johns Hopkins Hospital and the University of Maryland School of Medicine/R Adams Cowley Shock Trauma Center where he was Chief of the Division of Plastic, Reconstructive & Craniofacial Surgery and Professor of Surgery.

Dr. Rodriguez also leads NYU Langone's vascular composite allotransplantation (VCA) program, which encompasses face and limb transplantation. He and his team performed NYU Langone's first face transplant in August 2015 on Patrick Hardison, a firefighter from Senatobia, MS, who was severely burned in September 2001 in the line of duty. This case is widely recognized as the most extensive procedure of its kind to date – and the first performed in New York State.

Honored Member 2018

The American Association of Clinical Anatomists

Recognizes and Awards Honored Membership to

Anne Agur, B.Sc., M.Sc., Ph.D.



Anne Agur, BSc(OT), MSc, PhD, is a Professor in the Division of Anatomy, Department of Surgery at the University of Toronto, with cross appointments in the Division of Physical Medicine and Rehabilitation, Department of Medicine, and the Departments of Physical Therapy and Occupational Science and Occupational Therapy, Biomedical Communications, Institute of Medical Science, Rehabilitation Science Institute and Graduate Department of Dentistry. She has been a teacher and researcher in the Division of Anatomy for more than 40 years with a primary research interest in clinically applied normal vs pathological structure and function of the musculoskeletal system including joints, musculotendinous architecture, innervation patterns and pain-generating mechanisms. Anne has published widely with over 110 peer reviewed publications in basic science and anatomical education and won numerous teaching and mentorship awards. Her areas of teaching expertise include clinical anatomy, histology, embryology and neuroscience. Anne has authored or edited numerous books including Grant's Atlas of Anatomy (6 editions), Essential Clinical Anatomy (5 editions), and Clinically Oriented Anatomy (3 editions). She was president of the AACA 2011-2013, served on the Executive Committee and Council, was a Co- Editor of Clinical Anatomy (2003-2009) and hosted an annual meeting in Toronto in 2008.

Previous Honored Members of the AACA

*W. Henry Hollinshead, 1984
*Chester B. McVay, 1985
*Donald James Gray, 1986
*Russell T. Woodburne, 1987
*Oliver Beahrs, 1988
*N. Alan Green, 1989
*Frank H. Netter, 1990
*Ralph Ger, 1991
M. Roy Schwartz, 1992
*Carmine D. Clemente, 1993
Keith L. Moore, 1994
*Ray J. Scothorne, 1995
Robert A. Chase, 1996
Tatsuo Sato, 1997
*John E. Skandalakis, 1998
*Donald R. Cahill, 1999
*Sandy C. Marks, Jr., 2000
David G. Whitlock, 2001
*Robert D. Acland, 2002
Arthur F. Dalley, II, 2003
*John V. Basmajian, 2004
Ian Whitmore, 2005
Peter H. Abrahams, 2006
Gary G. Wind, 2007
Vid Persaud, 2008
Richard S. Snell, 2009
Ray Gasser, 2010
Harold Ellis, 2011
Ronald A. Bergman, 2012
John T. Hansen, 2013
Victor M. Spitzer 2014
Carol E. Scott-Connor 2015
Carlos A. G. Machado 2016
James D. Collins 2017

** deceased*

Educational Affairs Committee Symposium

Monday, July 9th
1:00 PM – 2:30 PM

"InterProfessional Education in Anatomy"

R. Lisa Popp, PhD

Texas Tech University Health Sciences Center

Incorporating IPE into a preclinical medical curriculum: Why and How?



If students in a healthcare professional program are to contribute to an interprofessional collaborative practice (IPECP) team upon graduation, we must prepare them for this transition by allowing for opportunities to develop IPE competencies. These competencies can be developed by introducing IPE learning activities throughout a medical school curriculum. I will provide an introduction and historical overview of IPECP. The challenges and hurdles, as well as lessons learned and the joys experienced when implementing IPE into an undergraduate medical school preclinical curriculum will be explored by presenting examples of IPE learning activities that occur at our medical school.

Bio: I received three degrees from the University of Texas at Austin: a B.A. in Biology in 1976, an M.A. in Exercise Physiology in 1983 and a Ph.D. in Pharmacology and Toxicology in 1995. Upon completion of my Ph.D., I conducted post-doctoral research in the laboratory of Dr. David Lovinger, one the leading experts on alcohol modulation of ligand-gated ion channels at Vanderbilt University School of Medicine I am currently an Associate Professor with tenure, in the Department of Medical Education (DOME) at Texas Tech University Health Sciences Center, School of Medicine (SOM). Before joining the DOME in 2015, I was in the Department of Pharmacology and Neuroscience (2003-2015), during which I was an NIH funded scientist studying the molecular mechanisms of alcohol addiction. I have been teaching medical students since 2004 in the fields of Pharmacology, Neuroanatomy, Neurophysiology and Neuropathology as well as addiction. My introduction to Interprofessional Education began in 2013 as a SOM champion for the TTUHSC Quality Enhancement Program (QEP) to promote Interprofessional teamwork. As a QEP champion, I served on many committees. Some of which included: the committee that prepared the QEP report for the Southern Association of Colleges and Schools (SACS); organizational committees for the annual institutional IPE Fall Symposium; and the faculty committee that prepared and accompanied TTUHSC student teams participating in National CLARION competitions.

In 2014, in preparation for the SOM LCME site visit, I began integrating IPE learning activities into the SOM curriculum and have personally been responsible for conducting approximately 10 Interprofessional Education and Collaborative Practice Learning Activities (IPECPLA) throughout the first two years of our medical curriculum. I have presented data from these activities at both international and national meetings in both podium and poster format, some of which include: Collaborations Across Borders (CABS) V in 2015; Keck's School of Medicine, Innovations in Medical Education in 2017; IAMSE International Conference in 2017 and The American Hearing and Speech Association National meeting in 2017. I am the SOM representative for the TTUHSC IPE Steering Committee and I have won two presidential awards in the area of IPE.

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Career Development Committee Symposium continued

Bruce Wainman, PhD

McMaster University

10 Years of Data on Interprofessional Education in Anatomy.



The human body in health and illness is the unifying element in health care and is thus a natural forum for IPE. At McMaster in 1999 we began an intense 10 week dissection elective for all of our professional health care groups. Ten years of detailed analysis of the attitudes of the participants using various modalities indicates this event is not only extremely effective education but has consistently improved professional identity, role clarity, feelings of competency and autonomy and the importance of cooperation in the provision of health care.

Bio: Bruce Wainman, PhD, is the Director of the Education Program in Anatomy and the Surgical Skills Laboratory at McMaster University, a Professor in the Department of Pathology and Molecular Medicine, an Associate Member of the Department of Ob/Gyn and the Coordinator of Biological Sciences for the Ontario Midwifery Consortium.

Bruce's research is on various aspects of anatomy education including IPE and the efficacy of x-reality tools. Recent eBooks produced by Dr. Wainman include "Pharmacology Revealed" and "Physical Assessment of the Well Woman and Newborn."

Dr. Wainman lectures at McMaster mainly on anatomy, pharmacology and reproductive physiology to the MD, undergraduate Health Sciences and Midwifery programs. For his teaching activities he has received the McMaster Student Union numerous times, the President's Award for Education, the Canadian Association for Medical Education Certificate of Merit Award for 2015, Osler Lecture Award and a 3M National Teaching Fellowship.

Lynn Copes, PhD

Frank H. Netter MD School of Medicine at Quinnipiac University

"Starting from Scratch: integrating interprofessional anatomy learning into a new medical school"



Summary: The Frank H. Netter MD School of Medicine at Quinnipiac University welcomed its first class in the fall of 2013. The medical school joined large and vibrant Schools of Health Sciences and Nursing and provided, for the first time, an on-site gross anatomy laboratory to be used by students from ten different degree programs. Integrating interprofessional opportunities for students taking anatomy has faced logistical challenges, but been met with enthusiasm from stakeholders in all areas.

Bio: Lynn Copes received a PhD in paleoanthropology from Arizona State University in 2012. In 2013, she was hired as one of the Founding Faculty members of the Frank H. Netter MD School of Medicine at Quinnipiac University where she has been active in the development of the gross anatomy curriculum. She is currently a Faculty Fellow at Quinnipiac's Center for Interprofessional Healthcare Education and is passionate about finding ways for students in all health care professions to learn clinically relevant anatomy while gaining respect for the expertise of other professions.

Anatomical Services Committee Symposium

Tuesday, July 10th
1:00 PM – 2:30 PM

"HIPAA & PHI in Anatomical Donation, Education & Research"

What is the Health Insurance Portability and Accountability Act of 1996 (HIPAA) and how does it apply to anatomical donations? The Anatomical Services Committee symposium will address this question and those related to the collection, use and dissemination of donor data from both compliance and ethical points of view. If you have ever wondered if the Privacy Rule applies to your program operations, if the data you collect or disseminate for education and research constitutes Protected Health Information (PHI), or what types of information you can receive from a donation program for your teaching and research activities, the ASC is providing a forum for our expert speakers to breakdown the applicable regulations and discuss implications of using donor data in academic activities. During this symposium, attendees will learn about collecting, protecting and disseminating data and will have an opportunity to have their questions answered during a moderated Q & A session. If you wish to submit any questions in advance of the session, please contact David Conley: dmc@wsu.edu or Brandi Schmitt: brandi.schmitt@ucop.edu

Thomas H. Champney, Ph.D.

University of Miami Miller School of Medicine



Dr. Thomas H. Champney earned his Ph.D. in Biomedical Research at the University of Texas Health Science Center at San Antonio in 1984. His research investigated the role of the pineal gland and its hormone melatonin on integrative physiology. He completed a postdoctoral fellowship at the University of Delaware investigating reproductive physiology and then accepted a faculty position at Texas A&M University's College of Medicine. He spent 18 years at Texas A&M University teaching anatomy, histology and neuroanatomy to medical students while publishing over 50 research manuscripts on melatonin's role in endocrinology, epilepsy and immune regulation. He also provided lectures on scientific ethics to graduate students and served on the Texas A&M University Institutional Animal Care and Use Committee.

In 2003, Dr. Champney moved to St. George's University in Grenada where he taught first year medical students histology and created a scientific ethics course that was required for all biomedical graduate students. In addition, he reviewed grants for the Office of Research Integrity that funded projects in research ethics and collaborated with investigators on objectives for research ethics courses. In 2008, he spent one year in Zurich, Switzerland, and attended seminars at the Biomedical Ethics program at the University of Zurich.

Dr. Champney accepted a faculty position at the University of Miami's Miller School of Medicine in 2009 to teach first year medical students gross anatomy, histology and neuroanatomy. In 2010, he took over the coordination of the South Florida Willed Body Program for the State Anatomical Board. In addition, he joined the University's Ethics Program (now the Institute for Bioethics and Health Policy). He helps teach the Responsible Conduct of Research course as well as teaching in a graduate level Research Ethics course. He has also written a module for the online ethics education program (CITI) on conflicts of commitment and conscience. He publishes commentaries on the ethical use of human tissues, notably the use of willed bodies, and is a member of the International Federation of Associations of Anatomists (IFAA) Medical Humanities and Ethics group.

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Zane D. Wagner

University of Minnesota

Zane Wagner is an attorney and a compliance officer at the University of Minnesota, where he works on privacy regulations and health law. Zane promotes HIPAA compliance by helping researchers, educators, and administrations understand the need for privacy and security efforts at every level of the organization. Drawing on his background in law and technology, he connects the dots between privacy policies and the day-to-day collection, use, and disclosure of health information.

Zane is a graduate of Washington State University and the University of Minnesota Law School. He holds the Certified Information Privacy Professional (CIPP/US) and Certified Information Privacy Technologist (CIPT) credentials from the IAPP. In his spare time, he enjoys programming and brewing beer.

Post Graduate Course - Thursday, July 12, 2018

The Anatomy of Orthopedic Trauma

Morehouse School of Medicine
720 Westview Drive SW
Atlanta, GA

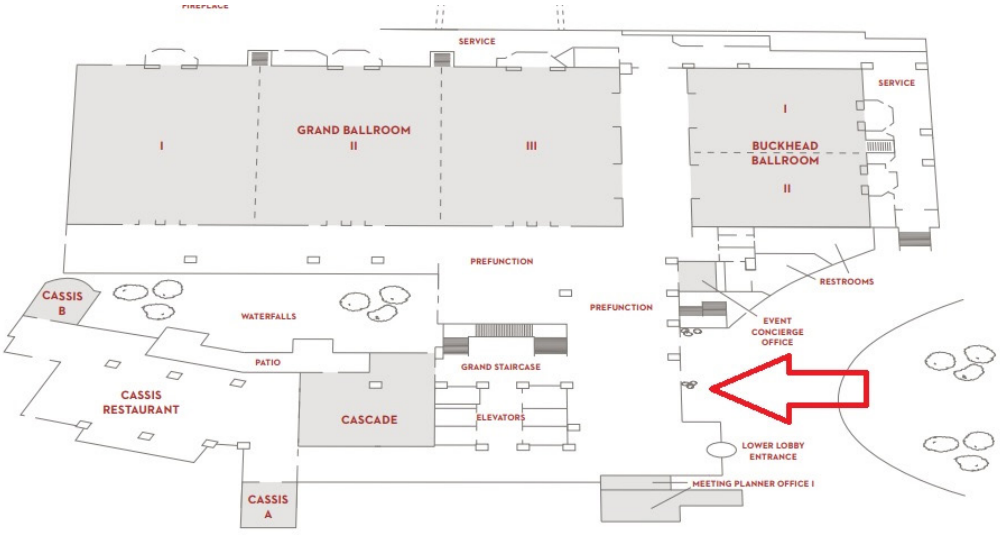
This course will include a general overview of orthopedic trauma situations and methods utilized to address those, plus hands-on laboratory stations in which the participants practice orthopedic procedures on human cadavers and/or artificial bones.

The four stations will be:

1. Femoral neck fracture repair
2. Distal radius open reduction
3. Intramedullary rodding of the tibia
4. Ankle fracture and syndesmosis repair

6:45 am	Load buses outside of Lower Lobby Level (same as the general session - see diagram below)
7:15 am	Bus departs from Grand Hyatt Outside of Lower Lobby Level
8:00 – 9:00 am	Arrival, registration and breakfast
9:00 – 10:00 am	Introductory lecture and discussion on the anatomy of the trauma from an orthopedic perspective
10:00 – 11:00 am	Cadaver Stations
11:00 am – 12:00 pm	Cadaver Stations
12:00 -1:00 pm	Lunch
1:00 – 2:00 pm	Cadaver Stations
2:00 – 3:00 pm	Cadaver Stations
3:00 - 3:30 pm	Wrap up and Departure

Lower Lobby Level



Poster Listings

Poster Session 1 – Monday, July 9, 2:45 PM – 4:00 PM

**Denotes publication in Clinical Anatomy.*

Poster # Abstract Title/Authors

001*
Architectural Characteristics of the Superficial Part of the Masseter Muscle by Ultrasonography.
LEE Hyungjin, You-Jin CHOI, Kang-Woo LEE, Young-Jun WE, and Hee-Jin KIM. Division in Anatomy and Developmental Biology, Department of Oral Biology, Human Identification Research institute, BK21 PLUS Project, Yonsei University College of Dentistry, Seoul, 03722, Republic of Korea.

002*
Three-Dimensional Territory and Depth of Asian Corrugator Supercilii Regarding to BTX-A Injection.
LEE, Hyungjin, Young-Jun WE, Kang-Woo LEE, and Hee-Jin KIM. Division in Anatomy and Developmental Biology, Department of Oral Biology, Human Identification Research institute, BK21 PLUS Project, Yonsei University College of Dentistry, Seoul, 03722, Republic of Korea.

005*
Structural Relationships between the Extrinsic and Intrinsic Muscles of the Tongue.
SAKAMOTO, Yujiro. Graduate School of Medical and Dental Sciences, Tokyo Medical and Dental University,Tokyo,113-8549, Japan.

008
Traumatic Dislocation of the Mandible into the Middle Cranial Fossa: An Anatomical Study.
WILSON, Charlotte S.[1], Joe IWANAGA[1,2,3], Rod J. OSKOUIAN[1], and R. Shane TUBBS[1,4]. [1]Seattle Science Foundation, Seattle, WA 98122, USA; [2]Division of Gross and Clinical Anatomy, Department of Anatomy, Kurume University School of Medicine, Kurume, Fukuoka, 830-0011, Japan; [3]Dental and Oral Medical Center, Kurume University School of Medicine, Kurume, Fukuoka, 830-0011, Japan; [4]Department of Anatomical Sciences, St. George's University, Grenada, West Indies.

011*
Anatomical Study of the Sensory Nerve Distribution in the Upper Eyelid.
WATANABE, Koichi[1], Tsuyoshi SAGA[1], Yoko TABIRA[1], Joe IWANAGA [1,2], and Koh-ichi YAMAKI[1]. [1]Department of Anatomy, Kurume University School of Medicine, Kurume, Fukuoka, 830-0011, Japan; [2]Seattle Science Foundation, Seattle, WA 98122, USA.

014*
The Torg Ratio of C3-C7 in African–Americans and European-Americans - Skeletal Study.
EZRA, David[1,2], Youssef MASHARAWI[3,] Khalil SALAME[1], Viviane SLON[1], Deborah ALPEROVITCH-NAJENSON[1] and Israel HERSHKOVITZ[1] [1]Department of Anatomy and Anthropology, Sacklar Faculty of Medicine, Tel-Aviv University, Tel Aviv 6997801 Israel; [2]School of Nursing Science, Tel Aviv Jaffo Academic College, Jaffo 6818211, Israel; [3]Spinal Reserch Lab, Department of Physiotheraphy, The Stanley Steyer School of Health Professions, Sacklar Faculty of Medicine, Tel-Aviv University, Tel Aviv 6997801 Israel.

017*
An Anatomic Study of the Zygomaticus Minor Muscle Connecting the Orbital and Mouth Regions.
HUR, Mi-Sun. Department of Anatomy, Catholic Kwandong University College of Medicine, Gangneung, Gangwon-do, 25601, Republic of Korea.

020*
Stereoscopic 3D Model Visualization for Trigeminal Ganglion Injection Procedure.
CUI, Dongmei, Jian CHEN, Rachel B. CRIM, and Gongchao YANG. Department of Neurobiology & Anatomical Sciences, Neurology, School of Medicine, University of Mississippi Medical Center, Jackson, MS 39216, USA.

023*
Recurrent Renal Cell Carcinoma with Metastasis to the Thyroid.
KELLY, Jonathan, Shireen SACHDEVA, Arroj ALI and Mark MILLER. Department of Surgery, Methodist University Hospital, Memphis, TN 38104, USA. Lincoln Memorial University, Harrogate, TN 37752, USA.

027*
Asymmetric Protrusion of Midface in the Young Population.
LEE, Shin-Hyo, Tae-Jun HA, Ki-Seok KOH, and Wu-Chul SONG. Department of Anatomy, Research Institute of Medical Science, Konkuk University School of Medicine, Seoul, Korea.

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Poster Session 1

032

Possibility of Zygomatic Arch as a Standard Line for Clinical and Anthropological Study.

KIM, Seung-Min, Ki-Seok KOH, Wu-Chul SONG, and Soon-Heum KIM. Department of Anatomy, Plastic and Reconstructive Surgery, Konkuk University School of Medicine, Seoul, Korea.

035*

Sonographic Image Analyses of the Upper Lip in Koreans.

PARK, Hyun-Jin, Kyu-Lim LEE, and Hee-Jin KIM. Division in Anatomy and Developmental Biology, Department of Oral Biology, Human Identification Research Center, BK21 PLUS Project, Yonsei University College of Dentistry, Seoul, 03722, South Korea.

038*

Topographic Anatomy of the Deep Temporal Artery and Clinical Implications for Temple Augmentation.

BAE, Hyung-Kyu, You-Jin CHOI, Kyung-Seok HU, and Hee-Jin KIM. Division in Anatomy and Developmental Biology, Department of Oral Biology, Human Identification Research institute, BK21 PLUS Project, Yonsei University College of Dentistry, Seoul, Republic of Korea.

041*

Positional Relationship of Superior and Inferior Labial Artery by Ultrasound Imaging Analyses.

LEE Kyu-Lim, Hyung-Jin LEE, You-Jin CHOI, Kyung-Seok HU, and Hee-Jin KIM. Division in Anatomy and Developmental Biology, Department of Oral Biology, Human Identification Research Institute, BK21 PLUS Project, Yonsei University College of Dentistry, Seoul, Republic of Korea.

044*

Submental Artery Passing the Mandibular Border and Its Clinical Implications.

LEE, Kangwoo1, Hyun-Jin PARK[1], Tanvaa TANSATIT[2], and Hee-Jin KIM[1]. [1]Division in Anatomy and Developmental Biology, Department of Oral Biology, Human Identification Research institute, BK21 PLUS Project, Yonsei University College of Dentistry, Seoul, 03722, Republic of Korea. [2]The Chula Soft Cadaver Surgical Training Center and Department of Anatomy, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand.

047*

Anomalous Exit of Chorda Tympani via Foramen Spinosum.

BRZEZINSKI, David W.[1], Sarah N. DUDGEON[1], Andrew ROSKO[2], and Joshua M. PETERSON[3]. [1]Division of Anatomical Sciences, Department of Surgery, University of Michigan, Ann Arbor, MI 48109, USA; [2]Department of Otolaryngology-Head and Neck Surgery, University of Michigan Health System, Ann Arbor, MI 48109, USA. [3]Univerity of Michigan Medical School, Ann Arbor, MI 48109, USA.

050*

The Role of Ultrasound in Identifying Midline Vasculature Relevant to Cricothyrotomy & Tracheostomy.

JACKSON, Tatum[1], Ololade AKINFEMIWA[1], Isabella GRAHAM1, Oyindamola TUNDE-BYASS[1], James COEY[1,2] and Sara SULAIMAN[3]. [1]St. George's International School of Medicine Keith B. Taylor Global Scholars Program, Northumbria University, Newcastle-Upon-Tyne, NE1 8ST, UK. [2]Department of Anatomy, St. George's University, Grenada, West Indies. [3]Department of Applied Sciences, Faculty of Health and Life Sciences, Northumbria University, Newcastle-upon-Tyne, NE1 8ST, UK.

053*

Three-Dimensional Topographic Anatomy of the External Nose Vasculature - Its Clinical Implications.

GIL, Young-Chun, Hyung-Jin LEE, Kyu-Lim LEE, Kyung-Seok HU, and Hee-Jin KIM. Division in Anatomy and Developmental Biology, Department of Oral Biology, Human Identification Research Institution, BK21 PLUS Project, Yonsei University College of Dentistry, Seoul, Republic of Korea.

056*

Co-localization Patterns of AQP-4, Aβ, and CD68 in Alzheimer's and Cerebrovascular Diseases.

CRUM[1], A. Bryan, BreAnna HUTCHINSON[1], Kevin S. STEED[1], Elisabeth BLACK[2], Dylan POPE[2], A. Parker COX[2], and Jonathan J. WISCO[1,2]. [1]Department of Neuroscience, Brigham Young University, Provo, UT 84602, USA. [2]Department of Physiology and Developmental Biology, Brigham Young University, Provo, UT 84602, USA.

059*

Forward Head Posture under Backpack Loading: An Ultrasound Study of Sternocleidomastoid Thickness.

VEGH, Andrea[1], Cristina BRAVI[1], Logan FLAXMAN[1], Jonathan IGNACIO[1], Jiakai JI[1], Alvaz KAUKAB[1], James COEY[1, 2], and Sara SULAIMAN[3]. [1]St. George's International School of Medicine Keith B. Taylor Global Scholars Program, Northumbria University, Newcastle upon Tyne, NE1 8ST, UK. [2]Department of Anatomy, St. George's University, Grenada, W.I. [3]Department of Applied Sciences, Faculty of Health and Life Sciences, Northumbria University, Newcastle upon Tyne, NE1 8ST, UK.

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Poster Session 1

062*

The Facial Artery in Relation to Manson's Point and the Submandibular Gland: An Ultrasound Study.

VARGHESE, Laura C.[1], Parima SAXENA[1], Mark P. MICHAEL[1], Fuad A. KHOURY[1], Sean R. SELLWOOD[1], James COEY[1,2] and Sara SULAIMAN[3]. [1]St. George's International School of Medicine Keith B. Taylor Global Scholars Program, Northumbria University, Newcastle-Upon-Tyne, NE1 8ST, UK. [2]Department of Anatomy, St. George's University, Grenada, W.I. [3]Department of Applied Sciences, Faculty of Health and Life Sciences, Northumbria University, Newcastle-upon-Tyne, NE1 8ST, UK.

065*

A Fresh Tissue Cadaveric Demonstration of the Clinical Anatomy of Eagle Syndrome.

CHAVARRIA, Matthew A., Timothy F. WALKER, Gilbert M. WILLETT, Michael J. WALEK, and Neil S. NORTON. Creighton University School of Dentistry, Omaha, NE 68178, USA.

071*

Facial Vein Variations and its Management in Facial Transplantation.

RANADE, Anu V[1], and Rajalakshmi RAI[2]. [1]College of Medicine, University of Sharjah, PO BOX 27272, Sharjah, UAE; [2]Centre for Basic Medical Sciences, KMC, Bejai, Mangalore, 575002, India.

074

The Anatomy Behind Platysmal Bands.

COTOFANA, Sebastian[1], Robert GOTKIN[2], Michael SMITH[1], Alexa GIAMMARINO[1], Tanvaa TANSATIT[3], Phillip LEVY[4], Nirusha LACHMAN[5] .[1]Department of Medical Education, Albany Medical College, Albany, NY 12208, USA; [2]Private Practice, New York, NY 11548, USA; [3]Department of Anatomy, Faculty of Medicine, Chulalongkorn University, Bangkok,10330, Thailand; [4]Private Practice, Geneva, 1206, Switzerland; [5]Mayo Clinic College of Medicine and Science, Mayo Clinic, Rochester, MN 55902, USA.

075

The Transverse Facial Septum – Implications for Plastic, Reconstructive and Aesthetic Procedures.

COTOFANA, Sebastian[1], Konstantin FRANK[2], Robert GOTKIN[3], Konstantin KOBAN[2], Nirusha LACHMAN[4], Thiloe SCHENCK[2]. [1]Department of Medical Education, Albany Medical College, Albany, NY 12208, USA; [2]Department for Hand, Plastic and Aesthetic Surgery, Ludwig – Maximilian University Munich, Munich 80469, Germany; [3]Private Practice, New York, NY 11548, USA; [4]Mayo Clinic College of Medicine and Science, Mayo Clinic, Rochester, MN 55902, USA.

078

Anatomical Variations of the Facial Artery for Facial Reconstruction and Aesthetic Procedures.

HOLDA, Mateusz, Mateusz KOZIEJ, Jakub POLAK, Jakub WNUK, Katarzyna PIĄTEK-KOZIEJ, Paweł BRZEGOWY, and Tadeusz POPIELA. Jagiellonian University Medical College, Krakow, 31-034, Poland.

081*

Superficial Ulnar Artery with High Bifurcation of the Brachial Artery and its Clinical Significance.

SIEGER, Jacob, Lajja PATEL, Kabir SHEIKH, Emily PARKER, Max SHENG, and Sumathilatha SAKTHI VELAVAN. Department of Biomedical Sciences, Marian University College of Osteopathic Medicine, Indianapolis, IN 46222, USA.

084*

Aberrant Bilateral Branching of the Second Portion of the Axillary Artery.

HAUGEN Natalie J, Ihiechi OHIA-ENYIA, Tiguiran KANE, Jenica G CHANDRAN, Sallyanna BAZELAIS, Ana QUINTERO, Ramona BAEZ and Sushama RICH. Touro College of Osteopathic Medicine, New York City, NY 10027, USA.

087*

Variant Palmaris Longus Invertus enclosing Ulnar nerve and Ulnar artery – A Case Report.

SANGARI Santosh K, Rosalinda G-GUCE, Ritwik BAIDYA and Estomih P. MTUI. Division of Anatomy, Department of Radiology, Weill Cornell Medicine, New York, NY 10065, USA.

090*

Parsing Out the Relationship between Contractile and Connective Elements in the Human Trapezius.

STIVER, Mikaela L.[1], Dinesh KUMBHARE[2], and Anne M.R. AGUR[1]. [1]Division of Anatomy, Department of Surgery, University of Toronto, Toronto, ON, M5S 1A8, Canada. [2]Toronto Rehabilitation Institute, University Health Network, Toronto, ON, M5G 2A2, Canada.

093*

Development of an In Vivo Ultrasound Protocol to Study Muscle Architecture of Pectoralis Major.

KAARID, Kaija P., Julia F. PENG, Roger LEEKAM, and Anne M. R. AGUR. Division of Anatomy, Department of Surgery, Faculty of Medicine, University of Toronto, Toronto, ON, M5S 1A8, Canada.

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096*
Smartphone Use and Repetitive Strain Injury: Investigating Flexor Pollicis Longus & the Median Nerve.
GILLIE, Breanne[1], Mark ORLANDO[1], Justin WISELY[1], Shuja KAZMI[1], James COEY[1,2] and Sara SULAIMAN[3]. [1]St. George's International School of Medicine Keith B. Taylor Global Scholars Program, Northumbria University, Newcastle upon Tyne, NE1 8ST, UK. [2]Department of Anatomy, St. George's University, Grenada, W.I. [3]Department of Applied Sciences, Faculty of Health and Life Sciences, Northumbria University, Newcastle upon Tyne, NE1 8ST, UK.

099*
Assessment of Fine-Wire Electrode Insertion into the Superior, Middle, and Inferior Infraspinatus.
SHAKERI, Shayan[1], Talia ALENABI[2], Clark R. DICKERSON[2], Anne M.R. AGUR[1], and Soo Y. KIM[3]. [1]Division of Anatomy, Department of Surgery, University of Toronto, Toronto, ON, M5S 1A8, Canada. [2]Department of Kinesiology, Faculty of Applied Health Sciences, University of Waterloo, Waterloo, ON, N2L 3G1, Canada. [3]School of Rehabilitation Sciences, College of Medicine, University of Saskatchewan, Saskatoon, SK, S7N 2Z4, Canada.

102*
Description of Axillary Arch and Adjacent Structures: A Cadaveric Study.
KIM, Pil-Woo. School of Health Sciences, Indiana Wesleyan University, Marion, IN 46953, USA.

105*
Characterization of the Clavicular Deltoid Tubercle Using Landmark Morphometrics.
KNIGHT, Brandon B. and Adam KOLATOROWICZ. Department of Anatomy, Lincoln Memorial University-Debusk College of Osteopathic Medicine, 6965 Cumberland Gap Parkway, Harrogate, TN 37752, USA.

108*
Compression of the Median Nerve, Anterior Interosseous Nerve, and Ulnar Vein by the Gantzer Muscle.
PETRONE Ashley B.[1,2], H. Wayne LAMBERT[1], Paula PACURARI[1], Tyler J. CELUCK[1], Reed C. ANDREWS[1], and Matthew J. ZDILLA[1,3]. [1]Department of Pathology, Anatomy and Laboratory Medicine, West Virginia University School of Medicine, Morgantown, WV 26506, USA; [2]Department of Neurology, West Virginia University School of Medicine, Morgantown, WV 26506, USA; [3]Department of Natural Sciences & Mathematics and Department of Graduate Health Sciences, West Liberty University, West Liberty, WV 26074, USA.

111*
Fibrosis and Scarring of the Brachial and Sciatic Plexus as Displayed by MRI/MRA/MRV.
COLLINS, James D. Department of Radiological Services, David Geffen School of Medicine, University of California, Los Angeles, CA 90024, USA.

114
Case Report: Rare Bilateral Branching Variations of the Suprascapular Arteries.
MEMAR, Shayan A., Jeffrey M. ALLISON, and Yun TAN. Center for Anatomical Science and Education, Department of Surgery, School of Medicine, Saint Louis University, St. Louis, MO 63104, USA.

Poster Listings

Poster Session 2 – Tuesday, July 10, 10:30 AM – 11:45 AM

* denotes publication in *Clinical Anatomy*

003*
Dental Students' Perceptions of Effective Anatomy Teaching.
ABDEL MEGUID, Eiman M.[1], Ashraf ALY[1] and Joseph W. ALLEN[2]. [1]Centre for Biomedical Sciences Education, School of Medicine, Dentistry and Biomedical Sciences, Queen's University Belfast, Belfast BT9 7AE, United Kingdom; [2]School of Social Sciences, Education, and Social Work, Queen's University Belfast, Belfast BT7 1HL, United Kingdom.

006
Labile Memory Enhancement Using Retrieval Practice.
GOHEEN, Joshua C., Ronald A. EASTEAL, Mohammad B. AZZAM, Rylan G. EGAN and Carolyn J. PERRY. Department of Biomedical and Molecular Sciences, Queen's University, Kingston, ON K7L 3N6, Canada.

009
The Integration and Retrieval of Previously-learnt Material Leading to Long-term Retention.
AZZAM, Mohammad B., Ronald A. EASTEAL, Joshua C. GOHEEN, and Rylan G. EGAN. Department of Biomedical and Molecular Sciences, Queen's University, Kingston, ON K7L 3N6, Canada.

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Poster Session 2

012*

Transitioning from Educator to Administrator: A Road Map to Build Anatomy and Survive the Journey.

LAMBERT, H. Wayne[1], Ashley B. PETRONE[1,2], and Matthew J. ZDILLA[1,3]. [1]Division of Anatomy, Department of Pathology, Anatomy and Laboratory Medicine, West Virginia University School of Medicine, Morgantown, WV 26506, USA; [2]Department of Neurology, West Virginia University School of Medicine, Morgantown, WV 26506, USA; [3]Department of Natural Sciences & Mathematics and Department of Graduate Health Sciences, West Liberty University, West Liberty, WV 26074, USA.

015*

An Anatomical Approach to Interpretation of Skeletal Trauma.

MESSER, Diana L.[1,2]. [1]Department of Applied Forensic Sciences, Mercyhurst University, Erie, PA, USA; [2]Department of Biomedical Education and Anatomy, College of Medicine, The Ohio State University, Columbus, OH 43210, USA.

018*

I-TEAM: Interactive Table-Exercise for Applied Morphology.

HASSAN, Sherif S1, 2, Rajunor ETTARH1, Fauzia NAUSHEEN1, Robert SUSKIND1, and Alfred TENORE1. 1Department of Medical Education, California University of Science and Medicine, School of Medicine, San Bernardino, CA, 92408, USA; 2Anatomy Department, Faculty of Medicine, Cairo University, Cairo, Egypt.

021*

Formative Assessments in Anatomy: Self-Assessment Resources for Laboratory Material.

LEE, Vaughan H., Katie HIGGINS, Megan GATES, and Brandt L. SCHNEIDER. Department of Medical Education, School of Medicine, Texas Tech University Health Sciences Center, Lubbock, TX 79430, USA.

022*

Demonstration and Presentation of Pharyngeal Structures in an Interprofessional Educational Activity.

LEE[1], Vaughan H., R. Lisa POPP[1], Angela VAN SICKLE[2]. [1]Department of Medical Education, School of Medicine, [2]Department of Speech, Language, & Hearing Sciences, School of Health Professions, Texas Tech University Health Sciences Center, Lubbock, TX 79430, USA.

026*

Surgical Education in Crisis: Anatomists to the Rescue!

SCHURTZ[1], Elleson A., Mark O. JENSEN[1], Priscilla THOMAS[1], and Robert P. STICCA[1]. 1Department of Surgery, University of North Dakota School of Medicine and Health Sciences, 1301 N Columbia Rd Stop 9037, Grand Forks, ND 58202, USA.

028*

Multi-Modal Gross Anatomy Education: Translating Knowledge to the Clinic.

TOPPING, Daniel B, and Arron SMITH. Department of Medical Education, University of Central Florida College of Medicine, Orlando, FL 32827, USA.

031*

Cadaver Case Studies: An Accelerated Learning Model.

LEWIS, James E., and Heather H. ROSS. Department of Physical Therapy, Ivester College of Health Sciences, Brenau University, Gainesville, GA, 30501, USA.

034*

Enhancing Students' Comprehension of Anatomy Through Engagement and Formative Assessment.

RAOOF, Ameed[1], Avelin MALYANGO[1], Mange MANYAMA[1], Nurru L. MLIGILICHE[1], Charles MSUYA[1], Nasnass NASSIR[1], Lotfi CHOUCHANE[1], Thurayya ARAYSSI[1], and Estomih MTUI[2]. [1]Medical Education Division, Weill Cornell Medicine-Qatar, Qatar Foundation, P.O. Box 24144, Doha, Qatar. [2]Radiology Program in Anatomy, Weill Cornell Medicine, New York, NY 10065, USA.

037*

Surface Anatomy Assessment Using Near-Peer Evaluation in Gross Anatomy: Planning and Perspectives.

PRATT, Rebecca L.[1,2]. [1]Department of Biomedical Sciences, Oakland University William Beaumont School of Medicine, Rochester, MI 48309, USA. [2]Department of Radiology, Michigan State University School of Osteopathic Medicine, East Lansing, MI 48824, USA.

040

EMG Analysis of Latissimus Dorsi, Erector Spinae and Middle Trapezius During Spinal Rotation.

JENO, Susan H.N., and Renee MABEY. Department of Physical Therapy, University of North Dakota School of Medicine and Health Sciences, Grand Forks, ND 59202-9037, USA.

043*

Viewing Patterns of Course Media Based on Academic Performance.

GREENE, Sarah J. Department of Pathology and Anatomy, Morehouse School of Medicine, Atlanta, GA 30310, USA.

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Poster Session 2

046*
Comparison between Hands-On-Dissections and Peer-Teaching on Comprehension of Anatomical Concepts.
PADARTI, Akhil, Jose VENEGAS, and Thomas GEST. Paul L. Foster School of Medicine, El Paso, TX 79905, USA.

049*
Evaluating the Effectiveness of Thiel-Embalmed Cadavers for Identifying a Positive Lachman Test.
BAILEY, James R., Kyle T. BODEN, Kenan T. WILHOIT, Robert M. BECKER, Tom E. KWASIGROCH, and Brian D. JOHNSTON. Department of Biomedical Sciences, Quillen College of Medicine, East Tennessee State University, Johnson City, TN 37604, USA.

052*
A Student-Sponsored Series of Talks on the History of Medicine.
WARD, Peter J. and Lindsey KENT. West Virginia School of Osteopathic Medicine, Lewisburg, West Virginia, USA.

058*
Should Pre-Professional Students Take This Course? A Resounding Yes from Professional Students.
MATTINSON[1], Catherine E., and Elisa M. KONIECZKO[2]. [1]Department of Anatomy and Neurobiology, Northeast Ohio Medical University, Rootstown, OH 44272, USA. [2]Department of Biology, Gannon University, Erie, PA 16541, USA.

061*
The Relationship between Supplemental Learning and Performance in Anatomy Practical Examinations.
KHALIL, Mohammed K., Shanna E. WILLIAMS, and H. Gregory HAWKINS. Department of Biomedical Sciences, University of South Carolina School of Medicine Greenville, Greenville, SC 29605, USA.

064*
Using Common Clinical Procedures to Teach Anatomy in a Medical School.
JACINTO, Brian[1], Heather A. BALSIGER[2], Thomas GEST[2], and Dolgor BAATAR[2]. [1]MD Program, Paul L. Foster School of Medicine, Texas Tech University Health Sciences Center El Paso, El Paso, TX, 79905, USA; [2]Department of Medical Education, Paul L. Foster School of Medicine, Texas Tech University Health Sciences Center El Paso, El Paso, TX 79905, USA.

067
Anatomic Radiology for International Students from Underdeveloped Countries - A Pilot Program.
GILROY, Anne M. Division of Translational Anatomy, Department of Radiology, University of Massachusetts Medical School, Worcester, MA 01655, USA.

070*
Anatomy Practical Testing Predicts Medical Student Success and Continued Interest in Gross Anatomy.
ECKELBARGER, Julie, Joshua HAHN, and Thomas GEST. Texas Tech University Health Sciences Center El Paso, Paul L. Foster School of Medicine, El Paso, TX 79905, USA.

076
Group-Based Anatomy Cumulative Oral Examinations.
RAREY, Kyle E. [1], Venkatesh NONABUR[1], Amanda MAXEY[1], Ziepei ZHU[2], and Ashleigh WRIGHT[3]. [1]Department of Anatomy & Cell Biology; [2]Department of Anesthesiology; [3]Department of General Internal Medicine, University of Florida College of Medicine, Gainesville, FL, USA.

077
Inclusion of Mini-Peer Teaching Sessions (MPTs) During Gross Anatomy Laboratory Periods.
RAREY, Kyle E.[1], Venkatesh NONABUR[1], Amanda MAXEY[1], Ziepei ZHU[2], and Ashleigh WRIGHT[3]. [1]Department of Anatomy & Cell Biology; [2]Department of Anesthesiology; [3]Department of General Internal Medicine, University of Florida College of Medicine, Gainesville, FL, USA.

080*
Qualitative Reasoning of a Novel Approach to the Pelvic Dissection.
MOSLEY, Claudia F., Leah D. HUNTER and Kirk M. MCHUGH. The Department of Biomedical Education and Anatomy, The Ohio State University, Columbus, OH 43210, USA.

083*
Introducing Short Answer Questions in Anatomy Spot Test.
ALRADDADI, Abdulrahman[1], Ibrahim HOJA[1], Haifa ALHAWAS[1], Bader KHAWAJI[2], and Emad MASUADI[1]. [1]College of Medicine, King Saud bin Abdulaziz University for Health Sciences, Riyadh, 11481, Saudi Arabia. [2]College of Medicine, King Saud bin Abdulaziz University for Health Sciences, Jeddah, 21423, Saudi Arabia.

086
Assessment Styles Do Not Affect Students' Drive for Learning or Performance in Anatomy Spot Tests.
MOGALI, Sreenivasulu R., Lucy V. ROSBY, Jerome I. ROTGANS, Peter ABRAHAMS, and Michael A. FERENCZI. Lee Kong Chian School of Medicine, Nanyang Technological University, 308232, Singapore.

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Poster Session 2

089*

Virtual Autopsy Reports of Anatomical Donors Prepared by Students after the Gross Anatomy Course.

BERND, Paulette[1], Jay LEFKOWITCH[1], Steven ERDE[2], Pallavi UTUKURI[3], Jasnit MAKKAR[3], and Joshua WEINTRAUB[3]. [1]Department of Pathology and Cell Biology, Columbia University, Vagelos College of Physicians & Surgeons, New York, NY 10032, USA; [2]College of Dental Medicine, Columbia University, New York, NY 10032, USA; [3]Department of Radiology, Columbia University, Vagelos College of Physicians & Surgeons, New York, NY 10032, USA.

095*

Exploring Anatomist and Student Perceptions of Teaching Anatomy in the Modern Medical Curriculum.

SULAIMAN, Sara[1], and James COEY[2, 3]. [1]Department of Applied Sciences, Faculty of Health and Life Sciences, Northumbria University, Newcastle-upon-Tyne, NE1 8ST, UK. [2]St. George's International School of Medicine Keith B. Taylor Global Scholars Program, Northumbria University, Newcastle-Upon-Tyne, NE1 8ST, UK. [3]Department of Anatomy, St. George's University, Grenada, West Indies.

098*

Muscular Dystrophy – A Cadaveric Study of Anatomical Findings.

PREWITT, Chantal. Department of Physical Therapy, College of Health Professions, School of Movement and Rehabilitation Sciences, Bellarmine University, Louisville, KY 40205, USA.

101

A New Role for the Clinical Anatomy Course - Anchor for Internationalization of Medical Education.

WU, Anette[1], Heike KIELSTEIN[2], Takeshi SAKURAI[3], Geoffroy NOEL[4], Suvi VIRANTA-KOVANEN[5], Tsai-Kun LI[6], Liisa KIUKKA[5], and Paulette BERND[1]. [1]Department of Pathology and Cell Biology, Columbia University, New York, NY 10032, USA; [2]Department of Anatomy and Cell Biology, Martin Luther University Halle, Halle, 06114, Germany; [3]Department of Drug Discovery, Medical Innovation Center, Kyoto University, Kyoto, 606-8501, Japan; [4]Department of Anatomy and Cell Biology, McGill Unversity, Montreal, QC, H3A0C7, Canada, [5]Department of Anatomy, University of Helsinki, Helsinki, 00014, Finland, [6]Department of Microbiology, National Taiwan University, Taipei, 10051, Taiwan.

104

Novice-Expert Differences/Similarities Correlating CT Images with 3D Human Simulation Setting.

SALKOWSKI[1,2], Lonie R. and Rosemary RUSS[3]. [1]University of Wisconsin Madison, Department of Radiology, Madison, WI 53792, USA. [2]University of Wisconsin Madison, Department of Medical Physics, Madison, WI 53705, USA. [3]University of Wisconsin, School of Education, Department of Curriculum & Instruction, Madison, WI 53706, USA.

107

Delivery of Novel Anatomy Dissector Guide using Dissection Tank-based Interactive iPad Interface.

COOPER, David W, Caroline ABERCROMBIE, Robert BECKER, and Charles WALDROFF. Department of Biomedical Sciences, Quillen College of Medicine, East Tennessee State University, Johnson City, TN 37604, USA.

110*

Investigation of Tendon Biomechanics in Soft Embalmed and Unembalmed Cadavers.

WHITAKER, Amy N.[1], James HARRIS[1], Ganesh THIAGARAJAN[2], Christina LEE[1], Sirus SAEEDIPOUR[1], Barth WRIGHT[1], and German BERBEL[1]. [1]Kansas City University of Medicine and Biosciences Division of Clinical Anatomy, Kansas City, MO 64106, USA. [2]University of Missouri-Kansas City Department of Civil and Mechanical Engineering, Kansas City, MO 64110, USA.

113*

Surveying Bone Lipids for the Detection of Low Bone Mineral Density.

CHELF, Stacy L.[1], Zachary C. WHITESIDE[1], John E. CEBAK[2], Paul WOOD[2], and Beatrix DUDZIK[1]. [1]Department of Anatomy, DeBusk College of Osteopathic Medicine, Harrogate, TN 37752, USA. [2]Metabolomics Unit, Lincoln Memorial University College of Veterinary Medicine, Harrogate, TN 37752, USA.

116*

Transitioning from Basic Science Research to Anatomical Sciences: Challenges and Opportunities.

PETRONE, Ashley B.[1,2], Matthew J. ZDILLA[3], and Wayne LAMBERT[1]. [1]Division of Anatomy, Department of Pathology, Anatomy and Laboratory Medicine, West Virginia University, Morgantown, WV 26506, USA; [2]Department of Neurology, West Virginia University, Morgantown, WV 26506, USA; [3]Department of Natural Sciences & Mathematics and Department of Graduate Health Sciences, West Liberty University, West Liberty, WV 26074, USA.

118

Procuring Anatomical Materials: A Look at Commercial Entities vs. Educational Donor Programs.

WILCOX, Erin L., Scott T. BARTON. Anatomical Services, Division of Medical Education, School of Medicine, University of California, San Diego, La Jolla, CA 92093, USA.

121*

Evaluation of Antiseptic Properties Seen in Saturated Salt as Alternative Embalming Solution.

BASTIAN David A, Heather BALSIGER, Amanda HERRARA, Jose SANTIAGO, Mark GIRTON, Faustino SALCIDO, and Thomas GEST. Department of Medical Education, Paul L. Foster School of Medicine, Texas Tech University Health Sciences Center El Paso, TX 79905, USA.

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Poster Session 2

123*
Cadavers: Unclaimed to Donated Bodies in Maryland, 1938-1977.
LAWRENCE, Susan C.[1] and Susan E. LEDERER[2]. [1]Department of History, The Ohio State University, Columbus, OH 43210, USA; [2]Department of Medical History & Bioethics, University of Wisconsin-Madison, Madison, WI 53706, USA.

125*
Variables Influencing Body Donation at McGill: Learning from the Past to Prepare for the Future.
NOEL, Geoffroy, and Julia HERON. Division of Anatomical Sciences, Department of Anatomy and Cell Biology, Faculty of Medicine, McGill University, Montreal, QC, H3A 1A3, Canada.

Poster Listings

Poster Session 3 – Wednesday, July 11, 9:15 – 10:30 AM

* denotes publication in *Clinical Anatomy*

004*
Hypoplasia of Clavicular Head of Pectoralis Major with Ipsilateral Upper Extremity Anomalies.
LOUIS, Sarah A, Salimah F MOHAMED, Sushama RICH, Carlos QUINTEROS, and Ramona BAEZ. Department of Anatomy, Touro College of Osteopathic Medicine - Harlem, New York, NY 10027, USA.

007*
Anomalous Origin and Course of the Left Common Carotid Artery – A Case Report.
KUMAR Sushil, Ritwik BAIDYA, Santosh K. SANGARI and Estomih P. MTUI. Anatomy Division, Department of Radiology, Weill Cornell Medicine, New York, NY 10065, USA.

010*
Evaluation of Bronchopulmonary Segments Variations Using Three-Dimensional Segmentation of CT Scans.
GOH Kang Shiong[1], Brian H K. HO[1], Gerald TJ. SIN[2] and Sreenivasulu R. MOGALI[1]. [1]Lee Kong Chian School of Medicine, Nanyang Technological University, 308232, Singapore; [2]Department of Radiology, Tan Tock Seng Hospital, 308433, Singapore.

013*
Surface Anatomy of the Subclavian Vein in Relation to the Clavicle: An Ultrasound Study.
VAZIRIAN, Saeed[1], Henry FAN[1], Roger STERN[1], Tenzin THINLEY[1], James COEY[1,2], Sara SULAIMAN[3]. [1]Keith B. Taylor Global Scholars Program at Northumbria University, St. George's International School of Medicine, Newcastle-upon-Tyne, NE1 8ST, UK. [2]Department of Anatomy, St. George's University, Grenada, West Indies. [3]Department of Applied Sciences, Northumbria University, Newcastle-upon-Tyne, NE1 8ST, UK.

016
Assessment of Coronary Artery Ostia Morphology by Computed Tomographic Angiography.
HOLDA, Jakub, Mateusz K. HOLDA, Agata KRAWCZYK-OZOG, Kamil W. TYRAK, and Wiesława KLIMEK-PIOTROWSKA. Department of Anatomy, Jagiellonian University Medical College, Krakow, 31-034, Poland.

019
Anatomy of the Pulmonary Valve Leaflets.
TYRAK, Kamil W., Jakub P. HOLDA, Mateusz K. HOLDA and Wiesława KLIMEK-PIOTROWSKA. Department of Anatomy, Jagiellonian University Medical College, Krakow, 31-034, Poland.

024
Histological Study of Capsular Synovial Metaplasia That Is Formed Around Silicone Breast Implants.
VARGA, Ivan[1], Lubos DANISOVIC[2], Michal MIKO[1], Martin BOHAC[3], and Stefan POLAK[1]. [1]Institute of Histology and Embryology, Faculty of Medicine, Comenius University, Bratislava, Slovakia, European Union; [2]Institute of Medical Biology, Genetics and Clinical Genetics, Faculty of Medicine, Comenius University, Bratislava, Slovakia; [3]Department of Plastic Surgery, Faculty of Medicine, Comenius University, Bratislava, Slovakia.

025
Histological Changes of the Thymus Resembling Accidental Involution and Sudden Infant Death Syndrome.
VARGA, Ivan[1], Lubos DANISOVIC[2], Michal MIKO[1], and Stefan POLAK[1]. [1]Institute of Histology and Embryology, Faculty of Medicine, Comenius University, Bratislava, Slovakia, European Union; [2]Institute of Medical Biology, Genetics and Clinical Genetics, Faculty of Medicine, Comenius University, Bratislava, Slovakia.

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Poster Session 3

030*
Surgical Anatomy of Heart Transplantation - 50 Years of History.
FRANCISCO, Margarida. Centro Académico de Medicina de Lisboa, Lisboa, LI, 1649-028, PT.

033*
Unusual Vascular Variations of the Left Kidney: A Case Study.
LOHMAN BONFIGLIO, Chelsea M.[1], Kellie C. HUXEL BLIVEN[1], Adam J. RAFFOUL[1], and Lesley K. GILMER[2]. [1]Department of Interdisciplinary Health Sciences, Arizona School of Health Sciences, A.T. Still University, Mesa, AZ 85206, USA. [2]Rocky Mountain University of Health Professions, Provo, UT 84606, USA.

036*
The Possibility of Saint's Triad and the Diagnostic Implications for a Physical Therapy Student.
RUTLAND, Marsha D., Leigh ALLEN, Allison BALL, Allison MORRIS, and Michael H. WESTBROOK. Hardin-Simmons University, Abilene, TX 79698, USA.

039*
Hiatal Hernia with Intrathoracic Stomach - A Cadaveric Case Report.
SAVICE, Krystal W.[1], Sercan TURE[1], Sai YETRINTALA[1], John O'CONNOR[1], Aveneet SINGH[1], Devanshi MEHTA[1], Sushama RICH[1], Luis VIDAL[1], Bedia CASTELLANOS[1], Eric BAKER[2], and Christopher SHACKLES[3]. [1]Department of Anatomy, Touro College of Osteopathic Medicine - Harlem, New York, NY 10027, USA. [2]Department of Basic Science and Craniofacial Biology, New York University College of Dentistry, New York, NY 10010, USA; [3]Stony Brook University Hospital. Stony Brook, NY 11794, USA.

042
Ligamentous Structure in Human Glans Penis: A Homologue of the Baculum?
LEE, Je-Sung, Shin-Hyo LEE, Tae-Jun HA, Ki-Seok KOH, and Wu-Chul SONG. Department of Anatomy, Research Institute of Medical Science, Konkuk University School of Medicine, Seoul, Korea.

045*
Double Inferior Vena Cava – A Rare Case Report.
BAIDYA, Ritwik, Sushil KUMAR, Santosh K. SANGARI and Estomih P. MTUI. Anatomy Division, Department of Radiology, Weill Cornell Medicine, New York, NY 10065, USA.

048*
Cadaveric Study of the Aortic Zones for Resuscitative Endovascular Balloon Occlusion of the Aorta.
MILLER, Zachary D.[1], Eliza R. PELRINE[1], Ada L. BREITENBUCHER[1], Kris WARING[1], Jillian V. JOHNSON[1], Alicia Q. ZHANG1, Brent BAUMAN[1], Peter KERNAHAN[1,2] , and James V. HARMON[1,2]. [1]Department of Surgery, University of Minnesota Medical School, Minneapolis, MN 55455, USA; [2]Department of Integrative Biology and Physiology, University of Minnesota, Minneapolis, MN 55455, USA.

051*
The Inferior Gluteal Nerve has a Cutaneous Branch in the Majority of Individuals.
IWANAGA, Joe[1,2], Emily SIMONDS[1], Marc VETTER[1], Mayank PATEL[1], Rod J. OSKOUIAN[1], and R. Shane TUBBS[1,3]. [1]Seattle Science Foundation, Seattle, 550 17th Ave, James Tower, Suite 600, Seattle, WA 98122, USA. [2]Division of Gross and Clinical Anatomy, Department of Anatomy, Kurume University School of Medicine, Kurume, Fukuoka 830-0011, Japan. [3]Department of Anatomical Sciences, St. George's University, St George's, Grenada, West Indies.

054*
Cadaveric Dissection of the Femoral Nerve within Psoas Major – A New Entrapment Syndrome?
SOLOMOU, Georgios[1], Mike MAHON[1], Nikolaos TZERAKIS[2], and Peter WILLAN[1], [1]Department of Anatomy, School of Medicine, University of Keele, Staffordshire, ST5 5BG, United Kingdom; [2]Department of Neurosurgery, Royal Stoke University Hospital NHS Trust, Stoke-on-Trent, ST4 6QG, United Kingdom.

057*
Protocol for En Bloc Removal of Viscera and Vasculature of the Thoracic and Abdominopelvic Cavities.
GIANNARIS, Eustathia Lela and Amanda J. COLLINS. Division of Translational Anatomy, Department of Radiology, University of Massachusetts Medical School, Worcester, MA 01655, USA.

060*
A Multi-Year Quantitative Analysis of Duodenal Papilla Relationships.
TRACY-BEE, Mary, Alaa ABU-MAHFOUZ, Rama ZOUABI, Reem BAZZI, AMENA AL-KHAFAJI. University of Detroit Mercy, Detroit, Michigan 48382, USA.

063*
Anatomic Evidence of the Effectiveness of Modified Quadratus Lumborum Blocks.
LANGLEY, Natalie R.[1], Sonya E. VAN NULAND[1], Shreya SHETTY[2], Tiffany WEIDNER[2], Patrick HANGGE[2], and Tonia M. YOUNG-FADOK[2]. [1]Department of Anatomy, Mayo Clinic College of Medicine and Science, Mayo Clinic, Scottsdale, AZ 85251, USA; [2]Department of Surgery, Mayo Clinic, Phoenix, AZ 85054, USA.

Poster Session 3

066

Innervation of the Pubic Symphysis: An Immunohistochemical Study.

WOODLEY, Stephanie J., Jimmy JO, and Natasha A.M.S. FLACK. Department of Anatomy, University of Otago, Dunedin, 9054, New Zealand.

069

A Case of Splenomegaly and Myelodysplastic Syndrome.

BREDY, Sancia[1] and Sarah GREENE[2]. [1]M.D. Program, Morehouse School of Medicine, Atlanta, GA 30310, USA. [2]Department of Pathology and Anatomy, Morehouse School of Medicine, Atlanta, GA 30310, USA.

072

Generation of Human iPSCs and Analysis of Their Potential for Osteochondral Regeneration.

DANISOVIC, Lubos[1], Maria CSOBONYEIOVA[2], Martin BOHAC[3], Zuzana VARCHULOVA NOVAKOVA[1], Michal MIKO[2], and Ivan VARGA[2]. [1]Institute of Medical Biology, Genetics and Clinical Genetics, Faculty of Medicine, Comenius University, Bratislava, SK-811 08, Slovakia; [2]Institute of Histology and Embryology, Faculty of Medicine, Comenius University, Bratislava, SK-811 08, Slovakia; [3]Department of Plastic Surgery, Faculty of Medicine, Comenius University, Bratislava, SK-826 06 Slovakia.

079

Stem Cell Research and It's Clinical Implications in the Kingdom of Saudi Arabia.

OOMMEN, Anitha and Ibrahim H. ALZAHRANI. Department of Anatomy, Department of Pathology, Northern Border University, Arar, 91431, Saudi Arabia.

082*

Unusual Ovarian Histologic Findings in a Case of Nager Syndrome and a Possible Shared Etiology.

HERCULE[1], Wilmene S., and Darren SALMI[1,2]. [1]Division of Clinical Anatomy, Stanford University School of Medicine, Stanford, CA 94305, USA. [2]Department of Pathology, Stanford University School of Medicine, Stanford, CA 94305, USA.

085*

Illustration of the Female Reproductive System from the 16th to 19th Century: A Historical Review.

BARNETT, Jessi Jo[1,2], Shayan SHAKERI[1,2], and Anne M.R. AGUR[2]. [1]School of Medicine, St. George's University, Grenada, West Indies. [2]Division of Anatomy, Department of Surgery, University of Toronto, Toronto, ON M5S 1A8, Canada.

088*

Cadaveric Study of Vastus Medialis Obliquus Fiber Angulation.

THOMAS, Nathan, Joshua HAHN, Thomas GEST, and Herb JANSSEN. Texas Tech University Health Sciences Center El Paso, Paul L. Foster School of Medicine, El Paso, TX 79905, USA.

091*

Bilateral Variant Hamstring Musculature with an Aberrant Sciatic Nerve and Sternalis Muscle.

IBEZIM, Kelechi O., Kathleen J. HOBAN, Kenzi J. HOLCOMB, Garret W. HOLST, Patrick M. JEFFERS, and Sumathilatha SAKTHI VELAVAN. Department of Biomedical Sciences, Marian University College of Osteopathic Medicine, Indianapolis, IN 46222, USA.

094*

The Contentious Origin of the Superior Medial Genicular Nerve.

VILDE, Tomas A.[1], John TRAN[1], Philip W.H. PENG[2], Michael GOFELD[2], and Anne M.R. AGUR[1]. [1]Division of Anatomy, Department of Surgery, Faculty of Medicine, University of Toronto, Toronto, ON, M5S 1A8, Canada; [2]Department of Anesthesia, Faculty of Medicine, University of Toronto, Toronto, ON, M5T 2S8, Canada.

097*

A High Fidelity 3D Model and Database of the Lower Limb Musculoskeletal System.

CASTANOV, Valera[1], Denyse RICHARDSON[2], Karl ZABJEK[3], and Anne AGUR[1]. [1]Department of Surgery, Faculty of Medicine, University of Toronto, Toronto, ON, M5S 1A8, Canada. [2]Division of Physical Medicine and Rehabilitation, Department of Medicine, Faculty of Medicine, University of Toronto, Toronto, ON, M5G 2C4, Canada. [3]Department of Physical Therapy, Faculty of Medicine, University of Toronto, Toronto, ON, M5G 1V7, Canada.

100*

Architecture of the Infant Gluteus Minimus: A 3D Modelling Study.

BRADSHAW, Luke R.[1], Ethan M. BREINHORST[1], Allen DUONG[3], N. Susan STOTT[2], Anne M.R. AGUR[3], and Seyed A. MIRJALILI[1]. [1]Anatomy and Medical Imaging Department and [2]Department of Surgery, School of Medicine, Faculty of Medical and Health Sciences, University of Auckland, Auckland, 1023, New Zealand; [3]Division of Anatomy, Department of Surgery, Faculty of Medicine, University of Toronto, Toronto, ON, M5S 1A8, Canada.

Poster Session 3

103*

Effects of Foot Positions and BMI on the Tibial Nerve at the Tarsal Tunnel.

BOURDKANE[1], Tony, Onyinye NNAMDI-NWOSU[1], Ruba ABDULLAH[1], Tamseela GURRU[1], James COEY[1,2] and Sara SULAIMAN[3]. [1]St. George's International School of Medicine Keith B. Taylor Global Scholars Program, Northumbria University, Newcastle upon Tyne, NE1 8ST, UK. [2]Department of Anatomy, St. George's University, Grenada, W.I. [3]Department of Applied Sciences, Faculty of Health and Life Sciences, Northumbria University, Newcastle upon Tyne, NE1 8ST,UK.

106*

Anterior Talofibular Ligament (ATFL) Relations to Surrounding Ligamentous Structures.

KHAWAJI, Bader[1,2], Clare LAMB[2], and Roger SOAMES[2]. [1]College of Medicine, King Saud bin Abdulaziz University for Health Sciences, Jeddah, 21423, Saudi Arabia. [2]Centre for Anatomy and Human Identification, School of Science and Engineering, University of Dundee, Dundee, DD1 5EH, United Kingdom.

109*

Mapping the Anatomical Variations of Subcutaneous Nerves surrounding the Knee.

LATER, Dylan M. and Jonathan J. WISCO. Brigham Young University, Provo, UT 84602, USA.

112*

Biomechanics Behind the Age-related Changes in the Anatomy of the Achilles Tendon Insertion.

PĘKALA, Przemysław A.[1,2], Anna DRZYMAŁA[2], Bendik SKINNINGSRUD[1,2], Brandon M. HENRY[1,2], Tomasz ROK[3], Grzegorz TATOŃ[3], Wadim WOJCIECHOWSKI[3], Krzysztof A. TOMASZEWSKI[1,2], and Jerzy A. WALOCHA[1,2]. [1]International Evidence-Based Anatomy Working Group, 31-034 Krakow, Poland; [2]Department of Anatomy, Jagiellonian University Medical College, 31-034 Krakow, Poland; [3]Department of Biophysics, Jagiellonian University Medical College, 31-008 Krakow, Poland.

115*

Length of Insertion and Thickness of the Calcaneal Tendon: An Ultrasound Study.

GLADSON, Shefali[1], Pranay SIRIYA[1], Salah AWADALLA[1], Abena ODURO[1], Sabin RAJKARNIKAR[1], Lijo LUKA[1], Yaw KORANKYE-ADJEI[1], James COEY[1, 2], and Sara SULAIMAN[3]. [1]St. George's International School of Medicine Keith B. Taylor Global Scholars Program, Northumbria University, Newcastle upon Tyne, NE1 8ST, UK. [2]Department of Anatomy, St. George's University, Grenada, W.I. [3]Department of Applied Sciences, Faculty of Health and Life Sciences, Northumbria University, Newcastle upon Tyne, NE1 8ST, UK.

117*

Anatomical Study of the Soleal Venous Network Focused on the Median Septum of the Soleus Muscle.

TABIRA, Yoko[1], Koichi WATANABE[1], Tsuyoshi SAGA[1], Joe IWANAGA[1, 2], and Koh-ichi YAMAKI[1]. [1]Department of Anatomy, Kurume University School of Medicine, Kurume, Fukuoka, 830-0011, Japan; [2]Seattle Science Foundation, Seattle, WA 98122, USA.

119*

Distal Interactions of the Quadratus Plantae Muscle.

FOGG, Quentin A., Georga K. BRUECHERT and Casper G. THORPE LOWIS. Department of Anatomy and Neuroscience, The University of Melbourne, Melbourne, Victoria 3010, Australia.

120*

Optimising Button Fixation on the Lateral Femur for Anterior Cruciate Ligament Reconstruction.

FOGG, Quentin A.[1], Mark HAMLET[2], Casper G. THORPE LOWIS[1] and Neil ASHWOOD[2]. [1]Department of Anatomy and Neuroscience, The University of Melbourne, Melbourne, Victoria 3010, Australia; [2]Department of Trauma and Orthopaedics, Burton Hospitals NHS Foundation Trust, Burton-upon-Trent DE13 0RB, UK.

122*

An Ultrasound Study of the Effect of Leg Crossing on Lower Limb Vasculature.

ICETON, J. Blake[1], Alissa GALAS[1], Kaitlyn GOODING[1], Adriane LUI[1], Jillian ROSS[1], Jennifer TAPLEY[1], James COEY[1,2], and Sara SULAIMAN[3]. [1]St. George's International School of Medicine Keith B. Taylor Global Scholars Program, Northumbria University, Newcastle upon Tyne, NE1 8ST, UK. [2]Department of Anatomy, St. George's University, Grenada, W.I. [3]Department of Applied Sciences, Faculty of Health and Life Sciences, Northumbria University, Newcastle upon Tyne, NE1 8ST,UK.

124*

Popliteal Vascular Entrapment Syndrome: Accessory Slip of the Medial Head of the Gastrocnemius.

MOTTERN, John L., Rebecca N. STEELE, Robert M. BECKER, and Caroline L. ABERCROMBIE. Department of Biomedical Sciences, Quillen College of Medicine, East Tennessee State University, Johnson City, TN 37614, USA.

Poster Session 3

126*

Anatomical Placement of Percutaneous Neuromodulation Electrodes Suitable for Clinical Studies.

OLLERENSHAW, Jeremy D., Rasagnya VISWANADHA, Natalia ALEXEEVA, David PAGE, Ryan CALDWELL, Shyamy R. SASTRY, Phillip SCHORR, and Eric A. SCHEPIS. Halyard Health, Alpharetta, GA 30004, USA.

127*

Novel Anatomical Access to the Saphenous Nerve for Pain Block Placement in Total Knee Arthroplasty.

OLLERENSHAW, Jeremy D.[1], Eric A. SCHEPIS[1], Natalia ALEXEEVA[1], and Daniel E. MATTHEWS[2]. [1]Halyard Health, Alpharetta GA 30004, USA; [2]Alabama Orthopedic Sports Medicine, Daphne, AL 36526, USA.

American Association of Clinical Anatomists

Annual Business Meeting

Agenda
Wednesday, July 11, 2018
Grand Hyatt Buckhead
Atlanta, Georgia

PO Box 2945
LaGrange, Ga 30241
Ph: 706-298-0287
www.clinical-anatomy.org

CALL TO ORDER: 2:00 pm

Approval of Minutes of 2017 Annual Business Meeting (ABM) and the 2018 Annual Business Meeting Agenda

1. **President's Report** – *Marios Loukas*
   a. 2018 Election Results
   b. 2019 Election – Positions open to the AACA Membership in 2019
   c. Presidential Committee Appointments
2. **Treasurer's Report** – *Tom Gest*
3. **Membership Committee Report** – *H. Wayne Lambert*
   a. Remembrance of Deceased Members – *Peter Ward*
4. **Journal Committee Report** – *H. Wayne Lambert*
   a. Report of Editor-in-Chief of Clinical Anatomy – *R. Shane Tubbs*
5. **Meeting Organization & Program Planning Committee Report** – *David Porta*
   a. Report of 2018 Annual Meeting Committee – *David Porta*
   b. Future Meetings:
      i. 2018 AACA Regional Meeting, Georgetown University, Washington, D.C. - *Carlos Suarez-Quian*
      ii. 2019 AACA Regional Meeting with HAPS, Louisville, KY – *David Porta* (AACA) and *Rachel Hopp* (HAPS)
      iii. 2019 AACA Annual Meeting, Tulsa, OK – *Elmus Beale*
      iv. 2020 AACA Annual Meeting, TBD
6. **Committee Elections**[1] - *Marios Loukas*
   a. Election of Members-at-Large for Bylaws: 2 vacancies
   b. Financial Affairs Committee: 1 vacancy
   c. Nominating Committee: 2 vacancies
7. **Annual AACA Awards** – *Marios Loukas*
   a. 2018 AACA Honored Member – *Dr. Anne Agur*
8. **Old Business**
9. **New Business**

ADJOURNMENT: 3:30pm

[1] The membership of Special Interest Group (SIG) Committees (Educational Affairs, Career Development, Clinical Anatomical Terminology, and Anatomical Services) elects members at their committee meetings.

American Association of Clinical Anatomists

Minutes
2017 Annual Business Meeting

PO Box 2945
LaGrange, Ga 30241
Ph: 706-298-0287
www.clinical-anatomy.org

American Association of Clinical Anatomists
Thursday, July 20, 2017
Marriott Minneapolis City Center
Minneapolis, Minnesota

Call to Order: 3:52 pm

After referring the AACA members to the 2016 Annual Business Meeting (ABM) Minutes located on Pages 33-34 and the 2016 ABM Agenda on Page 32 of the 2017 AACA Annual Program, these Agenda and Minutes were approved by general consent at 3:54 PM.

1. **President's Report** (Neil Norton – AACA President)
   a. 2017 Election Results – Neil announced the winners of the 2017 AACA Election to include: H. Wayne Lambert, President-Elect; Peter Ward, Secretary; Philip Fabrizio, Special Councilor – Allied Health; Anthony D'Antoni and Alan Richards, Councilors at Large. Anthony D'Antoni and Philip Fabrizio were re-elected to their positions by the AACA membership.
   b. 2017 AACA Election – The four positions open to the AACA Membership for next year's election include Program Secretary, Special Councilor – Anatomical Services, and two Councilor-at-Large positions.
   c. Presidential Committee Appointments – Neil listed the 2017 Presidential Appointments to the AACA committees, which were provided by AACA President-Elect, Marios Loukas, and included:
   Anatomical Services – James Coey
   Bylaws – Kathleen Bubb (Chair), Jon Jackson, Nirusha Lachman
   Career Development – Maria du Plessis
   CAT Committee – Richard Tunstall, Tony Weinhaus
   Educational Affairs – Vaughn Lee
   Financial Affairs – Lonie Salkowski, Muhammed Khalil
   Nominating – Kazzara Raeburn, Joe Iwanaga, Ameed Raoff

2. **Treasurer's Report** (Tom Gest – AACA Treasurer)
   Tom started his report by listing the assets for the AACA as ~$959,548, which includes the $550,000 contract extension with Wiley. Tom listed that as of June 30, 2007, the AACA had the following balances in our accounts: 1) $403,310 in checking, 2) $5,378 in a money market, and $550,860 in investment. He also listed $148,505 in impending conference expenses for an adjusted checking balance of $254,805. In 2016, he listed our checking balance as $212,413. With the impending conference expenses, Tom estimated our project assets as $811,043.

   Concerning our current fiscal year, Tom listed net gain as $204,492, but he reiterated that many of the conference expenses are yet to be paid. He anticipated an adjusted net gain of $55,987 after these bills are paid. He also estimated the profit for the 2017 AACA Meeting to be ~$726, due primarily to the increases in catering and AV equipment costs. Finally, he showed the incomes from past meetings, emphasizing that it appears that host cities with warmer climates seem to lead to higher profits for the AACA. He also reported that he anticipated a profit of ~$9,706 from our 2017 postgraduate course.

   Other financial numbers mentioned included profits from the 2016 Regional Meeting in Chapel Hill as $3,120, membership dues as ~$73,140, and a journal income of ~$30,000.

continued on next page

3. Membership Committee Report (Marios Loukas – AACA President-Elect)

Marios highlighted the Membership Committee report on Pages 42-43 of the 2017 AACA Meeting Program, which lists the new AACA members who joined from May 5, 2016 – May 5, 2017. Our membership on May 5th was 610 members.

3a. Remembrance of Deceased Members (H. Wayne Lambert – Association Secretary)

After mentioning some of their accomplishments, Wayne listed four AACA members (Drs. Donald Cahill, Carmine Clemente, David Whitlock, and Sam Scott) who passed away since the 2016 AACA Annual Meeting in Oakland. Wayne also mentioned the passing of Cecilia Clemente, wife of former AACA Councilor Rick Clemente. Dr. Art Dalley also informed the Association of the loss of Dr. Paula Hoos, a former AACA member from Vanderbilt University. A moment of silence was observed for these beloved AACA colleagues, mentors, and friends.

4. Journal Committee Report (Shane Tubbs – Editor-in-Chief of *Clinical Anatomy*)

Shane introduced the editorial board and shared current and future topics for special issues in *Clinical Anatomy*. Shane emphasized the importance of publishing special issues, and he listed the most cited and most downloaded articles in our journal. Finally, Shane shared the 2016 impact factor for the *Clinical Anatomy*, which took it largest annual boost, up 34%, from 1.316 to 1.834. He also emphasized the importance of member input and submission to the journal.

5. MOPP Committee Report (David Porta – Program Secretary)

David mentioned the Meeting Organization & Program Planning (MOPP) Committee report was located on Pages 43-45 of the Annual Program and summarized some of its content. He went through the abstract submission and judging process. He also listed the future destinations for our annual meetings, and he thanked Greg Smith and Jennifer Burgoon for their help in preparing for the 2017 AACA Meeting in Minneapolis.

7. Election of Members-at-Large for AACA Committees* (Neil Norton)

a.	Election of Members-at-Large for Bylaws:	Priti Mishall and Wayne Cottam
b.	Financial Affairs Committee:	Sarah Keim
c.	Nominating Committee:	Danielle Royer and Carol Lomneth

8. Old Business

Neil recognized Dr. James "Jim" Collins, the 2017 AACA Honored Member, and Ronn Wade, the 2017 R. Benton Adkins, Jr. Distinguished Service Award.

9. New Business

Neil stated that the changing of the President will occur at the banquet this evening.

Motion (Norton/Carmichael) – The American Association of Clinical Anatomists would like to show their extreme appreciation for Brian MacPherson for dedication to the AACA, especially during the last six years serving in AACA Presidential Cycle. The motion passed unanimously, and Brian received applause from the membership.

ADJOURNMENT: 5:06pm

Respectfully submitted,
H. Wayne Lambert, Ph.D., AACA Secretary

* The membership of Special Interest Group (SIG) Committees (Educational Affairs, Career Development, Clinical Anatomical Terminology, and Anatomical Services) elects members at their committee meetings.

2017 – 2018
Officers of the AACA Council

President - Marios Loukas, M.D.

President-Elect - H. Wayne Lambert, Ph.D.

Secretary - Peter J. Ward, Ph.D.

Treasurer – Thomas R. Gest, Ph.D.

Past-President - Neil S. Norton, Ph.D

Program Secretary – David J. Porta, Ph.D.

Councilors

Alan T. Richards, M.D.
Robert J. Spinner, M.D.
Anthony V. D'Antoni, M.S., D.C., Ph.D.
Lisa M.J. Lee, Ph.D.
Stephen W. Carmichael, Ph.D., D.Sc.
Alan Detton, Ph.D.
Angela McArthur, M.P.H.
Anne M. Gilroy, M.A.
R. Shane Tubbs, Ph.D.

Clinical Anatomy

The Official Journal of the American Association of Clinical Anatomists, the British Association of Clinical Anatomists, the Australian and New Zealand Association of Clinical Anatomists, and the Anatomical Society of Southern Africa

Editor-in-Chief – R. Shane Tubbs

Editor Emeritus – Stephen W. Carmichael

AACA Co-Editors – Senior Editor: Robert J. Spinner; Anthony V. D'Antoni, Thomas R. Gest, Joe Iwanaga, Marios Loukas, Susan Standring

BACA Editor – Philip Adds

Assistant BACA Editor – Jenny Clancy

ASSA Editor – Graham Louw

ANZACA Editor – Stephanie Woodley

Founding Editors: Ralph Ger and Ray J. Scothorne

Editorial Board – 2018
Associate Editors

Marwan Abu-Hijleh
Keiichi Akita
Robert H. Anderson
Nihal Apaydin
Peter Dangerfield
Raffaele De Caro
Fabrice Duparc
Jerzy Gielecki
Mohammed Khalil
Hee-Jin Kim
Nirusha Lachman
Duncan Lee Hamilton
Chelsea M. Lohman Bonfiglio
Vishy Mahadevan
Petru Matusz
Joanna Matthan
Stuart McDonald
Ali Mirjalili
Stanley Monkhouse
Martin M. Mortazavi
Alan Moulton
Bernard Moxham
Horia Muresian
Richard Newell
Michał Polguj
Alan T. Richards
Elias Rizk
Daisy Sahni
José Ramón Sañudo
Louise Scheuer
Gulgun Sengul
Mark D. Stringer
Richard Tunstall
Albert van Schoor
Ivan Varga
Joel Vilensky
Huan Wang
Robert Ward
Koichi Watanabe
Peter L. T. Willan
Bülent Yalçin

Editorial Assistant: Tyler Laws

Production Editor: Diane Grube

Committee Reports

Anatomical Services Committee
Brand Promotion and Outreach Committee
Career Development Committee
Clinical Anatomical Terminology Committee
Educational Affairs Committee
Journal Committee
Listserv Report
Membership Committee
Meeting Organization & Program Planning Committee
Nominating Committee

2018 Anatomical Services Committee Report

The Anatomical Services Committee (ASC) represents academic and technical members of the Association who are active in the operations and administration of institutional whole body donation programs. ASC functions to serve the AACA membership by developing symposia, special sessions, courses, and guidance documents and promoting technical and academic aspects of human anatomical tissue use in health care, university education, and research. The group advocates for the informed, ethical, and safe operation of body donation programs in order to support the human anatomical tissue requests of students, faculty, staff, and researchers who contribute to the advancement of medicine through education and research. The ASC meets monthly to focus on topics relevant to the operation of body donation programs including current practices, compliance, ethics, public relations, and to plan future Association annual meeting activities.

2017-2018 ASC highlights:

- Following our meeting last year in Minneapolis, ASC welcomed two new members to our committee: Dianne Person and James Coey.
- We de-briefed, reviewed, and reacted to our 2017 Special Session "The Legal and Ethical Considerations of Being the Guardian of the Gift" and to our breakfast committee meeting.
- Based on feedback from the 2017 sessions, ASC brainstormed topic areas and researched speakers for our 2018 meeting symposium.
- Plans for the 2018 ASC Symposium and Committee Meeting have taken shape and the committee has been working hard to book fantastic speakers and develop session agendas.
- Related to our 2018 Symposium topic, ASC is developing a data collection instrument to obtain information internationally on the use of donor personal information in education and research.
- Submissions for the Anatomical Services Award are organized for judging and presentation at the annual meeting.

Information about ASC, including position statements, best practices, contact information, and links can be accessed from the Association's website: http://clinical-anatomy.org/Committees

Anatomical Services Committee events at the 2018 AACA Annual Meeting:

Members of the Anatomical Services Committee will be present at the **Welcome Reception** on **Sunday, July 8th from 6:30 to 8:30 PM**. AACA meeting attendees interested in anatomical services are encouraged to attend, meet the committee members, and learn what we do and how to get involved.

The 2018 ASC Symposium titled **HIPAA and Protected Health Information in Anatomical Donation, Education, and Research** takes place on **Tuesday, July 10th from 1:00 to 2:30 PM**. The session will feature experts in biomedical ethics and HIPAA compliance who will speak on their areas of specialty and respond to questions from the ASC and the audience. Details of the session and the speakers can be viewed at: http://clinical-anatomy.org/Anatomical_Services_Committee_Symposium.

The **Anatomical Services Committee Meeting** will be held on **Wednesday, July 11th from 10:30 AM to 12:00 PM**. The agenda for this year's meeting features our popular *Lessons Learned* session where real case studies in academic donation programs will be presented and *Ask an Expert* where questions concerning anatomical donation programs will be posed and advice solicited from AACA colleagues in attendance at the session. Other agenda items include a report on the work of the ASC during the last year and discussion of current topics, future meetings, and symposia. Active AACA members will also be electing a new ASC member. All meeting attendees are welcome! Details of the ASC meeting are at: http://clinical-anatomy.org/Anatomical_Services_Committee_Meeting_

Current members of the ASC:

Presidential Appointees:

2015-2018: Brandi Schmitt, University of California, Technical Co-Chair - brandi.schmitt@ucop.edu

2016-2019: David Conley, Washington State University, Academic Co-Chair – dmc@wsu.edu

2017-2020: James Coey, St. George's University.

Elected Members:

2015-2018: Bobbi Morgan, West Virginia School of Osteopathic Medicine

2016-2019: Nicole Herring, University of Louisville

2017-2020: Dianne Person, Elon University.

Ex Officio:

Angela McArthur. University of Minnesota - ASC Special Councilor

Brand Promotion and Outreach Committee

Presidential Appointments
Appointee 2015-2018: Jonathan Wisco (Chair)

Members Recommended by Chair and Approved by President
Dolgor Baatar, Ken Jones, Christina Lewis, Danielle Royer, Peter Ward

BPOC Activities
The by-laws governing the committee are as follows:

The Brand Promotion and Outreach Committee is responsible for the promotion and maintenance of strategic initiatives of the AACA. The committee shall consist of six members. The President shall appoint three members, with the approval of the Council, and designate one nominee as the Committee's Chair. Two members shall be nominated and elected by the membership at the Annual Business Meeting.

- Providing oversight of regional meeting proposals and selecting hosts, in conjunction with the MOPP committee; and providing logistical support in conjunction with the AACA's professional management service;
- Establishing a promotional and collaborative presence with other professional organizations with complementary missions (particularly those involved with initiatives related to clinical anatomy research and educational scholarship);
- Maintaining and updating the AACA website and social media outlets to reflect current events, connect members, and seamlessly tie the efforts of the standing committees together in order to unify the public presentation of the Association;
- Soliciting information from the membership and monitoring current trends and emerging issues in the field of clinical anatomy to determine how AACA can best meet members' needs; this information will be communicated with the standing Committees and Council;
- Soliciting information from the membership regarding their perception of: events at the annual meeting, interface of the Society's social media outlets, events that would benefit the Association in the future;
- Interacting with media on behalf of the Association and directing inquiries to an appropriate member or member of Council;
- Selectively promoting products or services offered by or endorsed by the Association;
- Working with each of the standing committees to promote their initiatives to the public and other stakeholders;
- Recommending further suggestions, as needed, to Council to improve promotion of AACA as a clinically oriented, scientific and educational scholarly institution.

Subcommitee Work
We have organized our committee into four subcommittees (Regional Meetings, Community Outreach, Social Media, Website) in accordance with the objectives stated in the by-laws, and report herein:

Regional Meetings Subcommittee

- Members: Jon Wisco
- Purpose: Works with Association Services Group to promote and select regional meeting sites and support program committees.

The Regional Meetings Subcommittee has achieved the following milestones this year:

- We had a successful Regional Meeting hosted by A.T. Still University of Health Sciences, Arizona School of Dentistry & Oral Health in Mesa, AZ. Dr. Wayne Cottam led a multi-disciplinary team of AACA members and non-members to host a meeting focusing on technological and pedagogical advances in anatomical sciences education, with a particular emphasis on dental, and head and neck Anatomy. All sessions were engaging and dynamic. Of particular note was the piloting of a video conference call poster session. The students who presented their work did really well and the format will serve as a possible precedent for attendees to future meetings who could not otherwise attend in person.
- The next Regional Meeting will be hosted by Georgetown University School of Medicine. Dr. Carlos Suarez-Quian (Georgetown University) has assembled an excellent group of colleagues – Dr. Steve Rosswell (Uniform Services University), Dr. Don Rigamonti (Howard University), Dr. Shiloh Jones (Georgetown University), and Dr. Kirsten Brown (George Washington University) – who have worked diligently to produce a program focused on Anatomy in the new curriculum, with a focus on diversity in medicine, wellness, and the role of the military in medical education.
- We are poised to work with you and your institution if you would like to host a Regional Meeting. Come visit with us to learn more!

Community Outreach Subcommittee

- Members: Christina Lewis and Peter Ward
- Purpose: Identifies and establishes collaborations with professional and avocational groups to promote AACA and serve the community.

The Community Outreach Subcommittee has achieved the following milestones this year:

- Anatomy Academy has become an official partner with AACA. If you would like to institute service-learning in your curriculum, Jon Wisco, who directs Anatomy Academy can get you started! The program teaches anatomy, physiology and nutrition concepts as an effort to combat the obesity epidemic through educational intervention, and inspire kids to pursue science as a career. Anatomy Academy is low cost (~$200 to get started per classroom, all of which are used to purchase supplies to run the curriculum). The following curricula, compatible with the Core Curriculum model, are freely available to AACA faculty and school site partners: 5th Grade Anatomy, Physiology; Nutrition, 6th Grade Anatomy, Physiology, Nutrition; 7th Grade Dissection and Histology; 8th Grade Musculoskeletal System; Cooking Anatomy Academy; Dance Anatomy Academy; Exercise Anatomy Academy; Special Needs Anatomy Academy. Please direct questions to Jon Wisco, Peter Ward, or Christina Lewis.
- We are working with the following community outreach partners located in the proximity of Regional Meetings to host enrichment service activities for local elementary and secondary school children. Our hope is to provide community service opportunities for AACA members and colleagues.

Social Media Subcommittee

- Members: Dolgor Baatar and Danielle Royer
- Purpose: Determines strategies for and implements AACA social media presence

The Social Media Subcommittee has achieved the following milestones this year:

- We now have a very strong Twitter, LinkedIn and Facebook presence. You can follow on any of these outlets by clicking on the appropriate icon on the AACA website. We encourage you to participate in the opportunity to stay connected through social media!
- Tweet with us! **@AACAnatomy** and use the hashtag **#ClinAnat2018**. Pick up your "I Tweet" ribbon at the registration desk!
- Follow us on LinkedIn! Stay up to date with AACA news, discover new job opportunities, connect to other members: go to https://www.linkedin.com/company/american-association-of-clinical-anatomists.

Website Subcommittee

- Members: Ken Jones
- Purpose: Works with Association Services Group to maintain content and relevancy of our AACA website
  The Website Subcommittee has achieved the following milestones this year:
- Check out the most recent Member Spotlight on the AACA website! We are currently highlighting Dr. John Skandalakis.
- We have updated descriptions of the Sandy Marks and Ralph Ger Associate Member presentation awards.

We thank everyone for their support! If you are interested in getting involved, ask how!

Career Development Committee

The role of the Career Development Committee (CDC) is to support career growth and the advancement of clinical anatomy knowledge for an individual at any stage of their career. Additionally, the CDC strives to encourage high quality anatomical research and scholarly educational work. The committee accomplishes these goals through numerous activities, including: coordinating the judging of student posters (Sandy C. Marks, Jr. Award) and platform presentations (Ralph Ger Award) at the annual meeting, planning and implementing the mentor reception at the annual meeting, and planning the Career Development Symposium.

The CDC has been working on expanding mentorship opportunities both during and outside of the annual meeting platform. We plan to reach out to our registered mentees ahead of the 2018 meeting to begin to help new and early career members navigate the meeting and network with mentors. The Mentor Reception is also a time when we encourage networking between mentees and mentors.

If you are interested in serving, have a passion for mentoring, or have innovative ideas to promote career growth, please consider becoming a member of the CDC. We will be electing one new member at our breakfast meeting on Monday, July 9th from 7:30 - 9:00 am. We also look forward to an exciting round table discussion about strategies for teaching generational cohorts of learners.

Presidential Appointees

2015-2018: Nirusha Lachman (lachman.nirusha@mayo.edu)
2016-2019: Sarah Greene, chair (sgreene@msm.edu)
2017-2020: Natalie Langley (langley.natalie@mayo.edu)

Members Elected at Annual SIG Meeting of Committee

2015-2018: Yasmin Carter (yasmincarter@gmail.com)
2016-2019: Eileen Kalmar (Eileen.Kalmar@osumc.edu)
2017-2020: Maira du Plessis (maira.duplessis@gmail.com)

Clinical Anatomical Terminology Committee

Co-chairs: Tom Gest and Evan Goldman

Members: Alan Richards, Paul Gobée, Chelsea Lohman, Brad Martin, Ian Whitmore, Richard Tunstall, Sakti Srivastava, Tony Weinhaus

The CAT committee has held biweekly meetings throughout 2018. We continue to develop the "Patterns and Guidelines for Creating Anatomical Definitions" document, expanding it to include sections on “Areas & Volumes”, “Ligaments/ Aponeuroses”, and “Nervous System” structures.

CAT has continued its work with the Dutch company, Incision, whose physician members are creating first-draft definitions of anatomical terms, based on the Patterns and Guidelines document. The definitions are created using CAT’s online “definition machine”. Incision has created hundreds of 1st-draft definitions. CAT members review these definitions during our meetings although we recognized, prior to the July 2017 annual meeting in Minneapolis, the need to increase the number of individuals vetting the definitions.

Prior to the Minneapolis meeting, CAT recruited additional AACA members to vet the 1st-draft anatomical definitions. Prior to the meeting, CAT also prepared a seminar session featuring the following presentations: The History of Terminologia Anatomica (Ian Whitmore, MD); The Second Edition of Terminologia Anatomica and Other FIPAT Terminologies (Thomas Gest, PhD); AnatomicalTerms.Info (ATI) and the initiative to Create Definitions (Paul Gobée, MD); and An Online System for Developing and Vetting Anatomical Definitions (Evan Goldman, PhD).

Subsequent to the 2017 meeting in Minneapolis, CAT continued to meet on a bi-weekly basis, during which we spent our first hour covering business and working on the Patterns and Guidelines document. During the second hour, during the fall 2017 CAT trained the CAT ‘working group’ to use the guidelines, patterns, and definitions machine to perform 1st and 2nd reviews of the 1st-draft definitions. The working group held meetings throughout the fall 2017.

New initiatives recently undertaken by CAT include:

(a) Redeveloping the “definition machine” using a web-based, database system. The front-end interface is more streamlined and the goal of the back-end is to be easier to administrate.

(b) Developing a presence on Wikipedia. The right side-bar region will include CAT definitions, and links to ATI. In-line will be a more detailed treatment of the terms and will include relevant “comments”, and listings of alternate terms, including usage within different languages.

(c) Developing a system to incorporate medical students into the definition-review process.

All CAT meetings are held using video conferencing using “Zoom”.

Educational Affairs Committee

Purpose of Committee

The Educational Affairs Committee (EAC) shall promote the teaching of clinical anatomy, track national and international curricular changes, and develop educational initiatives that will benefit the Association's members, health care professionals, the education community, and the general public. The Committee shall disseminate data and recommendations for best practices for all aspects of anatomical education as it relates to clinical practice. The Committee shall plan and implement the Educational Affairs Symposium when scheduled by the Meeting Oversight and Program Planning Committee. The Committee shall consist of six (6) members, each serving a three (3) year term. The President-Elect shall appoint one (1) member in the second year of his/her term, and the President shall appoint one (1) member in the first year of his/her term. One (1) member shall be nominated and elected by the Active Members in attendance at its annual open meeting.

During the 2017-2018 monthly EAC meetings, discussions focused on planning the EAC events for the annual meeting. The EAC has also begun exploring scholarly initiatives for disseminating recommendations of best practices in clinical anatomy education.

Educational Affairs Committee events at the 2018 AACA Annual Meeting:

The **EAC symposium** is scheduled for **Monday, July 9th** and features three invited speakers on the topic of **"InterProfessional Education in Anatomy."** The speakers will give an overview of IPE, present their experiences and best practices in IPE, as well as lessons learned.

The **EAC breakfast meeting** is scheduled for **Tuesday, July 10th** and will focus on the topic of **"Technology in Anatomy Education."** We'll start with a table-discussion session where participants will share and record what technologies they use and why. Then have a facilitated open forum where participants can discuss the technologies they use in the context of evidence-based pedagogy.

EAC Members

Presidential Appointees

2015-2018: Peter Ward (pward@osteo.wvsom.edu)

2016-2019: Mohammed Khalil (KhalilMK@greenvillemed.sc.edu)

2017-2020: Vaughan Lee (vaughan.lee@ttuhsc.edu)

Members-at-Large Elected at Annual SIG Meeting of Committee

2015-2018: Elmus Beale (elmus-beale@utulsa.edu)

2016-2019 **Lela Giannaris, Chair** (EustathiaLela.Giannaris@umassmed.edu)

2017-2020 Dolgar Bataar (dolgor.baatar@ttuhsc.edu)

Journal Committee

Committee Members: H. Wayne Lambert, Chair *(ex officio)*, Phil Adds (ex officio; BACA), Marios Loukas, Neil S. Norton, Tom Gest, Jinnie Kim (Wiley editor), Shane Tubbs, Editor-in-Chief *(ex officio)*.

The *Clinical Anatomy* journal has had a very successful year, under the leadership of Editor-in-Chief, Dr. R. Shane Tubbs. Our journal now boasts its highest impact factor to date with the latest data showing our 2016 impact factor is now 1.824, which is a 34% increase over the last report of an impact factor of 1.316. To support the continued growth of our journal, the AACA Council approved a motion to give an additional $40,000 to the budget for the *Clinical Anatomy* editorial office. This one-time payment will help fund additional editorial and language editors and graphic designers. Our Editor-in-Chief is going to use these funds to improve the overall quality of the journal, and in future years, our journal will request additional funds from our publishing company, Wiley, to support the continued growth of our journal. This increased budget will prove to Wiley that the AACA is committed to continuing on our current upward trend of impacting the literature in the field of clinical anatomy.

In 2018, we have already published two Special Issues in *Clinical Anatomy*, which included the Clinical Anatomy of Transgender Surgery and another issue on Ocular Trauma. These special issues draw a lot of attention and new readers to our journal, and they continue to boost the impact factor of our journal.

Please download the Clinical Anatomy app, which now available for Android and the iPhone.

Submissions to the Journal continue to grow each year, including ~500 submissions in 2017. In 2018, the *Clinical Anatomy* Journal is on pace to receive 600 submissions. Please submit your best work to *Clinical Anatomy*, so we can continue to make an impact.

Respectfully submitted,

H. Wayne Lambert, Chair of AACA Journal Committee

Listserv Report

AACA's Education Issues Listserv was moved from the mailserver at Einstein to being hosted on Google Groups in February of 2016. There are currently 1,390 subscribers to AACA's Listserv. From May 1, 2017 to April 30, 2018 there were 34 subjects posted. To the right of this report is a table of those posts that received the most responses.

AACA Education List

Total Subscribers (as of 4/30/18) = **1,390**

Activity 5/1/17-4/30/18 = 34 messages

May 2017 – April 2018 Monthly Email Activity

May '17 = 3
June '17 = 6
July '17 = 1
August '17 = 1
September '17 = 1
October '17 = 4
November '17 = 5
December '17 = 1
January '18 = 4
February '18 = 3
March '18 = 4
April '18 = 1
Total Emails = 34

Most Commented upon Threads

Articles on med student perspectives on the anatomy experience (7 posts)
Do you use plastinated specimens? (5 posts)
Research Project (3 posts)
IFAA Announcement (3 posts)
Immersion Tank (3 posts)
Question about Anatomy Teaching Methods in med schools/PT programs (2 posts)

Membership Committee

Committee Members: H. Wayne Lambert, Neil S. Norton, Rachael George, Quentin Fogg

The membership committee is pleased to state that the following new members have joined AACA from July 25, 2017 to May 15, 2018. The total number of active members in the association is 637.

AFFILIATE

Mariana Villalobos
Anette Wu Fortgang

ASSOCIATE POST-DOC ELECTRONIC

Alexander Kuehl
Imran Waheed
Jessica Byram
Mohamed Awad
Elleson Schurtz
Tomas Marek
Shin-Hyo Lee
Mateusz Holda
Evan Garofalo

ASSOCIATE ELECTRONIC

Natalie Yoshioka
Jacob Sieger
Kelechi Ibezim
Isabella Graham
Eric Potter
Jorge Guerra
Christina Alvara
Sarah Louis
Brandon Knight
Mohammed Hamid Karrar Alsharif
Akhil Padarti
Georgios Solomou
Brian Jacinto
Wilmene Hercule
Abena Oduro
Tatum Jackson
Joshua Goheen
Mohammad Azzam
Jonathan Kelly
Sydney Langford
Mikaela Stiver
Zachary Miller
James Bailey
Mark Parry
Saeed Vazirian
Jordan Iceton
Ethan Breinhorst
Luke Bradshaw
Tony Bourdkane
Shefali Gladson
Natalie Haugen
Anthony Crum
Krystal Savice
Andrea Vegh
Chase Walton
Dylan Later
Kang Shiong Goh
Hyungjin Lee
Kyu-Lim Lee
Hyun-Jin Park
Young-Jun We
Kang-Woo Lee
Hyungkyu Bae
Kim Seung Min
Lee Myung Jin
Jaskirat Takhar

continued on next page

Masahiro Tsutsumi
Kaija Kaarid
Kang Shiong Goh
Tomonori Yabuuchi
Przemyslaw Pekala
Laura Varghese
Adele Kim
Alison Thomas
Churchill Ihentuge
Edgar Meyer
Shayan Memar
Gary Farkas
Mark Gary
David Cooper
Kamil Tyrak
Jakub Holda
Ihiechi Ohia-Enyia
Micah Lierly

REGULAR ELECTRONIC

R James Swanson
James Lewis
Randall Nydam
Christopher Meseke
Gyorgy Lonart
Amy Lovejoy Mork
Daniel Daly
Matthew Protas
Shyamala Ganesan
Mohammad Kassem
Charlotte Wilson
Stephanie Villalba
Stacy Chelf
Marco Teloken
Mark C. Delano
Resa Chase
Mohammad Vohra
Ruthba Zaman
Emily Simonds
Oleksandr Azarov
Shaik Hussain Saheb
Mehnaz Parvez
Pil-Woo Kim
Mark Nielsen
David Dominguese
Belkadi Ismail
John Carter
Motaz Nuggedalla
Breanne Gillie
R. Lisa Popp
Manas Das
Dongmei Cui
Anu Ranade
Mi-Sun Hur
Vivien Jones
Oyindamola Tunde-Byass
Ololade Akinfemiwa
Joy Balta
Sreenivasulu Reddy Mogali
Geoffroy Noel
Tamara Ostervoss
Ashley Petrone
Robert Mark Caulkins
Mayank Patel
Marc Vetter
Emre Yilmaz
Maia Schumacher
Juan Altafulla
Steven Lewis
Nicole Marquez
Paul Choi
Casey Knight
Henru Wingfield
Jim Barton
Prashant Chaware
Russell Pryor
Sebastian Cotofana
Daniel Cawley
Ayman Behiery
Cameron Schmidt
Lucy Clunes
Tamara De Souza
Brandt Schneider
Mu Hsiang Joy Wang
Sonja Salandy
Lexian Mcbain
Rafik Shereen
Sancia Bredy
Ivan Varga
Lubos Danisovic
Delia George
Kevin Chatar
Joanna Loukas
Ian Muray
Brandon Michael Hery
Kimberley Caton
Woong Kee Baek
Naomi Ojumah
Boopathi Subramaniam
Madonna Phillip
Brandon Holt
Ewarld Marshall
Mathangi Rajaram-Gilkes
Charles Price
Feimatta Sowa
Anna Cyrus-Murden
Temitope Kehinde
Olufemi Obadina
David Nahabedian
Katie Yost
Carolina Carmona
Sujatha D'Costa
Denitsa Savakova
Robert L'Heureux
John (Logan) Mottern
Sailabala Vanguri
Susan E. Lederer
Jose Antonio Lozano
Randy Craig
Ramona Baez
Jessica Osagbobu
Abdullah Alkushi
Diana Pettit
Carlos Quinteros

REGULAR – PRINT

Santosh Khamani
Haley Nation
Sumathilatha Sakthi Velavan
Jeremy Ollerenshaw
Ranjana Dr
Ron Easteal
Jaime Hinojosa
Sahar Hafeez
Anna Farias
Natalia Alexeeva
Padma Gadepally
Manuel Rolando Perez Fernandez
Kyung-Seok Hu
Michael Jones
Carissa Vinovskis
Jake Loitz
Matthew Chavarria
Nathan Thomas
David Denton
Lois M. Newnan
Samuel Allwyn Joshua
Zachary Gallaher

Meeting Organization & Program Planning Committee Annual Report, 2017-2018

Members:

Special Interest Committees

Anatomical Services Co-Chairs - Brandi Schmitt & David Conley

Career Development Committee, Chair – Sarah Greene

Educational Affairs, Chair – Lela Giannaris

Clinical Anatomical Terminology Committee Co-Chairs– Evan Goldman & Tom Gest

Meeting Managers (Formerly known as Annual Meeting Committee Co-Chairs)

Jennifer Burgoon 2017-2018

Sarah Greene 2018-2019

Local Hosts

Sarah Greene & Larry Wineski

ASG Representatives (contracted professional organization management company)

Caitlin Hyatt, Executive Director

Executive Committee

President – Marios Loukas

President-Elect – H. Wayne Lambert

Past President – Neil Norton

Treasurer – Tom Gest

Association Secretary – Peter Ward

Program Secretary – David Porta, MOPP Chair

This report is being filed on May 7, 2018. The information contained herein is the most accurate available as of this date. Also, I am completing my 3-yr term as Program Secretary (after a 2 yr term as Meeting Manager). Congratulations and thanks to Jennifer Burgoon on her election to Program Secretary. This report has suggestions for the next MOPP Committee.

The 2017-2018 Meeting Organization and Program Planning (MOPP) Committee has worked diligently to bring you the best possible 2018 annual scientific conference. Immediately after the 2017 Conference in Minneapolis, the MOPP began reviewing the Post-Conference Surveys to look for ways to improve. The committee held telephone conference calls on the third Tuesday of each month. The program you are reading is the result of many hours of service by the members listed above as well as excellent professional support by ASG. The committee is extremely grateful to our Executive Director, Caitlin Hyatt. As always, she has been highly responsive to the AACA needs and she has done a great job guiding us through the process of putting together what we hope will be a high quality scientific conference. Special thanks is also due to our local hosts, Sarah Greene and Larry Wineski. They have done an excellent job serving as liaisons with the hotel, organizing the social, and planning the postgraduate course. Their efforts are truly appreciated.

The main MOPP members are responsible for steering other committees, etc., so much of the program planning responsibilities fall on the Meeting Managers. Sarah Greene, Jennifer Burgoon, and I have spent many additional hours working with ASG on a large number of tasks with, and on behalf of, the MOPP committee. These include the following:

Preliminary Planning for Future AACA Meetings

- 2018 **Regional** AACA Mtg to be held in Washington, D.C. at Georgetown University and hosted by Carlos Suarez-Quian on 10/6/18.
- 2019 **Regional** AACA Mtg to be held jointly with a Regional HAPS Mtg in Louisville, KY. This will be cohosted by David Porta (AACA) and Rachel Hopp (HAPS) on 3/30/19.
- 2019 **National** AACA Mtg to be held in Tulsa, Oklahoma and hosted by Elmus Beale, June 11-16, 2019.
- The next MOPP will need to work with ASG and the Executive Committee to plan the 2020 Mtg in Washington state (Seattle or Spokane), as well as future mtgs that hopefully will include a joint meeting with BACA in England in 2023.
- If you are interested in hosting a regional or national AACA meeting, please contact the MOPP or ASG.

Abstract Submissions

- Each year, the committee reviews the Abstract Submission Guidelines and the Abstract Reviewer Guidelines in an effort to improve clarity. Changes were made to the guidelines that we hope helped. The AACA hopes to accept completed, original, previously unpublished work. However, this year the Council approved accepting some previously presented or published work for poster presentation only. The hope is that these will make up a small portion of the conference, but allow for increased sharing of work that our members might not otherwise see (e.g. BACA or ANZACA presentations, etc.). The abstracts for any of this work will not be published and these posters are ineligible for awards. Discussion should continue regarding what particular matter is appropriate for our conference, especially in light of what material is accepted for publication by our journal. Specifically, recent submissions in the fields of molecular and animal biology have resulted in questions that should be considered by the next MOPP.
- This year, a call for volunteers to serve on a committee charged with helping define plagiarism resulted in over a dozen volunteers. Hopefully the committee can be formally convened and help develop guidelines to be used for the 2019 abstract submission process.
- The abstract submission software includes questions about previous publication, IACUC and IRB approval. These were examined closely and, in some cases, authors were asked for additional information prior to acceptance of the abstracts.
- Last year, Council approved the purchase of new (and sorely needed) abstract submission software by PLANSTONE. Post-conference surveys indicated the membership was pleased with the updated submission process. However, there is always room for improvement. There is a great deal of customization for such software and this year, several such areas were noted and will hopefully be incorporated for 2019. Most notable, it is hoped that Meeting managers can be temporarily given editorial control during the initial Format Review phase of the process so that minor corrections can be made most expeditiously. Also, reports for the Program Committee need to be tailored for the Content Review phase and Sessionizing of abstracts for the final program planning.
- The table below shows the recent trends regarding abstracts, attendance, and presentations at our conferences.

Meeting Stats	2018 Atlanta	2017 Minn	2016 Oakland	2015 Vegas	2014 Orlando
Initial Abstract Subs	147	135	192	147	139
Returned for Format	13	10	32	51	20
Late-breaking Subs	15	10	4	21	26
Total Rejections	2	1	23	24	10
REGISTRANTS	?	345	350	338	327?
PLATFORM Pres	24	16	18	22	29
Tech Fair Pres	7	7	5	3	6
Publishable Posters	98	97	115	78	80
Not Publishable Posters	29	22	26	43	40

2014 – 2018 MOPP Highlights

- New Abstract submission Software 2017.
- New Harassment Policy 2016.
- Assisted with the establishment of Regional AACA Mtgs beginning in 2015.
- Establishment of 2 Meeting Manager positions with 2-year terms that are staggered. These volunteers serve with the Program Secretary to prepare for and run the annual meeting. These positions also serve as excellent preparation for serving as Program Secretary should these people decide to run for the position.
- Increased vigilance for plagiarism, and proper IRB and IACUC approval.
- Instituted a dual Review process whereby the Meeting Managers review all abstract submission for format errors. Those that do not pass are returned to the authors for corrections and they can be resubmitted with a $20 fee.
- Switched to Dual Podiums during Platform presentations in an effort to eliminate down time between talks.
- Moved to a graduated lunch break. 1.5 hrs on the first day of the conference in order to allow attendees to

participate in the Tech Fair and find time to locate suitable restaurants. The lunches shorten to 1 hr on the last day of the conference.

- We have moved the Banquet and the Business meeting to the last day of the conference in an effort to increase attendance for the entire conference. Also, officer appointments technically end at the Business meeting so moving it to the last day ensures their authority throughout the entire conference.
- Posters have been shrunk to half their previous size in order to allow for them to be hung for the entire conference without increasing costs for boards and without increasing the need for more room space.

In closing, I would like the membership to know that the MOPP has done the best we can to maintain and improve our annual scientific conference. There is certainly more to do and we wish the next MOPP the best of luck. Suggestions for improvement are always welcome, but the greatest contribution of any member is to submit their highest quality work for our conference and our journal.

Respectfully submitted on behalf of the committee, and for the last time!
David Porta, Program Secretary

2018 Nominating Committee Report

The Nominating Committee consist of Kazzara Raeburn (Chairperson), Joe Iwanaga and Ameed Raoof as presidential appointees, and Danielle Royer and Carol Lomneth as elected Members-at-Large.

On February 7th 2018, the Committee met on a conference call for the first time (most members as well as Peter Ward, the Association Secretary were present). The main aim of the discussion was to nominate a diverse group of candidates from members who are active within the association. A healthy conversation ensued and the meeting ended with a list of three potential candidates for Program Secretary, six potential candidates for Councilor-at-Large and three potential candidates for Special Councilor. These names were submitted to Peter Ward, Association Secretary, who overtook the responsibility of contacting the potential candidates.

Respectfully submitted on behalf of the committee
Kazzara Raeburn, Chairperson of the Nominating Committee.

Assistant/Associate/Full Professor of Preclinical Sciences (Anatomy)

William Carey University COM is looking for anatomists interested in combining and leveraging their knowledge and experience of anatomy with the development of innovative methods for anatomical teaching and curricular design towards supporting comprehensive anatomical support primarily for the first-year (OMS1) but including supporting services for OMS2 through OMS4. Active interaction with both the basic sciences and clinical faculty will be expected.

Under the respective course director(s) and the Associate Dean, Preclinical Sciences, the successful candidate will provide instruction in one or more of the anatomical sub-disciplines, including embryology, histology, gross anatomy, neuroanatomy and medical imaging. The ultimate goal is to form a solid foundation in this critical science, and create testable inter-dependencies with other disciplines, such as biochemistry, physiology, pathology and clinical skills, including osteopathy using the curricular model database. In particular, we are interested in the thorough inclusion of medical imaging (i.e.: x-ray, CT, MRI, US) into both lecture and laboratory sessions of our anatomy program. The radiology software application OSIRIX currently plays an active role in this in the dissection laboratory. Live ultrasound demonstrations will have significant representation in our courses based on the application of our kiosk machines. Additionally, ultrasound student simulators will expand the direct experience with standard US cases. The Radiology SIG will have a role in tutoring basic imaging concepts and cases to all interested students across all four years with their website which will accumulate cases and RSNA journal concept papers relevant to each anatomical region and system.

WILLIAM CAREY
UNIVERSITY

Please visit
https://wmcarey.peopleadmin.com/hr/postings/1422
or contact Dr. Cal Hisley, Senior Anatomist, at chisley@wmcarey.edu for more information.

Abstracts – Platform Presentations

(Listed by presenting author last name)

BOAZ, Noel T.[1,2,3], Caroline ABERCROMBIE[4], Joy Y. BALTA[5], Robert BECKER[4], Raymond BERNOR[2,6], Tony CLARY[1], Craig GOODMURPHY[7], John GRAHAM[1], Eileen L. KALMAR[8], Thomas KWASIGROCH[4], Jon KRIMSIER[7], Carrie ROBINSON[1], Dana SIKON[9], Richard SIKON[10], and Michael WESSELS[11]. [1]Emory and Henry College School of Health Sciences, Marion, VA 24354, USA; [2]Laboratory of Biological Anthropology and Anatomy, Integrative Centers for Science and Medicine, Martinsville, VA 24112, USA; [3]Anthropology Program, Virginia Commonwealth University, Richmond, VA 23284, USA; [4]Department of Biomedical Sciences, Quillen College of Medicine, East Tennessee State University, Johnson City, TN 37614, USA; [5]Department of Anatomy and Neuroscience, University College Cork, Cork T12 K8AF, Ireland; [6]Department of Anatomy, Howard University College of Medicine, Washington, DC 20059, USA; [7]Department of Pathology and Anatomy, Eastern Virginia Medical School, Norfolk, VA 23506, USA; [8]Department of Biomedical Education and Anatomy, Ohio State University, Columbus, OH 43210, USA; [9]Surgical Skills Training Center, University of Virginia School of Medicine, Charlottesville, VA 22908, USA; [10]Virginia State Anatomical Program, Richmond, VA 234219, USA; [11]Trinity Fluids, Lapeer, MI 48446, USA.
Tissue Solidification in Heart, Lung, and Brain in Soft-Embalmed (Modified Thiel Method) Cadavers.

INTRODUCTION. A modified Thiel Method of soft embalming as developed by the Virginia State Anatomical Program was used as a starting point for investigating preservational procedures that would ensure greater solidification of internal organs in order to foster better anatomical educational outcomes. METHODS. In this initial pilot study of the heart, lungs, and brain in 9 soft-embalmed cadavers dissected during gross anatomy courses, an embalming machine was used to perfuse organs with one of five solutions, prepared by Trinity Fluids. Solution G1 was used to perfuse hearts through cannulae in the right and left coronary arteries and to perfuse lungs through the pulmonary arteries. Solutions R1 to R4 were solutions of varying strengths used to perfuse brains through right and left common carotid arteries. Each solution was tried on two cadavers. SUMMARY. A team of 11 anatomical reviewers independently assessed the treated organs and commented on their texture, solidification, and utility in anatomical instruction. CONCLUSIONS. Reviewers ranked the treated hearts most favorably, noting that the treatment reduced the flaccidity seen in the soft-embalmed heart but retained more flexibility than formaldehyde-fixed specimens. Treated lungs were ranked less favorably by reviewers who noted that they were generally too "floppy" to retain surface impressions of mediastinal structures. Re-perfusion and subsequence immersion improved results reported by reviewers. Brain results were ranked the lowest, with Solutions R1 and R2 ineffectual. Partial solidification with good structural detail of the brain were seen in cadavers treated with Solutions R3 and R4 but incomplete initial embalming attributable to atherosclerotic narrowing of cerebral arteries complicated results. Subsequently, a new G2 Solution, similar to Thiel's published brain solution, was used for a whole-body embalming through both common carotids. Outcomes of this injection are still pending.

BREINHORST, Ethan M.[1], Luke R. BRADSHAW[1], N. Susan STOTT[2], Anne M.R. AGUR[3], and Seyed A. MIRJALILI[1]. [1]Anatomy and Medical Imaging Department and [2]Department of Surgery, School of Medicine, Faculty of Medical and Health Sciences, University of Auckland, Auckland, 1023, New Zealand; [3]Division of Anatomy, Department of Surgery, Faculty of Medicine, University of Toronto, Toronto, ON, M5S 1A8, Canada.
Architecture of the Infant Gluteus Medius: A 3D Modelling Study.

INTRODUCTION. Knowledge of paediatric musculature is sparse in comparison to that of the adult. Muscle architecture, the arrangement of the contractile and connective tissue elements, in the infant has not been studied. Gluteus medius (GM) is an important muscle for static and dynamic control of the lower limb, however, knowledge of the development of GM architecture is lacking. Therefore, the purpose was to: 1. determine the 3D spatial arrangement of the contractile and connective tissue elements of infant GM; 2. quantify the architectural parameters of infant GM and 3. compare infant GM with adult. METHODS. The fibre bundles, aponeuroses and tendons of the GM of one 6 month old, formalin embalmed specimen were serially dissected and digitised (Microscribe® G2X) throughout the muscle volume in situ. The data was modelled in 3D using Autodesk® Maya® and the architectural parameters, fibre bundle length (FBL), pennation angle (PA) and physiological cross-sectional area (PCSA), quantified. Infant and adult GM (data from previous study) were compared. SUMMARY. Infant GM had fibre bundles (FBs) that spanned between the ilium and a small connective tissue bridge that attached to the greater trochanter. No aponeuroses or tendon were found. GM had three parts, anterior, middle and posterior, based on architectural parameters and attachment sites. Adult GM had superficial and deep heads each consisting of three parts and a large aponeurosis proximally and tendon distally. In both, the anterior part, had the longest mean FBL and posterior, the shortest mean FBL and largest mean PA. CONCLUSIONS. In the infant, the connective tissue elements were not developed and the muscle belly was thin and found to consist of three parts in comparison to the two heads, each with three parts, in the adult. Significant changes in GM architecture need to occur along the developmental spectrum from infant to adult.

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CARTER, Melinda L., Eric EMERY, Byron BERRY, Thomas LINDSEY, Frank ABENE, and Kevin HAYES. Alabama College of Osteopathic Medicine, Dothan, AL 36303, USA.
Clinical Implications of Age-Related Changes in the Articulations of the Apical Petrous Bone.

INTRODUCTION. The founding anatomic theory of osteopathic cranial manipulative medicine (OCMM) assumes movement between cranial bones relative to movement at and adjacent to the sphenobasilar synchondrosis (SBS). Published research confirms that the SBS is completely fused by 25 years old in most people, thus limiting movement at that joint in adults. We investigated if bony articulations adjacent to the SBS around the petrous temporal remain unfused later in life, thus allowing for potential movement in the skull base. METHODS. We defleshed and examined partial skulls from 9 embalmed cadavers (aged 56 to 88 years old) previously used for education and approved for research. Using gross observation and a dissecting microscope, three observers (an experienced osteologist and two medical students) scored observations of the endo- and ectocranial aspects of the petro-occipital fissure (POF) and petro-sphenoidal fissure (PSF) on one side only. Observations were standardized and scored from 0 (open) to 4 (complete obliteration). SUMMARY. Across observers, only the endocranial morphology could be consistently assessed. Scores from the medial POF, lateral POF, and PSF were summed for a composite value that was plotted against age at death. Composite scores from 8 individuals were positively correlated (r=0.60) with increasing age (one sample was removed as an outlier). CONCLUSIONS. These pilot data suggest that synchondroses within the skull base ossify with increasing age. Therefore, subtle movements palpated during OCMM in older patients may not be due to movement between bones in the cranial base. Additional specimens will help determine if this conclusion is statistically significant. Histologic examination of the opposite side may identify asymmetry and details of changes in connective tissue. Further research will examine morphologic variation in the inferior petrosal sulcus that parallels the POF.

COEY, James[1,2] and Sara SULAIMAN[3]. [1]St. George's International School of Medicine Keith B. Taylor Global Scholars Program, Northumbria University, Newcastle-Upon-Tyne, NE1 8ST, UK. [2]Department of Anatomy, St. George's University, Grenada, West Indies. [3]Department of Applied Sciences, Faculty of Health and Life Sciences, Northumbria University, Newcastle-upon-Tyne, NE1 8ST, UK.
An Insight into the Medical Dissectors' Mind: Physician's Views of Organ and Body Donation.

INTRODUCTION. The use of cadaveric material in medical schools has have a recognised impact not only on the delivery of anatomical knowledge and practical skills but also on the development of behaviours of future practitioners. Factors that determine an individuals' choice to enrol in organ/body donation programs vary widely among professions, demographics and cultural background. This study aims to explore the views of medical doctors (MDs) regarding organ/body donation in comparison to that of anatomists. METHODS. A total of 91 MDs and 26 anatomists from the UK and Ireland; and 54 anatomists from the United States of America (USA) completed a 15-items electronic survey designed to explore their views on dissection and organ/body donation. SUMMARY. Only 6.6% of MDs were willing to donate their whole body for research/education; 35.2% were willing to do so if organ donation was not an option, whilst 58.3% indicated they would only donate their organs. Among anatomists, 20.4% and 66.7% expressed their willingness to donate their organs and whole body respectively in the USA; while 38.5% and 42.3% were willing to donate their organs and whole body respectively in the UK. Anatomists' willingness to donate their bodies was significantly correlated to experience and influenced by their belief in an afterlife which was not the case amongst MDs. MDs cited preference for organ donation (26%), family objections (14%), and "insider" information (6.6%) as factors influencing their decision. Less than half of the MDs respondents appreciated the relevance of cadaveric dissection to the future doctor-patient-relationship in contrast with the 79.6% and 80% of anatomists based in the USA and UK respectively. (Significance set at p-values<0.05). CONCLUSIONS. MDs views on the impact of cadaveric dissection are dissimilar to that of anatomists. Attitudes influencing MDs to donate their organs/whole body is relatively unexplored in the literature warranting further investigation.

DUONG, Allen[1], Zhi LI[1], Ngaire S. STOTT[2], Seyed A. MIRJALILI[3], and Anne M.R AGUR[1]. [1]Division of Anatomy, Department of Surgery, Faculty of Medicine, University of Toronto, Toronto, ON, M5S 1A8, Canada, [2]Department of Surgery, School of Medicine, Faculty of Medical and Health Sciences, University of Auckland, Auckland, 1023, New Zealand; [3]Anatomy and Medical Imaging Department, School of Medicine, Faculty of Medical and Health Sciences, University of Auckland, Auckland, 1023, New Zealand.
Comparison of the Morphology of Infant and Adult Flexor Digitorum Superficialis and Profundus.

INTRODUCTION. Current clinical practice often applies knowledge of adult anatomy to children, despite marked differences. The architecture of flexor digitorum superficialis (FDS) and flexor digitorum profundus (FDP) has not been studied in infants. The purpose was to: (1) digitize and model in 3D the FDS and FDP of an infant at the fibre bundle level; (2) compute the architectural parameters of FDS and FDP (FB length, FBL; pennation angle, PA; physiological cross-sectional area. PCSA; and muscle volume, MV); and (3) compare infant anatomy with the adult (results of previous study). METHODS. The fibre bundles and connective tissue components of FDS and then FDP of a 6-month old formalin embalmed specimen were serially dissected and digitized (Microscribe® MLXDigitizer). The digitized data were used to construct a 3D volumetric model

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of each muscle, to determine the arrangement of fibre bundles and connective tissue elements. FBL, PA, PCSA, and MV were quantified with custom software developed in our laboratory. FDS and FDP morphology and architecture were then compared with existing adult data. SUMMARY. Infant FDS had a larger area of aponeuroses and 46% shorter mean FBL than the adult. The mean PA was similar, however the infant PCSA was 96.5% smaller. Both had five heads, one for each digit (2-5) and a superior head located close to the proximal attachment. PCSA of infant FDP was 90% smaller than the adult and mean FBL 40% shorter. Infant and adult mean PA was similar. The number of heads and location of aponeuroses and tendons was also similar. CONCLUSIONS. Adult and infant FDS had considerable differences in morphology and architecture, whereas FDP had more similarities with a considerable size difference. This suggests that there are significant changes to FDS and FDP as hand function develops. The results of this studies could be used to develop an in vivo ultrasound protocol for infants, in order to investigate the developmental changes of FDS and FDP.

FOGG, Quentin A. Department of Anatomy and Neuroscience, The University of Melbourne, Melbourne, Victoria 3010, Australia.
Cadaveric Simulation of Abductor Pollicis Brevis-Based Versus a Thenar Raphe-Based Opponensplasty.

INTRODUCTION. Opponensplasty aims to surgically restore opposition of the thumb to the other fingers in patients with, for example, low median nerve palsy. The extensor indicis [proprius](EIP) muscle is amongst the most popular choices for a new thumb muscle. Current techniques graft the harvested tendon to the distal attachment of the abductor pollicis brevis (AbPB) muscle. These techniques are successful in improving thumb functionality, but do not allow for true opposition, which requires rotation of the thumb metacarpal about its long axis, rather than just translation of the thumb towards the fingers. It has been previously detailed that the normal thumb relies on the attachment of the opponens pollicis muscle to the thenar raphe along the length of the first metacarpal. The current study will explore the differences between a typical EIP opponensplasty and a newly devised opponensplasty that anchors the harvested tendon more proximally, to the thenar raphe. METHODS. Unembalmed cadaveric hands (n=5) were used to simulate both procedures. The EIP tendon was subcutaneously tunnelled ulnarly and drawn radially under the palmar skin of the wrist. The tendon was sutured to the AbPB tendon distally through a small incision. Tension was applied to the EIP muscle and the movement of the thumb documented. The EIP tendon was then released and repositioned through a more proximal incision along the thumb, and anchored to the thenar raphe. Movement was again documented. SUMMARY. Excellent translation of the thumb was observed in both scenarios. With AbPB tendon attachment fingers could only be brought to meet the ulnar margin of the thumb. With thenar raphe attachment the thumb pulp was easily brought to meet the pulp of each finger. CONCLUSIONS. This modification of a common opponensplasty technique is likely to improve post-operative thumb function. Further investigation of the underlying anatomical rationale and clinical testing is required.

GILROY, Anne M. and Amanda J. COLLINS. Division of Translational Anatomy, Department of Radiology, University of Massachusetts Medical School, Worcester, MA 01655, USA.
Creating a Fetal Image Database.

INTRODUCTION. The study of embryology is a standard part of medical education and images of human embryos are readily available in texts and online resources. However, the continuum of development through the fetal period is not included in most curricula and sources of fetal images are limited. The goal of this project was to create a digital database of 3-dimensional (3D) fetal magnetic resonance images (MRIs) representing a broad range of ages (15-35 weeks) that demonstrate important goalposts in fetal development. RESOURCES. Fetal and neonatal demises were obtained with the cooperation of the UMass Memorial Departments of Obstetrics and Gynecology and Pathology. DESCRIPTION. Criteria used in selecting specimens included normalcy of gross anatomy, time elapsed between demise and delivery, parental permission, disposition plans for the fetus, and scanner availability. Specimens were transported via currier from UMass Memorial Hospital to the Advanced MRI Center on the UMass Medical School campus, where images were obtained using a 3.0 Tesla whole-body MR scanner (Philips Medical Systems, Best, the Netherlands). Spin Echo 3D pulse sequence with repeat time (TR) value of 600 milliseconds (ms) and echo time (TE) value of 40 ms was used to acquire the images. Seven fetuses, ranging in age from 16 to 32 weeks, were selected for imaging from 58 demises over 20 months. MRIs uploaded to the Anatomage table were reconstructed in 3D and examined in a variety of cutting planes and viewing modalities. SIGNIFICANCE. Once incorporated into the Anatomage digital library, the database will be available for use in education and research. Using these images, progressive growth of individual structures, organ systems, and anatomic relationships can be measured throughout the fetal period. Comparison of these images with comparable images of embryos will provide a more complete understanding of early human development. (Sponsored by Project FID-01 by Anatomage, Inc.)

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GUERRA, Jorge D., Isaac FERNÁNDEZ, Eric POTTER, Christina A. ALVARA, Heather A. BALSIGER, Thomas GEST, and William M. WEISS. Department of Orthopaedic Surgery and Rehabilitation, Texas Tech University Health Sciences Center El Paso - Paul L. Foster School of Medicine, El Paso, TX 79905, USA.
The Impact of Shoulder Position on Arterial Flow through the Upper Extremity.

INTRODUCTION. Neurologic injuries during surgery are often attributed to compression or traction, however changes in arterial flow with manipulation of the upper extremity may compromise the extremity and represent an additional factor. The purpose of this investigation was to measure flow through the arterial system of the upper extremity in four common positions used in shoulder surgery. It was hypothesized that flow would be decreased in a position of abduction alone, and in full external rotation and abduction, compared to the neutral position. METHODS. Three human cadavers (four shoulders) were dissected to reveal the proximal subclavian and distal radial arteries, and positioned in an upright "beach chair" position commonly used in shoulder surgery. The cadavers were embalmed with a unique procedure using saturated salt fluid which maintains soft tissue integrity, compressibility, and joint mobility comparable to live tissue. Blood flow between the subclavian and radial arteries was simulated using a pump approximating physiologic pressure, and fluid was collected from the radial artery to quantify flow over a span of 60 seconds in each position. Shoulder positions included neutral (no abduction and 0 degrees external rotation), 60 degrees of external rotation, 90 degrees of abduction, and 90 degrees of abduction with 90 degrees of external rotation. SUMMARY. No statistically significant differences were observed between flow rates in the neutral, externally rotated, and abducted arm positions. However, flow rates decreased by 42% ($p = 0.016$) between the neutral and externally rotated and abducted position. CONCLUSIONS. This investigation suggests a significant decrease in arterial blood flow in full abduction and external rotation which may have implications in shoulder surgery and overhead physical activity. Furthermore, this embalming method provides a unique opportunity for the investigation of blood flow and extremity positioning.

KAPOOR, Kanchan, Ramandeep KAUR, Jyotsna SINGH, and Rupinder SINGH. Department of Anatomy, Government Medical College & Hospital, Chandigarh, UT, 160030, India.
The Developing Lumbar Sympathetic Trunk: Its Comparison with Adult Configuration.

INTRODUCTION. The lumbar sympathectomy is a well established measure to relieve vasospastic influence in peripheral vascular diseases. However the disappointing results following sympathectomies are due to ignorance of the variations in the anatomy of lumbar sympathetic trunk (LST).The purpose of the present study is to provide precise anatomical information about the morphology of lumbar sympathetic ganglia (LSG) in adults; to trace the development of LST at different stages of gestation and to define the histogenesis of LSG. METHODS. The LST was exposed bilaterally in 15 adult cadavers and 15 fetal specimens of varying gestational ages. Further a light microscope study was done on LSG in fetuses from each gestational age group. SUMMARY. In adult LST, it was rare to find 5 ganglia on either side of LST. However in fetal specimens, 90% showed 5 lumbar ganglia on either side. The length of LSG varied from 0.8cm to 2.5cm while the breadth was in the range of 0.2-0.6cm. Various branches were observed arising from each LSG. The intervening cord was duplicate/triplicate in 27% adult specimens. In fetal specimens, presence of LST was noticed in all cases from gestational age of 12¬+ wk. Light microscopic examination at 12th wk of gestation showed small, rounded cells with a large heterochromatic nucleus. Cluster formation by these cells was observed in a 16th wk embryo. After 18th wk, sections showed cytoplasmic extensions i.e. appearance of an axon and later (at 20th wk.) the formation of dendrites. After 30 wk of gestation, the neuron appeared more like an adult neuron. CONCLUSIONS. The medial border of psoas major muscle is a reliable guide to trace the presence of LST. The most reliable vertebral level is taken as starting from L2 to L5. The number of ganglia in the initial stages is five which later on get reduced to 4 or 3 within the fetal period. Histogenesis of LSG progressed till 30th week gestation; after that the ganglia resembled the adult configuration.

LANGFORD, Sydney J.[1] and Jonathan J. WISCO[1,2]. [1]Brigham Young University, Provo, UT 84604, USA. [2]University of Utah School of Medicine, Salt Lake City, UT 84132, USA.
Considering Anatomy Pedagogy through the Lens of Second Language Learning.

INTRODUCTION. Typically, life science departments in pre-professional institutions are responsible for teaching anatomy courses. This discipline is conceptual - less analytical than the problem-solving courses of physics and chemistry, and less mechanistic/procedural than biology and physiology. Hence, many professors with training in anatomical sciences teach the subject using memorization methods. With a large volume of concepts, this presents an enormous cognitive load for students. Second language learning (SLL) is also a subject with many concepts but taught hierarchically starting with semantics and building to syntax. The purpose of our analysis was to consider whether anatomy should be taught using SLL methods. RESOURCES. We compared and contrasted pedagogical techniques for traditional 'hard' sciences with SLL as described in the following works: 'How We Learn' (Carey), 'Learning to Teach in Higher Education' (Ramsden), 'Content-Based Second Language Instruction' (Brinton). DESCRIPTION. Carey wrote that different and nontraditional methods of learning may actually be the most beneficial for students. Different learning systems, such as a 'deep' approach, Ramsden

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wrote, are promotional of longer information retention. Brinton wrote that students learn language best through a subject of interest; therefore, anatomy should be taught this way. Additional analyses examined current literature. SIGNIFICANCE. We propose that anatomy should be taught and learned using pedagogical techniques that take advantage of language learning. This could include immersion in flipped-classroom assignments that inform in-class application to hands-on activities and projects. A SLL learning environment can help students appreciate, understand and analyze anatomical information better than rote memorization.

LAWRENCE, Susan C.[1] and Susan E. LEDERER[2]. [1]Department of History, The Ohio State University, Columbus, OH 43210, USA; [2]Department of Medical History & Bioethics, University of Wisconsin-Madison, Madison, WI 53706, USA.
Bodies for Science, 1860 to 1940: A Long History of Unexpected Altruism.

INTRODUCTION. The history of body donation programs begins in California in the early 1950s. Before there were official programs, however, hundreds of American expressed a desire that their bodies to go to medical schools to be used for "science." Anatomists may be familiar with a few stories of such eccentric individuals, but our research reveals that men and women from all socioeconomic levels had their intentions included in newspapers articles and made available to a general readership between 1860 and 1940. METHODS. Public (Library of Congress), academic subscription (ProQuest) and commercial (newspapers.com) digitized newspaper collections were searched for notices and articles about anatomical gifts using an extensive set of search terms. Results were found in newspapers from across the United States. All were reviewed for information about gender, motivation and intended recipients. SUMMARY. Given the fragmentary and unsystematic nature of digitized newspaper sources, along with the problems of searching OCR enabled pdf files, we do not claim that the data provide a statistically representative sample of potential donors' intentions. Nor do we typically know whether medical schools accepted these anatomical gifts. They are highly significant, nevertheless, in demonstrating complex attitudes towards death and postmortem use of remains well before anatomists publically expressed concern over cadaver shortages in the 1950s and asked for whole body donations. These donors' intentions also antedate the rise of successful corneal transplants and the idea that tissues of the deceased could be used for therapeutic purposes. CONCLUSIONS. Our results challenge the conventional history of the anatomical cadaver. During decades when anatomists used unclaimed bodies provided under Anatomy Acts under the belief that there was universal revulsion to the idea of dissection, there were Americans whose desire to be useful included giving their bodies to science.

LEE, Lisa M.J.[1,3], Brian MOORE[2], and Ian STEWART[3]. [1]Department of Cell and Developmental Biology, University of Colorado School of Medicine, Aurora, CO 80045, USA. [2]Department of Pathology, University of Colorado School of Medicine, Aurora, CO 80045, USA. [3]Master of Science in Modern Human Anatomy Program, University of Colorado School of Medicine, Aurora, CO 80045, USA.
Clinically Oriented, Asynchronous Undergraduate and Graduate Medical Histopathology Education.

INTRODUCTION. Educational contact hours for histology in undergraduate medical education (UME) are at an all-time low. Not surprisingly, survey of pathology graduate medical education (GEM) program faculty and residents revealed an alarmingly low knowledge and preparation for the residency training in the new interns. Advances in technology for histology education over the years have been largely focused on virtual microscopy (VM) development and its use in histology education with a little emphasis on meaningful educational interactions or clinical integration. To that end, a series of neuropathology virtual slide collection was added to a virtual histology lab featuring instructor simulator tools such as interactive annotations and timed quizzes. METHODS. In an IRB exempt study, graduate students in a histology course and pathology residents completed a prequiz on neuropathology subjects, interacted with the neuropathology virtual slides with the instructor simulator tools, then completed a postquiz and a survey. Statistical analyses were completed using statistical analytics software (SAS). SUMMARY. There was a significant increase in postquiz scores compared to the prequiz for both cohorts, suggesting neuropathology virtual laboratory interaction can yield measurable learning outcomes in the absence of in-person interaction with an expert. The survey revealed both graduate students unanimously rating the educational value of the pathology content highly, indicating that exposure to pathology increased their perception of the importance of learning histology and motivated them to learn it better. Pathology residents also ranked the educational value of the neuropathology virtual lab high, but the annotations were ranked slightly lower. CONCLUSIONS. This study highlights the potential of the new, asynchronous virtual histopathology educational platform with instructor simulator tools, and the value of clinical integration in basic sciences education.

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MAREK, Tomas[1], Kimberly K. AMRAMI[2], and Robert J. SPINNER[1]. Department of Neurologic Surgery[1] and Radiology[2], Mayo Clinic, Rochester, MN 55905, USA.
Targeted Nerve Biopsy: An Evolving Concept/Technique.

INTRODUCTION. Over the past two decades, our group has introduced and successfully implemented Targeted Fascicular Biopsy into clinical practice to diagnose patients with "idiopathic" neurologic disorders (e.g., proximal neuropathies or plexopathies) and more effectively treat them. This technique of biopsy of major mixed proximal nerves based on abnormalities detected on high resolution MR imaging has helped our group diagnose a multitude of neurologic benign and malignant conditions. It has higher diagnostic yield over the non-targeted nerve biopsy of distal (sensory or motor) nerves and can be done relatively safely. Recently, we refined this technique to target the pathology in cutaneous and motor branches of these proximal nerves in order to simplify and potentially decrease the risks of the biopsy of the major nerves themselves. RESOURCES. We describe the evolution of our surgical rationale and technique from the time honored non-targeted biopsy of distal sensory (cutaneous) or motor nerves to targeted nerve biopsy of major nerves and branches, especially in patients with suspected perineural spread. We describe our experience of targeted fascicular biopsy in more than 350 patients with an 80% diagnostic yield and our early experience with targeted nerve branch biopsy in more than 10 patients with historical cohorts treated with non-targeted biopsies. DESCRIPTION. To discuss the rationale for the evolution of surgical techniques, results with these different approaches, and potential future applications of targeted nerve biopsy. SIGNIFICANCE. Armed with knowledge of clinical anatomy, experience with correlating neurologic and imaging abnormalities, and higher resolution imaging in depicting pathology, surgeons are able to target biopsy sites to affected nerves in a safe, efficacious and individualized process. We believe that "tissue is the issue" and that targeted biopsy leads to targeted treatment.

MISHALL, Priti L.[1, 2], William B. BURTON[3], and Michael S. RISLEY[1]. [1]Department of Anatomy and Structural Biology, [2]Department of Ophthalmology and Visual Sciences, [3]Department of Family and Social Medicine, Albert Einstein College of Medicine, Bronx, NY 10461, USA.
Quizlet-Online Learning/Review Tool to Study Medical Histology.

INTRODUCTION. Formative assessment is critical for learning. Quizlet is an online formative assessment tool that utilizes gaming tools (Flashcards, Learn, Speller, Test Scatter and Race/Gravity) to enhance learning by repetition and recapitulation. The present study aims to investigate the preferred Quizlet learning tool adopted by the students to learn histological image recognition by tracking the frequency of usage of a particular gaming tool they self-selected while using the practice sets for formative assessment. METHODS. In the medical histology course, at the Albert Einstein College of Medicine, Bronx, NY, we used the quizlet website to create four practice sets that contained images testable in four quizzes during the course. These practice sets used unlabeled light and electron microscopy images from diverse sources. The quizlet website uses these practice sets in different modes to test knowledge. All data were tracked and analyzed for graduating Classes of 2018 to 2021 to calculate the overall quizlet usage for each quiz set, quizlet usage by year and quizlet tool preference by the students. SUMMARY. The data showed consistent year-to-year increases in usage of quizlet by almost 50%. This may be attributed to recommendation by more senior students on the benefit of quizlet as a learning tool for image identification. Further, within each year, there was decline in usage of quizlet 1 to quizlet 4 that ranged from 9.43 % (Class 2020) - 19.33% (Class 2018). With the progression of the course the students become familiar with other learning resources that they may prefer over quizlet. Of the six quizlet learning tools, flashcard was the preferred learning tool of all years combined with an average usage of 52. 3%. Flashcard was also the preferred learning tool within each year. CONCLUSIONS. Flashcard is the preferred and consistently used self-paced learning tool preferred by the students in the quizlet study sets. IRB Number for the study: 2017-7718.

MURO, Satoru[1], Yuichiro TSUKADA[2], Masayo HARADA[1], Masaaki ITO[2], and Keiichi AKITA[1]. [1]Department of Clinical Anatomy, Tokyo Medical and Dental University, Tokyo, 1138519, Japan. [2]Department of Colorectal Surgery, National Cancer Center Hospital East, Chiba, 2778577, Japan.
Muscle Layer Structure in Anterior Wall of Anorectal Canal in Females.

INTRODUCTION. The anorectal wall consists of two layers of smooth muscle: the circular muscle and the longitudinal muscle (LM). At the level of the anal canal, the circular muscle thickens and is called the internal anal sphincter (IAS). It is surrounded by LM which is encircled by the external anal sphincter (EAS). In the anorectal anterior wall of males, LM is known to anteriorly extend several fibers which form the rectourethralis muscle. The rectourethralis muscle is believed to contribute to the stabilization of the membranous part of the urethra. However, previous reports hardly described the muscle layer structure of the anorectal anterior wall in females. The present study aimed to verify the hypothesis that smooth muscle fibers extend anteriorly from the anorectal anterior wall in females. METHODS. Twelve female cadavers were used for macroscopic and histological examination. SUMMARY. The dissection by layer in the anorectal anterior wall showed that IAS partially protruded toward the anterior space between the inferior end of the vagina and the superior margin of

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EAS. LM in median and paramedian converged and merged with the protruding IAS. On the other hand, the anterolateral LM shifted to the midline under the protruding IAS, and form LM of the anal canal. Histological examination of the median section showed that several smooth muscle fibers of IAS anteriorly extended while involving LM fibers in the superior and inferior. The smooth muscle fibers spread to merge into the smooth muscle layer of the vagina, scatter subcutaneously, and cover the anterior surface of EAS. As a result, the region anterior to the anorectal junction was occupied by smooth muscular tissue. CONCLUSIONS. The present study revealed that IAS extended anteriorly while involving LM. These extended smooth muscle fibers most likely contribute to the stabilization of the vaginal posterior wall and EAS in the anal anterior wall. (Supported by JSPS KAKENHI Grant No. JP15K08129.)

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Use of Prosection Anatomy Labs and Clinical Cases to Improve Outcomes in an Integrated Curriculum.

INTRODUCTION. A clinical and basic science integrated pre-clerkship curriculum has many advantages. However, due to the need for integration across multiple disciplines and reduced time for anatomy labs, traditional dissection-based anatomy labs are not well suited for this type of curriculum. To address these issues, we replaced dissection labs with prosection-based labs and case-study sessions. In this study we evaluated the effect of this transition on student perception and performance in anatomy. METHODS. A class of first year medical students (Class A) was taught anatomy using prosection labs during their second unit (Unit 2) and was taught using a combination of prosection labs and case-study sessions during their third unit (Unit 3). Student performance on the anatomy portion of the end-of-unit summative exams (anatomy score) was evaluated and compared to that of the previous year's students (Class B) who were taught anatomy with dissection labs. SUMMARY. Both Unit 2 and Unit 3 anatomy scores of Class A (74% and 78%) were significantly higher than those of Class B (64% and 72%), suggesting that prosection labs were more effective than dissection labs with an integrated curriculum. Also, Class A students had significantly higher anatomy scores in Unit 3 compared to Unit 2, suggesting that addition of the case study sessions further improved student outcomes. Non-anatomy scores were not significantly different between the two units and two classes. Student perception of changes in the anatomy curriculum was very positive. The majority of students thought that the case study sessions helped them to understand the clinical relevance of the anatomy material. CONCLUSIONS. Prosection-based labs in combination with case study sessions may be a better alternative to dissection-based labs for teaching anatomy at medical schools with an integrated pre-clerkship curriculum.

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Interprofessional Teaching and Learning: Anatomy Graduate Students and Cardiology Fellows.

INTRODUCTION. Cardiac catheterization via the radial artery has several important clinical advantages over trans-femoral artery cardiac catheterization, yet the US lags behind other countries in adopting a "radial artery" first approach to cardiac catheterization and interventional procedures. In the medical school curriculum anatomy is taught exclusively during the first two years of study, and it is widely appreciated that retention of anatomical knowledge in the clinical years is meager. Pairing anatomy graduate students who are well-versed in anatomy but inexperienced with patient care with physician trainees who are several years removed from detailed anatomy education can be a mutually beneficial educational experience. RESOURCES. A Radial Artery Anatomy Workshop for Transradial Catherization was created to allow clinical cardiology fellows and cardiac cath lab staff to review the vasculature and related structures of the upper extremity. Graduate students in the Division of Anatomy at The Ohio State University serve as proctors for this program. DESCRIPTION. The one-hour workshop includes a PowerPoint presentation about transradial cardiac catherization, radial anatomy and vasculature, angiograms, and a proctored exploration of upper extremity anatomy as well as lower extremity anatomy on prosected cadavers. SIGNIFICANCE. Reviewing the anatomy relevant to an invasive clinical procedure has the potential to increase uptake and safety of the transradial cardiac cath procedures. In turn, anatomy graduate students gain an increased appreciation of the clinical application of their expertise in human anatomy.

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Discovery of a New Ligament of the Lumbar Spine.

INTRODUCTION. The ligaments of the lumbar spine are integral to structural integrity and have been heavily studied.

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However, during the routine microdissection of the lumbar spine, we identified a new midline ligament, congruent with the ligamenta flava but distinctly separate. To our knowledge, such a ligament has not been previously described. The purpose of this study was to investigate the morphology of these ligaments and the neighboring lumbar ligamenta flava to elucidate their individual anatomies. METHODS. A total of ten sides from five fresh cadaveric specimens were dissected for a total of 40 ligaments. The cadavers' age at the time of death ranged from 63 to 88-years-old. Dissections were carried out by completely removing the vertebral column. The lumbar vertebral column was then sectioned coronally dividing it into anterior and posterior parts. The length and width of the ligamenta flava were measured on right and left sides. In the midline, the presence or absence of the midline ligament and its connections were recorded and its length and width measured. SUMMARY. Twelve out of twenty (60%) lumbar intervertebral levels were found to have a unique midline and segmental ligament traveling on the intraspinal aspect of the base of the spinous processes and slightly anterior to the plane of the ligamenta flava. The mean length of the ligamenta flava on left sides was 18.7±3.9 mm and on right sides, 17.5±3.0 mm. The average width of the ligamenta flava on left sides was 15.7±2.5 mm and on right sides,16.7±2.0 mm. The mean length and width of the new midline ligament was 7.6±2.9 mm and 5.1±1.7mm, respectively. CONCLUSIONS. Based on our cadaveric findings, a distinct midline ligament was identified in the lumbar spine at the majority of spinal levels. This ligament might have clinical significance and potential biomechanical importance. Further clinical and biomechanical studies are necessary to better elucidate the function of these structures.

THOMAS[1], Alison M., Jickssa M. GEMECHU[2], and Daniel K. FAHIM[3]. [1]Oakland University William Beaumont School of Medicine, Rochester, MI 48309, USA; [2]Department of Neurosurgery, Beaumont Health System, Royal Oak, MI 48073, USA; [3]Department of Biomedical Sciences, Oakland University William Beaumont School of Medicine, Rochester, MI 48309, USA.
Recurrent Laryngeal Nerve and its Vulnerability during Surgical Procedures of the Neck.

INTRODUCTION. Accurate knowledge of anatomical variability of the recurrent laryngeal nerve (RLN) provides information for preventing inadvertent intraoperative injury, improving patient safety, optimizing clinical outcomes, and guiding best clinical and surgical practices. The present study aims to assess the potential anatomical variability of RLN pertaining to its course, branching, and relationship to the inferior thyroid artery, which makes it vulnerable to injury, compression, or stretch during surgical procedures of the neck, together with side preference considerations. METHODS. The study was done on 55 formalin-fixed cadavers used for dissection as part of Gross Anatomy at Oakland University William Beaumont School of Medicine in 2016-2018. Following observation and careful dissection, cadavers with anatomical variation were photographed and the data was analyzed qualitatively. SUMMARY. Our findings indicate that extralaryngeal branches coming off of the RLN on both the right and left side innervate esophagus and trachea. On the right side, 89.09% of the cadavers demonstrated 2-5 extralaryngeal branches. On the left side, 74.55% of the cadavers demonstrated 2-3 extra-laryngeal branches. In relation to the inferior thyroid artery, 67.92% of right RLNs were anterior, while 32.08% were posterior. On the other hand, 32.08% of left RLNs were anterior to the inferior thyroid artery, while 67.92% were posterior. On both sides, 3-5% of RLN crossing in between the branches of inferior thyroid artery. CONCLUSIONS. The findings show significant variation in the course and branching of the RLN. Anatomical consideration of the variations is essential to minimize complications associated with surgical procedures of the neck, especially anterior cervical spine surgery and thyroidectomy. The information gained in this study emphasizes the need for special considerations during surgical procedures, and side preferences in preserving the extralaryngeal branches of the RLN.

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A Cadaveric Study of the Nerve Supply of the Posterior Knee Joint Capsule.

INTRODUCTION. Image guided peripheral nerve blocks (PNBs) are commonly used to provide non-opioid postoperative analgesia following total knee arthroplasty (TKA). More recently, novel approaches targeting the sensory innervation of the posterior capsule have been suggested, however this requires a detailed understanding of knee joint innervation. Previous anatomical studies are scarce and have not been related to landmarks visible with image guidance. Therefore, the purpose was to determine and document the course and frequency of the nerves innervating the posterior knee joint capsule, and to identify anatomical landmarks discernable by image guided systems. METHODS. Articular branches innervating the posterior knee joint capsule were meticulously dissected in 15 semi-embalmed specimens using magnification. The origin, number and course of articular branches were documented, relationships to bony and soft tissue landmarks identified, and a frequency map generated. SUMMARY. In all specimens, articular branches from the posterior division of obturator (PON), and tibial (TN) nerves innervated the knee joint. Articular branches from the common fibular nerve (CFN) were found in 8 specimens and from the sciatic nerve (SCN) in 3. TN innervated the entire posterior capsule with overlapping distribution from the PON, superomedially. When present, the CFN/SCN provided innervation to the superolateral capsule, overlapping with TN. Landmarks included the superior border of medial and lateral femoral condyles, adductor hiatus, and popliteal artery and vein. CONCLUSIONS. The frequency map of the course and distribution of articular branches supplying the posterior capsule provides an anatomical basis for the development of new clinical protocols for perioperative and chronic pain management.

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Morphological Analysis of Gluteus Medius Tendon and Its Insertion Sites.

INTRODUCTION. Although the gluteus medius (GMe) tears have been recognized as the potential cause of the lateral hip pain, the precise location and extent of the tear remains unclear. Our hypothesis is that the tendinous portions of the GMe itself have the non-uniform structure which contributes to the etiology of the tears. The aim of this study was to examine the three dimensional structure of the GMe tendon. METHODS. In total of 26 hips from 15 Japanese cadavers, we macroscopically and histologically analyzed 22 and 4 sides, respectively. In all specimens, the three-dimensional morphology of the greater trochanter (GT) was examined using micro-computed tomography (micro-CT: inspeXio smx-100ct, SHIMADZU, Kyoto, Japan). In 10 sides, the local thickness of the GMe tendon detached from the GT were analyzed by micro-CT and the Image J software (version 1.41; National Institutes of Health, Bethesda, MD). SUMMARY. Two parts of the GMe tendons, posterior and anterolateral ones, were roughly distinguished based on the aspects of the iliac origins. The posterior part of the GMe tendon was long and thick, ran with a fan-like shape and converged into the posterosuperior facet of the GT. The anterolateral part was short and thin, and ran posteroinferiorly toward the lateral facet of the GT. These facets of the GT were identified by the micro-CT before detaching the GMe tendon from the GT. Analysis of the local thickness of the GMe tendon showed that both of anterior and posterior margin of the anterolateral part were relatively thin compared with the other parts. The histological study showed that the posterior part inserted into the GT via the fibrocartilage which is thicker than the anterolateral one. CONCLUSIONS. GMe tendon itself had the non-uniform structure. The thin anterior and posterior margin of anterolateral part might be mechanically weak compared with the other parts and have a close relationship with the etiology of the GMe tear.

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Assessment of Anatomical Variation of the Glenohumeral Joint in Swimmers.

INTRODUCTION. Shoulder Impingement Syndrome (SIS) is often referred to as Swimmer's Shoulder due to prevalence in swimming sports. The glenohumeral joint is composed of a variety of muscles, tendons, ligaments, and bursa. We hypothesize that anatomical variations within the glenohumeral joint may be predictive of SIS. METHODS. In this pilot study, the shoulders of 27 subjects were imaged using a CISS (1mm iso) MRI protocol. Each subject was positioned supine with the shoulder flexed upward 140° and forward 90°. A shoulder examination was also performed to determine passive range of motion. Both shoulders were analyzed in the study. Subjects were categorized as collegiate, recreational, or non- swimmers. SUMMARY. One-way MANOVA statistical model showed a trend toward significant difference in overall shoulder anatomy based on swimmer type [$F(16, 32) = 1.708$, $p = 0.096$; Wilk's $\beta = 0.291$]. Post-hoc comparisons showed that the type of swimmer has a statistically significant effect on right anatomical coracohumeral distance [$F(2, 23) = 4.918$; $p = 0.017$] and trend toward significance for right anatomical subacromial distance [$F(2, 23) = 2.537$; $p = 0.101$]. The data show a significant pair-wise comparison between collegiate and non-swimmers ($p = 0.014$), but not between collegiate and recreational swimmers ($p = 0.112$) for coracohumeral distance. CONCLUSIONS. These data reveal a trend toward significance relating shoulder anatomy and swimmer type, which justifies further recruitment of subjects. Further research is required to determine the influence of biomechanics, in addition to shoulder morphologies, on incidence of SIS.

WARD, Peter J. West Virginia School of Osteopathic Medicine, Lewisburg, West Virginia, USA.
The Anatomy-Intensive Elective: A Rotation Highlighting Anatomy and Effective Communication.

INTRODUCTION. We report on five years of hosting a dissection-based elective for students during their 4th year. This elective was specifically designed to improve the medical knowledge related to the students' upcoming residency while also improving their ability to gather and critically appraise research literature, integrate this knowledge clinically, and effectively communicate to an audience. RESOURCES. In 2012, the curriculum committee and administration of WVSOM approved this elective as an offering for rotating students. The gross anatomy laboratory was made available and the human gift registry approved the use of cadaveric donors in this elective. DESCRIPTION. For the last five years, students have applied to this elective and conducted a focused dissection or histologic investigations. Students submit a proposal that details the clinical topic they wish to investigate and perform a focused review of literature pertaining to that topic. Once the elective begins, they are allowed to dissect the relevant structures to connect the anatomy to the clinical topic. This allows the students to critically appraise the research literature while synthesizing it to the relevant anatomy, and (often) surgical approaches. At the end of the elective the students present their projects to the faculty and their peers on campus. Topics have included: episiotomy, ultrasound-guided nerve blocks, suprapubic prostatectomy, salivary gland resection, and many others. SIGNIFICANCE. Unlike some similar programs that have been described, this elective includes a focused review of literature

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and public presentation. In this way it assesses the competencies of medical knowledge, professionalism, interpersonal and communication skills, practice-based learning and improvement. As greater emphasis is shifted to competency-based assessment, this elective can serve as a resource for measurably grading students based on these competencies.

YABUUCHI, Tomonori, Satoru MURO, and Keiichi AKITA. Department of Clinical Anatomy, Tokyo Medical and Dental University, Tokyo, 1138519, Japan.
Origins of the Levator Ani with Special Reference to the Tendinous Arch.

INTRODUCTION. The levator ani muscle (LA) is generally accepted to be composed of three portions: the puborectalis (PR), the pubococcygeus (PC), and the iliococcygeus (IC). It is generally accepted that PR and PC originate from the internal surface of the pubis, however IC originates from the tendinous arch of the levator ani (TA). During the dissection practices, it is very often found that the length and manner of the attachment of TA could not be constant. In this study, we investigated the origins and insertions of LA and forms of TA to discuss the function of the pelvic floor. METHODS. 54 hemi-pelvic specimens from 29 cadavers (9 males and 20 females, the mean age, 86.7 y/o) were used in this study. After investigation of the origins and insertions of LA macroscopically in all specimens, some specimens were randomly chosen to examine the forms of TA histologically stained by Masson's trichrome stain. SUMMARY. The anterior end of TA attached to the anterior border of the obturator canal in 35%, and the anterior end was situated more anterior to the obturator canal in 61%. Interestingly, in 2 cases (4%), TA was not observed. LA originated from the pubis was mainly attached to the pelvic organs, however LA originated from TA was mainly inserted to the anococcygeal raphe. In the histological sections, TA attached to the obturator fascia in the section of the anterior part of TA. However, in the section of the posterior part of TA, TA was shown to be separated from the fascia. CONCLUSIONS. LA originated from the TA could not be firmly attached especially in the posterior region except 2 cases. Pelvic organs are mainly supported by LA originated from the pubis.

Abstracts – Tech Fair Presentations

(Listed by presenting author last name)

CARTER, Yasmin[1,2], Daniel J. MANGIAMELI[2], and Hillary E. MULLAN[2]. [1]Division of Translational Anatomy, Department of Radiology; [2]Innovations Lab at the Interprofessional Center for Experiential Learning and Simulation (iCELS), University of Massachusetts Medical School, Worcester, MA 01655, USA.
Practical 3D Printing: For All the Things You Can't Buy On Amazon.

INTRODUCTION. The utility of 3D printing has been lauded for anatomical education, focused mainly on the creation of teaching models. The unique environment of the anatomy lab results in highly-specialized requirements in terms of tools and equipment. 3D printing allows for the in-house design and creation of equipment solutions. RESOURCES. Two relatively low-cost MakerBot Replicator and Replicator 2X desktop 3D printers were used to manufacture tools and equipment specific to the needs of the human cadaveric lab environment. Design occurred in the free-to-academics software, Fusion 360 (Autodesk). DESCRIPTION. Initial production focused on models already available from open-source community platforms such as 'Thingiverse'. Open source chopstick holder designs were resized and repurposed to hold sets of ribs in anatomical position for study and testing. Additionally, designs for VR headsets were repurposed as stands for surgical binocular loupes to protect expensive equipment. Custom made in-house designs include pins and loops in different colors and sizes for labeling exam specimens and brain stands, to prop these notoriously soft specimens in different orientations for study. An unexpected bonus was the ability to design and build prototypes of dissection tools in plastic, which can then be tested before being sent out for manufacture in more sturdy materials. SIGNIFICANCE. Anatomical labs have unique requirements for tools and equipment often not easily sourced or purchased. Desktop 3D printing and free software allow for a relatively simple and fast production of physical solutions. Furthermore, the adoption of designs from the 3D printing community allows even the beginner to adapt models to their own particular needs.

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GOLDMAN, Evan M., Timothy D RENZI, Nicholas A RUSSO, Sneha KOLLA, and Maha ELGAWLY. Cooper Medical School of Rowan University, Department of Biomedical Sciences, Camden, NJ 08103, USA.
Virtual Reality: Bringing Cadaveric Education into the Next Dimension.

INTRODUCTION. Students use a variety of learning tools to supplement cadaveric-based gross anatomy coursework. To improve understanding of three-dimensional (3-D) anatomy, students have historically utilized various learning techniques such as drawing, constructing clay and string models, and visualizing structural relationships on 3-D software. Virtual Reality (VR) provides a platform to combine these methods into a single immersive experience. RESOURCES. We developed a set of VR training modules that guide students through the active process of drawing anatomical structures on 3-D models. The 3-D VR models, created from cadaveric prosections and skeletons, also includes 3-D painting tools. We designed a pre-test/post-test study to assess performance on anatomy quizzes, to be taken before and after VR training. In addition, we included a survey to gauge student impressions of the VR tool. DESCRIPTION. To design a VR software package that teaches 3-D relational anatomy using actual cadaveric specimen. SIGNIFICANCE. Virtual Reality (VR) has been touted to provide a more immersive experience analogous to the one gained from a prosected cadaveric specimen. Our VR anatomy training tool has continuously received positive reactions during the initial testing phases. Students, anatomy faculty, and clinical faculty have shown great interest in using our VR tools for their studies and training programs. We are currently developing content for (a) new medical students who have not yet had gross anatomy coursework, (b) medical students who are currently taking gross anatomy, (c) orthopedic procedures simulations, and (d) urogynecology resident training. VR offers tremendous learning opportunities to supplement cadaveric dissection.

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The New Active Learning: Converting Large Group Lectures into Interactive Sessions Using Nearpod.

INTRODUCTION. Recently, many medical schools have looked for ways to decrease the percentage of pre-clerkship education time in lecture and increase the amount of educational activities with interactive components. One of the ways to achieve this is by engaging in problem-based learning activities in small group formats moderated by faculty members or staff. This case study examined the effectiveness of using Nearpod (nearpod.com) in large lectures with only one instructor to mimic small interactive learning sessions. RESOURCES. Nearpod is a digital teaching tool that facilitates an immersive learning experience by empowering instructors to create interactive lessons. Nearpod has applications for iOS, Android, PC/MAC, and Windows 8 devices, and also works as a web-based platform. DESCRIPTION. Nearpod was incorporated in three required medical school courses in the fall quarter of academic year 2017-2018: Clinical Anatomy, Embryology, and Histology. Prior to the in-class sessions, students had access to new content which helped induce in-class participation by using Nearpod on their own devices. These sessions were led by a single instructor in the main lecture hall projecting questions based on scenarios related to the topic. After the instructor deemed it appropriate, response results were displayed, a brief discussion followed, and the instructor moved on to the next question. Question and response type varied from simple multiple choice questions, polls, open-ended questions, and a 'Draw-It' function, which enabled students to identify structures on radiologic images or virtual histology slides. SIGNIFICANCE. Nearpod can make large-group sessions interactive and may have significant future applications in schools with limited faculty and resources. The variety of question and response types allow the instructor to choose assessments appropriate for the topic being covered, especially for anatomy and other topics with a prominent visual component.

LOZANOFF, Scott, Jesse THOMPSON, Jessica GRAZZIOTIN, Beth K. LOZANOFF, & Steven LABRASH. Department of Anatomy, Biochemistry & Physiology, John A. Burns School of Medicine, University of Hawaii at Manoa, Honolulu, HI 96813, USA.
Mixed Reality Tracking of Anatomical Plastinations using X-Reality Visualization Devices.

INTRODUCTION. Anatomical plastinations provide useful learning materials particularly in the absence cadaver availability. However, the usability of plastinations is somewhat restrictive since they are static representations that lack annotation. X-Reality visualization devices could provide a novel opportunity to superimpose annotations and additional information within a space occupied by the plastination. The purpose of this presentation is to describe an approach to annotate and plastinations using Microscoft Hololens. RESOURCES. An anatomical plastination of the human heart was used as based model for this application. The plastination was 3d scanned using photogrammetry and the scaled model was used to create a model target through the edge-detected outlines setting an anchor point for spatial transforms. DESCRIPTION. Annotations and supplemental information were added to the real world object set as spatial mapping anchors in mixed reality applications. Annotations can be toggled "on" or "off" and supplemental information can be added to the real world object as desired. SIGNIFICANCE. The approach we describe provides annotations applied to complicated anatomical features of plastinations from any viewing angle. Models could be potentially shared between individuals wearing Hololens headsets either locally or remotely. Other attributes, including dynamic physiological features could be potentially included.

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Abstracts - Tech Fair Presentations continued

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Perceptions and Utilization of Three-Dimensional Printing in Human Anatomy Courses: A Pilot Study.

INTRODUCTION. Three-dimensional (3-D) printing is an increasingly available yet underutilized technology that has both clinical and didactic value. Benefits of 3-D printed anatomical models have been found in medical practice and education. The primary purpose of this study was gain insight on student and educator perceptions of utilizing 3-D printing as an educational tool. METHODS. During a one-day conference (2017 American Association of Clinical Anatomists Regional Meeting) a 3-D printing workshop was offered to attendees. Following this interactive workshop, survey data was collected that asked about educators' and health professional students' utilization and perceptions of 3-D printing, and how it may benefit anatomical education. SUMMARY. Respondents included anatomical educators and students (n=10; mean age=43.8 ±16.0 years; male=9, unreported=1; educator=9, student=1). Only 20% (2/10) of respondents had used 3-D printing before, but none (0/10) were currently using 3-D printing in their anatomy curriculum. Most (8/10) felt it would improve student learning, and all (10/10) agreed 3-D printed models are different from models currently available on the market. CONCLUSIONS. Anatomical educators and students agree there are potential benefits to utilizing 3-D printing in anatomy curriculum. Additional data should be collected to determine whether these results are similar in a larger sample, and interventional studies should be conducted to examine the usefulness and benefits of 3-D printed anatomical structures in other health professions education.

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XR Model of Sciatic Nerve Variant and Spinal Nerve Contributions, and Piriformis Mass Relationship.

INTRODUCTION. Recent advances in computer technology and visualization enables realistic depictions of anatomical structures and spatial relationships within X-reality space. Anatomical variations are particularly well suited for electronic archiving. The purpose of this study was to develop a surface rendering of a sciatic nerve variant with piriformis muscle involvement as a contribution to an anatomical model repository. In addition, piriformis muscle mass was examined in the presence and absence of sciatic nerve variation to determine whether an association exists with piriformis syndrome. METHODS. Focused dissections were conducted on the lumbosacral plexus with photo documentation and subsequent formation of Augmented Reality models imported to Sketchfab, Z-Space, and Hololens. Quantitative analysis was performed through bilateral dissection of piriformis from 37 cadavers (7 variants) and mass determined (.01 mg). Statistical analysis (SPSS 24) consisted of a paired sample T-test to assess intra-cadaver dissection reliability, and independent samples T-test to assess mass differences between variant and normal cadavers. SUMMARY. A rendering of the sciatic nerve and piriformis variant was completed and accessible on personal devices and for ease of reference and education. No significant difference was found between the mass of right piriformis in normal sciatic variants (mean: 18.83g, SD: 7.64g) compared to identified variants (mean: 18.58g, SD: 5.49), t = 0.081 (p=0.336). No significant difference was found between the mass of left piriformis in normal sciatic variants (mean: 20.45g, SD: 9.2g) and in variants (mean: 19.14g, SD: 6.06g), t=0.33, p=0.204. CONCLUSIONS. X-Reality visualization was accomplished and provided a realistic model that could be manipulated and dissected manually facilitating understanding of the segmental contributions of the sciatic nerve. However, high division of sciatic nerve did not appear to affect piriformis mass.

WINESKI, Lawrence E., and Lionel WILLIAMS. Department of Pathology and Anatomy, Morehouse School of Medicine, Atlanta, GA 30310, USA.
Introduction to Osteology and Radiology of the Back.

INTRODUCTION. Ongoing reductions in curricular contact hours plus increased expectations in knowledge base (e.g., in medical imaging) plus student demands for computer-based resources create an increasing need for innovative educational tools that supplement traditional classroom sessions and aid independent learning. RESOURCES. The authors have created an interactive digital resource that elucidates the fundamentals of osteology and radiology of the back. This program is presented in a responsive web-based format for both desktop and mobile applications. The web accessible browser-based study guide is supplemented by downloadable interactive e-books for further offline study options. All components of the program are available for open access and free use. DESCRIPTION. The program utilizes an expandable modular index of visually rich illustrations, photographs, animations, and medical images (plain films, CT, MRI) of the base of the skull and the vertebrae. The viewer moves through explanatory text and optional audio at will, maximizing self-driven study, review, and self-quizzing. SIGNIFICANCE. This program offers a means of delivering structured information while simultaneously allowing students flexibility in pacing their studies and managing schedules. It substitutes for traditional lab sessions in osteology and radiology, provides students an outline of learning expectations, and promotes any-time-any-place, self-paced and independent learning opportunities. (Supported in part by NIH PO3-1B040107 and G12-MD00762.)

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Abstracts – Poster Presentations Session 1

(Listed by presenting author last name)

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Topographic Anatomy of the Deep Temporal Artery and Clinical Implications for Temple Augmentation.

INTRODUCTION. Temple augmentation procedures have been frequently performing in patients with depressed temple. Injection of fillers into the temple area can lead to a smoother line from the side of the forehead to the zygomatic prominence. The aim of this study was to identify the anatomical features of the anterior and posterior deep temporal artery (ADTA and PDTA) to optimize safety and efficiency during deep injection technique. METHODS. Twelve hemifaces from 5 Korean and 4 Thai cadavers were dissected to expose the temporalis muscle, zygomatic bone and arch. Then, further dissections were done to show the location of the ADTA and PDTA with a perpendicular reference line (PL) passing the zygomatic tubercle (Zt). SUMMARY. Horizontal distance from PL to the ADTA and PDTA were 4.7±1.5 mm (0~ 7.3) and 18.5±2.7 mm (14.4~30.0). CONCLUSIONS. Based on our findings of the location of the ADTA and PDTA, the area about 10 mm posterior to the PL passing the Zt could be suggested as novel deep temple injection point to avoid the intravascular injection.(Sponsored by Grant No. NRF-2015R1D1A1A01061046 from the National Research Foundation of Korea (NRF) Association).

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Anomalous Exit of Chorda Tympani via Foramen Spinosum.

INTRODUCTION. The chorda tympani is the branch of the facial nerve which carries special taste afferents from tongue taste receptors and preganglionic parasympathetic fibers to submandibular and sublingual glands. Embryologically, it remains outside of the temporal bone during the totality of fetal development. Bony formation of the anterior canaliculus of the chorda tympani does not begin until age two and is not complete until age five. Two to five percent of persons have an extratemporal origin of the chorda tympani, which is the most common variation, and bilateral variations in its course are generally attributed to severe congenital malformation. Normal dissection during a medical school course revealed a unilateral (left) variant path for the chorda tympani nerve in a specimen without documented congenital malformation. RESOURCES. A cadaveric specimen was dissected using standard dissection and otoscopic assisted dissection. DESCRIPTION. On the left side, the chorda tympani was discovered in the infratemporal fossa exiting the foramen spinosum immediately adjacent and posterior to the middle meningeal artery. Otoscopy revealed a standard course of the chorda tympani through the middle ear. Microscopic dissection revealed the chorda tympani coursing through an anomalous bony canal along the entirety of its length until exiting in continuity with the middle meningeal artery at the foramen spinosum. While within this canal, it was entirely encased in bone and did not enter the middle cranial fossa. The chorda tympani was then observed to join the lingual nerve in the infratemporal fossa medial to the inferior alveolar nerve. SIGNIFICANCE. Surgical approaches to this region of the skull—in particular, neurotologic procedures—will benefit from additional knowledge of potential variations in the course of the chorda tympani nerve.

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A Fresh Tissue Cadaveric Demonstration of the Clinical Anatomy of Eagle Syndrome.

INTRODUCTION. Eagle syndrome is defined as a group of chronic head and neck symptoms associated with an elongated styloid process and/or a calcified stylohyoid ligament. The classic symptoms associated with Eagle syndrome include compression of the glossopharyngeal nerve and surrounding tissues by the styloid process, pain on rotation of the head, head and neck pain, dysphagia, and odynophagia. Symptoms due to vascular complications include syncope, carotid artery dissection, transient ischemic events, and stroke. RESOURCES. Cone beam computed tomography (CBCT) was performed on a dental patient symptomatic for Eagle syndrome for evaluation. Fresh tissue cadavers were procured for dissection to demonstrate the relevant clinical anatomy. DESCRIPTION. Fresh tissue cadaver dissection was performed to demonstrate the clinical anatomy. The CBCT scan of the patient revealed the presence of an elongated left styloid process but no calcification

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of the stylohyoid ligament was observed. The left styloid process was measured to be 3.5cm, and the right styloid process was measured to be 2.1cm. The maximum length of a normal styloid process is reported at 2.5-3.0cm in the literature. SIGNIFICANCE. While a rare occurrence, an elongated styloid process can be observed via imaging and palpated in the tonsillar fossa. In this patient, the CBCT scan provided three-dimensional imaging of the elongated styloid process. Fresh tissue cadaveric dissection demonstrated the clinical anatomy of the region. The dissections highlight the muscles, nerves, and vessels which can be affected leading to the symptoms associated with Eagle syndrome. A thorough understanding of the clinical anatomy is important when considering non-surgical or surgical treatment options for the patient.

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Fibrosis and Scarring of the Brachial and Sciatic Plexus as Displayed by MRI/MRA/MRV.

INTRODUCTION. Bilateral rounding of the shoulders (laxity) associated with kyphosis causes costoclavicular compression and brachial plexopathy. This form of thoracic outlet syndrome is usually not amenable to surgical treatment since this alters fascial planes and blood supply causing fibrosis and scarring of the plexus. In a closed circulatory system, compression of the venous drainage from peripheral nerves, impedes venous and lymphatic return, which increases arterial pressure. A bicuspid valve is usually located lateral to opening of the external jugular vein. If external pressure is applied to the upper extremity, the walls of the draining veins and lymphatics may compress. Surface veins may be observed to dilate reflecting lymph and venous blood back up within soft tissues and arterial blood flow is impeded. RESOURCES. This presentation displays costoclavicular compression of the brachial plexus and compression of the sacral plexus with fibrosis and scarring in two patients. One patient post multiple fractures of the thorax and pelvis complicated by thoracic outlet syndrome, and the second patient post cervical fusion and bilateral total shoulder and hip replacement with foot drop. DESCRIPTION. The objective of this presentation is to display the sites of landmark anatomy compressing venous return from the nerves resulting in fibrosis and scarring of the soft tissues marginating the brachial and sacral plexuses. Monitored bilateral MRI, MRA and MRV is the modality of choice to display the compression. If the resulting pressure is unrelieved, nerves suffer a conduction block injury. Compression ischemia with degeneration and fibrosis develop. With continued pressure, the endoneurial tubes and funniculi atrophy increasing ischemia, and fibrosis increases. SIGNIFICANCE. We have imaged over 3000 patients presenting with symptoms of plexopathy. It is instructive that these patients often have a common MRI/MRA finding- compression of the draining veins.

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The Anatomy Behind Platysmal Bands.

INTRODUCTION. Platysmal bands are the leading sign of the aged appearance of the neck. These prominent subcutaneous folds can be treated surgically (neck-lift) or non-surgically (neuromodulators, threads) or using high frequency ultrasound devices. To date the anatomy behind platysmal bands is still poorly understood, albeit different explanatory models exist .METHODS. Thirty cadavers (18 males / 12 females) of which 12 were Asians and 18 were Caucasians were objectively investigated using layer-by-layer anatomic dissections. The shape of the platysma and the presence of fibrous bands within the platysma was evaluated. The results of the dissections were compared to clinical findings. SUMMARY. The location of platysmal bands, when evaluated on clinical images, was 1: paramedian (1 per side), 2: mid-mandibular (1 per side) and 3: posterior neck (1 per side). Longitudinal bands of connective tissue were in none of the investigated cases (0%) identified. The platysmal bands corresponded to the location of the anterior margin of the platysma (= paramedian), to the location of the muscle fibers attached to the mandibular ligament (= mid-mandibular) and to the location of the posterior margin of the platysma (= posterior neck). No differences between ethnic background was observed. CONCLUSIONS. No underlying longitudinal bands of fibrous connective tissue were identified supporting the muscular theory and thus the application of neuromodulators for the treatment of platysmal bands. The difference between skin laxity and muscular tension seems to cause the prominent appearance of parts of the platysma explaining the para-median and the posterior neck band. The course of the mid-mandibular band can be followed to the location of the mandibular ligament, providing again support for the muscular theory, which seems to apply independent of ethnic background.

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The Transverse Facial Septum – Implications for Plastic, Reconstructive and Aesthetic Procedures.

INTRODUCTION. The anatomy of the face has received increasing attention throughout the past decade. Previous studies have described the layered arrangement of the mid-face, but have failed to incorporate the facial muscles into their concepts. The present study has discovered a new structure located in the mid-face, which has been pustulated but not yet described .METHODS. Seventy-two fresh human cephalic specimens (32 males, 40 females) with a mean age of 75.2 ± 10.9 years and a body mass index 24.2 ± 6.6 kg/m2 were investigated. Seventy-one cadavers were of Caucasian and one (1.4%) of African-American ethnicity. Cephalic specimens were dissected and objectively investigated based on layer by layer identification of facial structures. SUMMARY. In 100% of the cases a sheet of fibrous connective tissue was identified emerging from the underside of the zygomaticus major muscle and attaching to the maxilla. This structure will be called the transverse facial septum and forms the upper boundary of the buccal space and the inferior boundary of the deep lateral and the deep medial cheek fat. In its medial portion the transverse facial septum includes the levator anguli oris muscle, which forms there the floor of the deep pyriform space. The angular vein pierces this septum as well as a variable amount (1-3) of zygomatic branches of the facial nerve. CONCLUSIONS. The transverse facial septum is a new but integral part of the mid-face. Contraction of the zygomaticus major muscle during smiling tenses this septum and leads to an uplifting of the mid-facial fat compartments which reside in this "hammock". The uplifting of the midfacial fat compartments leads to the formation of "apple-cheeks" during smiling. Plastic, reconstructive and aesthetic procedures of the mid-face should incorporate the functional anatomy of the transverse facial septum into their treatment planning and account for its functional anatomy.

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Co-localization Patterns of AQP-4, Aβ, and CD68 in Alzheimer's and Cerebrovascular Diseases.

INTRODUCTION. Glymphatic system dysfunction has been implicated in the increased aggregation of amyloid-beta (Aβ) plaques in elderly adults diagnosed with Alzheimer's disease (AD). The translocation of aquaporin-4 (AQP-4) from astrocytic endfeet regions to areas surrounding Aβ plaques is one hypothesis for this dysfunction. This pilot study aimed to elucidate the co-localization hypothesis in subjects with AD, cerebrovascular disease (CVD), and a combination of the two (AD+CVD). METHODS. Post-mortem hippocampal samples from five elderly adults diagnosed via autopsy with varying stages of AD and/or CVD (2 AD, 1 CVD, 1 AD+CVD, and 1 control) underwent immunohistochemical staining for AQP-4, Aβ, and CD68. Slides were scanned and analyzed using Aperio ImageScope Positive Pixel Count to identify co-localization patterns. SUMMARY. Co-localization patterns of Aβ and AQP-4 were shown in all subjects diagnosed with AD. These patterns were observed as centralized Aβ plaques with strong bands of AQP-4 clustered around the plaques with ribbons radiating out from said plaques. Stronger patterns with greater amounts of AQP-4 clustering were observed in later Braak stages. Clustering patterns were not found in the subject with only a CVD diagnosis. The subject with AD+CVD showed strong clustering patterns of AQP-4 around Aβ plaques as well. CD68 did not follow co-localization patterns in any diagnosis. CONCLUSIONS. Based on our pilot study, AQP-4 and Aβ undergo an increasing co-localization pattern during AD progression. While CD68 did not follow the same pattern, it is possible CD68 is a poor marker for the chronic inflammation involved in AD. Therefore, future directions will include other potential markers for inflammation. Further histological studies are necessary to increase our sample size and verify our preliminary findings.

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Stereoscopic 3D Model Visualization for Trigeminal Ganglion Injection Procedure.

INTRODUCTION. Trigeminal ganglion injection has been used as one common procedure for many facial pain syndromes including trigeminal neuralgia. The procedure is usually performed under 2D fluorescent guidance to target the foramen ovale, where the mandibular branch of the nerve exits the skull after stemming from the deeply nested ganglion. In this project, 3D stereoscopic visualization was used to explore the pathway of trigeminal ganglion during the injection procedure. RESOURCES. 3D reconstructing program, Amira software and 469 slices of deidentified computed tomography angiography (CTA) images were used to create anatomical structures, which involve the pathway of trigeminal ganglion injection. DESCRIPTION. The 3D structures of the trigeminal ganglion, its branches, associated blood vessels, muscles, glands, skull and skin were created. These 3D structures can be displayed in a virtual reality environment, where they can be reassembled and dissembled. Having integrated with CTA images in both coronal and sagittal orientations, and in combination with

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the flexibility of a 360 degree view, the 3D model allows for visualization of the relationships of anatomical structures. This is conducive to internal visual exploration of the pathway from the foramen ovale, where the trigeminal ganglion lies, and the nerve passes through internal structures and out to external anatomic landmarks. SIGNIFICANCE. The 3D stereoscopic models provide a new approach to better understand the anatomical structures that are associated with the injection procedure, and allow multiple explorations and visualization of the pathway, help to avoid unnecessary damages to the important internal structures, therefore reduce potential risks and help prevent post-operative complications. The stereoscopic 3D model with pathway visualization can be useful for both medical education and clinical training purposes.

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The Torg Ratio of C3-C7 in African–Americans and European-Americans - Skeletal Study.

INTRODUCTION. The Torg ratio is the ratio between the sagittal diameter of the spinal canal and the sagittal diameter of the vertebral body. This ratio proposed as an indicator for spinal canal narrowing, when ratio is <0.80, clinical symptoms may appear: cervical myelopathy, neurapraxia etc. This study aims to determine the Torg ratio in C3-C7 and the association with sex, age and ethnicity. METHODS. Direct measurements with Microscribe-3D on C3-C7 vertebral bodies and foraminae were taken on human skeletal remains n=277 from the Collection Museum of Natural History Cleveland, OH. The spines originate from African-American (AA) or European-American (EA) males and females, which were assigned into three age groups: young, middle and old. SUMMARY. The vertebrae most prone to spinal stenosis, are C6 and C7, regardless of the sex of the individual. Pathological ratios are more common in males compared to females ($P<0.05$ in C3) and in AA compared to EA ($P<0.05$ in C3-C5). Torg ratio prevalence increases significantly with age in all vertebrae except C3. This, however, does not necessarily imply a greater risk for spinal stenosis, as the changes is mainly in the sagittal diameter of the vertebral bodies, whereas the diameter of the canal remains constant. Torg ratio mean is greater in females than in males ($P<0.05$ in C3-C4), in AA compared to EA (C6 excluded), and in young individuals compared to old. The explanations of the results are: The large sample size in this study compare to others, the types of measurements carried out varies as well. Our study was carried out with 3-D digitizer directly on dry vertebrae, allowing for accurate measurements. Nevertheless, such as approach does not enable an evaluation of the sclerosis of the ligamentum flavum. CONCLUSIONS. The popularity of the Torg ratio as a measure for spinal canal narrowing derives from its simplicity. Nevertheless, this criterion should not be used indiscriminately, as it varies with sex, age and ethnicity.

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Three-Dimensional Topographic Anatomy of the External Nose Vasculature - Its Clinical Implications.

INTRODUCTION. The aim of study is to clarify the course and the depth of arteries of nose three-dimensionally in order to facilitate safer injection rhinoplasty. METHODS. Eighteen adult Asian cadavers were used. Prior to dissection, facial skin surface was scanned with a structured-light 3D scanner. After scanning, the left half of face was dissected and scanned again for superimposition between the undissected and the dissected faces. After superimposition, the nose area was divided into 12 zones using MPS 3.0 software. The course, the distance from midline, and the depth of arteries were analyzed. SUMMARY. The arteries of the external nose passed through the zone 4, 7, and 10 in about 70%. The dorsal nasal artery (DNA) was dominantly observed on one side and crossed the midline in 72%. In these cases, the DNA crossed the midline at the 2nd part between the sellion and the rhinion (39%), at the 3rd part between the rhinion and the supratip (22%), and at both 2nd and 3rd region (11%), respectively. Remarkably, the DNA ran along the midline in 33%. The depth of DNA at the crossing point on the 2nd and the 3rd part were 2.63 mm and 2.78 mm, respectively. The distances from the midline to the DNA at the level of the sellion, the rhinion, and the supratip were 4.95 mm, 4.11 mm, and 5.10 mm, respectively. The depths of DNA at the same points were 2.83 mm, 2.34 mm, and 2.79 mm, respectively. CONCLUSIONS. The midline and the supraperiosteal layer have been regarded as a safe zone during filler injection. However, in case of nose hump, it is difficult to keep injection plane on the supraperiosteal layer above the rhinion. Besides, the DNA crossed the midline near the rhinion in 72% and the depth of arteries about 2.5 mm in this area. Therefore, near the rhinion, the course and the depth of arteries should be considered to enhance the safety during the filler injection rhinioplasty. (Sponsored by Grant No. NRF-2017R1A2B4003781 from the National Research Foundation of Korea)

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Smartphone Use and Repetitive Strain Injury: Investigating Flexor Pollicis Longus & the Median Nerve.

INTRODUCTION. The estimated 2.5 billion smartphone users worldwide has raised the possibility of physical and psychological health implications. A correlation between smartphone use and repetitive strain injury has yet to be fully characterized. This study aims to investigate the effects of smartphone size/use on grip strength, dexterity, and the dimensions of (i) the tendon of flexor pollicis longus (FPL) and (ii) the median nerve (MN). METHODS. Smartphone usage was evaluated and classified as "high" or "low" according to the Smartphone Addiction Scale in sixty-five participants, (37 male, 28 female) aged between 20 and 50. Participants' grip strength, dexterity, hand and smartphone lengths were measured and a longitudinal phone-to-hand ratio calculated using phone length:hand length measurements. Cross-sectional area (CSA), short and long axis of the MN and CSA and circumference of FPL tendon were measured bilaterally using built-in-ultrasound calipers. A single observer using a GE Logiq e ultrasound system with a 12L-RS transducer at the level of first carpometacarpal joint and the scaphoid/pisiform bones took measurements of the FPL tendon and MN respectively. SUMMARY. The measured CSA-FPL, CSA-MN and the long-axis of the MN were 10.48±5.06 mm2, 8.42±2.15 mm2 and 5.34±1.43 mm respectively. The aforementioned variables were all significantly greater in individuals with a "low" phone-to-hand ratio. FPL circumference was significantly larger in "high" smartphone users. Dexterity was not influenced by phone-to-hand ratio or phone-usage, while grip strength was significantly greater in individuals with "low" phone-to-hand ratio (all p-values<0.05). CONCLUSIONS. Results obtained from this study suggest that smartphone usage and phone-to-hand ratio can influence wrist/hand anatomy. Smartphone ergonomics and overuse/addiction could predispose individuals to use-related pathologies. Subsequent research could determine future public health guidance.

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Aberrant Bilateral Branching of the Second Portion of the Axillary Artery.

INTRODUCTION. The axillary artery is the major artery that supplies the upper limb, thorax and axilla. It begins as a continuation of the subclavian artery and is anatomically divided into three parts. The first part gives rise to the superior thoracic artery. The second part gives rise to the thoracoacromial artery and the lateral thoracic artery. The third part gives rise to the subscapular artery and the posterior and anterior humeral circumflex artery. The artery terminates as the brachial artery in the inferior border of teres major. This abstract reports on the abnormal bilateral variations of the arterial supply to the arms arising from the second part of the axillary arteries. RESOURCES. Bilateral dissection of the arterial supply of the axillary artery in a 95-year-old Caucasian female cadaver. DESCRIPTION. During routine dissection variations in the branching patterns of the bilateral axillary arteries were observed. The second part of the axillary artery on the right upper limb gives rise to an extra branch that courses between the median and ulnar branches of the brachial plexus. On its way down the upper arm, it gives a muscular branch to the biceps brachii muscle and a cutaneous branch to the skin of the upper arm. The variant branch then terminates by joining the radial artery near the cubital fossa. On the left arm, the abnormal branch arising from the second part of the axillary artery gives off a muscular branch to pectoralis minor, a branch to the left breast, and also provides a muscular branch to the biceps brachii. It terminates by joining the radial artery near the cubital fossa. Aberrant branching of the axillary artery can be explained by the persistence of embryological capillary vessels during different stages of limb development. SIGNIFICANCE. Clinically this provides important collateral circulation to the forearm and can maintain blood flow in the event that the radial artery is injured.

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Anatomical Variations of the Facial Artery for Facial Reconstruction and Aesthetic Procedures.

INTRODUCTION. The facial artery (FA) plays a major role in supplying blood to the face. The aim of this study was to evaluate anatomical features of the FA that is significant in reconstructive surgery and aesthetic medicine. METHODS. A morphology of 255 FAs was evaluated based on computed tomographic angiography of the face. The FA was classified according to its termination pattern, branching and course. Artery location and properties with reference to surrounding structures were also described. SUMMARY. Diameter of the facial artery at the inferior border of the mandible was 1.8 (1.2; 2.2) mm. The superior labial artery was the most common occurring branch of the FA (82.2%) and it was followed by: inferior labial artery (60.0%), submental artery (44.8%), angular artery (42.5%) and lateral nasal artery (25.1%). The FA appearance was as follows: I – terminate proximal to the superior labial artery (34.2%), II – terminate distal to the superior labial artery, close to the nasolabial fold (39.6%), III – classical course, lateral nasal or angular artery as a final branch (24.0%), IV – duplex with dominant lateral angular branch (2.1%). The angle between facial artery and inferior border of the mandible was 49.8 (31.9; 72.4) mm. The most frequent variant of the artery course was the FA located medially to the nasolabial fold (65.5%). The distance from center of the inferior orbital rim to the FA vertically was 40.1 (34.1; 46.5) mm. CONCLUSIONS. This study presents detailed anatomy and relations of FA which should be taken into consideration to avoid any unexpected complications for plastic, reconstructive, and aesthetic surgeons performing face procedures. We have created unique anatomical map which summarize the major measurements and geometry of the FA based on large clinical material.

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An Anatomic Study of the Zygomaticus Minor Muscle Connecting the Orbital and Mouth Regions.

INTRODUCTION. Facial expressions of the orbital and mouth regions can occur together or independently. To understand and analyze the movements of the orbital and mouth regions in static and dynamic status, the detailed anatomy of the muscles that connect both regions must be known. The present study aimed to investigate the arrangement and terminal attachments of the zygomaticus minor muscle (Zmi) fibers connecting the orbital and mouth regions. METHODS. The Zmi was examined in 20 specimens of embalmed Korean adult cadavers. The face was dissected to expose the Zmi and its surrounding structures. The Zmi fibers were traced to observe their arrangement and attachments. SUMMARY. The Zmi was formed by the muscle fibers that arose from the zygomatic bone and the muscle fibers that extended from the orbicularis oculi muscle (OOc) in all specimens. The Zmi had more muscle fibers from the OOc than the zygomatic bone in 40%, and from the zygomatic bone than the OOc in 45%. Amounts of the Zmi fibers from the zygomatic bone and the OOc were similar in 15%. In 95%, the muscle fibers that extended from the OOc constituted the inferior margin of the Zmi, descending to the level between the nasal ala and the vermilion border of the upper lip and inserting into the muscle and the skin of the upper lip. Some of the Zmi fibers that arose from the zygomatic bone blended with the inferior fibers of the OOc in 45%, and they constituted the inferior and medial margins of the OOc. These fibers were attached to the medial palpebral ligament, the frontal process of the maxilla, the levator labii superioris alaeque nasi muscle, and the depressor supercilii muscle. CONCLUSIONS. The data regarding the arrangement and attachments of the Zmi fibers connecting the orbital and mouth regions will be useful for electromyographic analyses, botulium toxin type A therapies, and various facial surgeries. (Sponsored by Grant No. 2016R1D1A1B03930402 from the National Research Foundation of Korea.)

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The Role of Ultrasound in Identifying Midline Vasculature Relevant to Cricothyrotomy&Tracheostomy.

INTRODUCTION. Despite airway management procedures such as tracheostomies and cricothyrotomies being commonplace in both elective and emergency settings, complications from damage to underlying structures are a significant cause of morbidity and mortality. This study (i) reviews the use of ultrasound in tracheostomies and cricothyrotomies and (ii) investigates the prevalence of vasculature in the mid-neck region in-vivo through ultrasound in a healthy population. METHODS. An initial review of national/international protocols in the use of ultrasound in airway management of tracheostomies and cricothyrotomies was conducted. Eighty participants (37 females, 43 males) between the ages of 18 and 77 with no prior history of cricothyrotomies and tracheostomies were scanned using GE Logiq e ultrasound system with a 12L-RS transducer by a single observer. Transverse/short-axis ultrasound images were taken of the mid-neck region noting

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any vessels crossing the inferior aspect of the thyroid isthmus (TI), superior border of the cricoid cartilage (CC) and inferior border of the thyroid cartilage (TC). SUMMARY. There is a clear lack of consensus across current protocols with a reliance on knowledge of "normal anatomy" and digital palpation to identify underlying structures relevant to tracheostomies and cricothyrotomies. Mid-neck vasculature was found; inferior to the TI, superior to the CC and inferior to the TC in 22.5% (18/80), 3.8% (3/80) and 2.5% (2/80) of participants respectively. There was no significant effect of sex, body mass index or ethnicity on the presence of mid-neck vasculature. CONCLUSIONS. The limited prevalence of midline vasculature above the superior border of the CC confirms that the establishment of an emergency airway through cricothyrotomy should not be delayed. Our data supports a reevaluation of procedure regarding the use of ultrasound in reducing complications of elective airway management procedures such as tracheostomy.

KAARID, Kaija P., Julia F. PENG, Roger LEEKAM, and Anne M. R. AGUR. Division of Anatomy, Department of Surgery, Faculty of Medicine, University of Toronto, Toronto, ON, M5S 1A8, Canada.
Development of an In Vivo Ultrasound Protocol to Study Muscle Architecture of Pectoralis Major.

INTRODUCTION. The frequency of tendinous and muscular tears of pectoralis major (PM) has increased over the last twenty years. In a cadaveric study of PM architecture, carried out in our laboratory, we found that the clavicular head (CH) was one architecturally uniform region, whereas the sternal head (SH) consisted of 6-7 segments based on fascial planes and attachment sites. Gross PM segmentation is supported by EMG activation studies; however, the morphologically defined segments have not been studied. RESOURCES. LOGIC e General Electric ultrasound machine using L4-12T transducer. Goniometer to measure joint angle. DESCRIPTION. To investigate whether PM is differentially activated, we propose to develop an in vivo ultrasound (US) protocol to target each segment. During initial scanning, the following could be visualized: 1. entire CH, 2. SH originating from 2nd and 3rd ribs, 3. SH from 4th rib, 4. SH from 5th and 6th ribs. After identifying the ribs and clavicle as landmarks, the fibre bundles in each area were scanned in the axial and sagittal planes. Fibre bundles were scanned medially and laterally in all areas. To assess differential PM activation, the pennation angle and muscle thickness were measured at each site in relaxed and contracted states. The investigated movements included shoulder flexion and internal/external rotation. Fibre bundle length could not be assessed. The ultrasound transducer could not scan the full length of the fibre bundles, which span between the sternum and tendon of PM inserting into the humerus. SIGNIFICANCE. This US protocol will be used to investigate static and dynamic states of PM, to determine if PM is differentially activated. In future, this knowledge will be extended to investigate PM pathology.

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Recurrent Renal Cell Carcinoma with Metastasis to the Thyroid.

INTRODUCTION. Over 99% of thyroid tumors are primary in origin. Of the remaining, 12-34% of secondary thyroid tumors represent metastasis from renal cell carcinoma (RCC). At time of diagnosis, 25-30% of all RCC patients are found to have metastasis, signifying an unpredictable pathology. We review a unique case of metastatic RCC to the thyroid. RESOURCES. This is the case report of a 58-year-old African American male with a past medical history significant for renal cell carcinoma with subsequent distant recurrences and metastasis. The patient initially presented with flank pain accompanied by hematuria. Imaging at that time revealed a 22cm right renal mass, which was subsequently removed via total right-sided nephrectomy. Pathology confirmed a diagnosis of RCC. He has had recurrences of both retroperitoneal and small bowel RCC metastasis at 8 and 15 months after his original diagnosis. At the time of resection, small bowel pathology revealed fuhrman nuclear grade ¾ renal clear cell carcinoma. Twenty-four months after initial diagnosis, he began to experience airway compression due to right-sided thyroid enlargement. He was referred to surgery for the excision of an enlarging asymmetric thyroid nodule with recommendation for a right thyroid lobectomy with biopsy. Immunohistochemistry of the resected mass revealed it was positive for PAX-8 and CD-10, while studies were negative for calcitonin, TTF-1, and thyroglobulin- indicating renal cell metastasis. DESCRIPTION. To highlight the importance of considering thyroid metastasis in a patient with a history of renal cell carcinoma. SIGNIFICANCE. Although rare, it is important to consider secondary thyroid tumors when a patient with a known history of metastatic renal cell carcinoma presents with an enlarging thyroid mass. With FNAB often dictating the next step in care, when inconclusive, mass excision with immunohistochemical stains for RCC-specific markers may help reveal the true etiology of secondary thyroid tumors.

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Description of Axillary Arch and Adjacent Structures: A Cadaveric Study.

INTRODUCTION. The axillary arch (AA) is a unique structure in the axilla. It crosses from the anterior to posterior axillary fold. Because the muscle sits in the middle of the axilla, it could potentially interfere with adjacent structures traveling to the upper extremity. Variations of the AA with the attached muscles are clinically significant because it may irritate and entrap the structures in the axillary sheath. RESOURCES. It was found during the dissection class of the brachial plexus in a 69-year-old male cadaver. It was identified through the precise dissection of the structures bilaterally. DESCRIPTION. The AA showed bilaterally the same in this case. It was inferior to the pectoralis minor and separated to the two different layers. The inner layer joined to the pectoralis fascia under the pectoralis major muscle, the deeper layer of the axillary fascia and the axillary sheath. The outer layer joined to the pectoralis quartus muscle (PQM) which attached to the fourth rib. The other end of the AA attached to accessory slip of the latissimus dorsi (LDa) which had attachments to 9th, 10th, and 11th rib and the latissimus dorsi. The distal attachment of LDa to the AA was 3cm wide and 1.5mm thickness. The length of LDa was about 20.5cm anteriorly and 12cm posteriorly. PQM was 9.5cm long, 1.55mm thickness. The anterior LDa and AA, posterior latissimus dorsi, and lateral coracobrachialis and short head of biceps made the axillary foramen. The foramen allowed the axillary sheath to travel through to the extremity. SIGNIFICANCE. The AA and attached structures are one of the variations of the axilla with an incidence of 7% -8%. This finding could have classified as 'superficial group arches.' In these cases, an obstruction might occur in the axillary vein resulting in axillary vein entrapment syndrome and may induce the axillary venous thrombosis. It has also been implicated in the hyper abduction syndrome.

KIM, Seung-Min, Ki-Seok KOH, Wu-Chul SONG, and Soon-Heum KIM. Department of Anatomy, Plastic and Reconstructive Surgery, Konkuk University School of Medicine, Seoul, Korea.
Possibility of Aygomatic Arch as a Standard Line for Clinical and Anthropological Study.

INTRODUCTION. Frankfurt horizontal line is the most frequently and widely used as a reference line in cephalometric analysis, but has shortcomings including difficulty of landmark identification. This study suggested using superior border of zygomatic arch as a new external bony landmark and investigated the angular difference between new line and Frankfurt line. METHODS. Three-dimensional (3D) facial CT scans were obtained from 170 patients (100 males and 70 females), hospitalized at Konkuk University Chungju Hospital. Porion, inferior orbital rim and superior border of zygomatic arch were indicated in the software by two observers twice. A horizontal line parallel to the superior border of the zygomatic arch was established. Then angular differences between Frankfurt line and newly introduced line were measured each side. SUMMARY. Intra-observer and inter-observer bias showed no significant difference. The mean angular difference between Frankfurt line and superior border of zygomatic arch was $4.5^{\pm}2.6$ degree. The angle between Frankfurt line and superior border of zygomatic arch was measured somewhat larger in female than male, which proved not to be significantly different. CONCLUSIONS. This study demonstrated good reproducibility of superior border of zygomatic arch and showed relatively constant angular difference of newly introduced line to the Frankfurt line. The superior border of zygomatic arch has a potential to be used as an alternative reference line to traditional Frankfurt line in specific clinical areas and anthropological studies, since it is more easily accessible external skull bony landmark.

KNIGHT, Brandon B. and Adam KOLATOROWICZ. Department of Anatomy, Lincoln Memorial University-Debusk College of Osteopathic Medicine, 6965 Cumberland Gap Parkway, Harrogate, TN 37752, USA.
Characterization of the Clavicular Deltoid Tubercle Using Landmark Morphometrics.

INTRODUCTION. The deltoid tubercle of the clavicle is a reliable surgical landmark for central vein cannulation. This study is the first to investigate the location and size of the deltoid tubercle in a large sample with known demographics to explain observed variation as well as provide operational definitions of landmarks. METHODS. A Microscribe® G2X digitizer was used to register seven, 3D landmarks from 672 left and right clavicles (356 individuals aged 21 years or older) in the William M. Bass Donated Skeletal Collection. Interlandmark distances from the coordinate data were calculated to measure tubercle projection and location. A MANCOVA was run to test the effects of sex and side on projection and location when accounting for stature, weight, and age. Landmark data were subjected to a generalized Procrustes analysis and then a principal components analysis was conducted. Data were analyzed in MorphoJ v1.06d and SPSS v22.0. SUMMARY. Twelve individuals had no observable tubercle. The tubercle was located between 19 and 45% of the distance from the acromial end and ranged from 0.0 to 5.2 mm in height. The MANCOVA indicated age and stature affected tubercle projection only whereas sex affected both tubercle projection and location. Weight and side had no effect. Morphometric analyses revealed curvature and length of the clavicle explained 45% percent of shape variation with location and the degree of projection explaining an additional 20%. CONCLUSIONS. The deltoid tubercle varies in location depending on the sex of an individual. This variability

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may impact a clinician's ability to locate the subclavian vein with palpability potentially being affected by the age and stature of the patient. Some individuals may not have a palpable tubercle. Appreciating normal variability will help to improve clinical practice. (Sponsored by the Basic Science Fellowship Award, Lincoln Memorial University-DeBusk College of Osteopathic Medicine.)

LEE Hyungjin, You-Jin CHOI, Kang-Woo LEE, Young-Jun WE, and Hee-Jin KIM. Division in Anatomy and Developmental Biology, Department of Oral Biology, Human Identification Research institute, BK21 PLUS Project, Yonsei University College of Dentistry, Seoul, 03722, Republic of Korea.
Architectural Characteristics of the Superficial Part of the Masseter Muscle by Ultrasonography.

INTRODUCTION. It has recently been reported that the superficial part of the superficial muscle belly of the masseter muscle is composed not only of the muscle belly but also of the strong deep tendon within the muscle belly at the inferior region of the masseter muscle. But previous studies lacked information regarding the depth of the deep tendon structure. Therefore, the aim of this study was to examine the deep tendon structure in humans and to compare the deep tendon structure with those of cadavers. In addition, we aimed to identify the depth of the deep tendon in order to propose most effective treatment methods of botulinum neurotoxin type A injection. METHODS. Twenty healthy volunteers participated in this study and the masseter muscle were scanned both longitudinally and transversely via ultrasonography. SUMMARY. The deep tendon structure within the superficial part of the superficial muscle belly of the masseter was present in every subject. The deep tendon structure was located at anterior, middle, and posterior portion of the masseter muscle in 77.5%, 95%, 45% on the left side and 57.5%, 95%, 47.5% on the right side, respectively. The depth of the deep tendon was 5.0mm, 6.6mm, 3.6mm on the left side and 6.3mm, 7.6mm, 4.7mm on the right side at the anterior, middle and posterior portions from the mandible, respectively. CONCLUSIONS. The deep tendon of the masseter was confirmed via ultrasonography and can be regarded as a common structure in both human and cadavers. Based on the result of this study, both dual injections and ultrasound-guided injections are required in order for the treatment of botulinum neurotoxin type A injection to be most effective. (Sponsored by Grant No. NRF-2017R1A2B4003781 from the National Research Foundation of Korea.)

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Positional Relationship of Superior and Inferior Labial Artery by Ultrasound Imaging Analyses.

INTRODUCTION. The aim of this study was to investigate the location and distribution of the labial artery on the basis of the vermillion border, which is the reference structure for non-invasive treatment. In addition, we tried to provide the depth information of the orbicularis oris muscle and labial artery using ultrasound images which could not be achieved in the traditional cadaveric study. METHODS. We performed ultrasound examination of the volunteers to identify the location of the labial arteries and suggest the safe injection guidelines to prevent the complications. Thirty Korean healthy volunteers (15 males, 15 females; age range, 21-36 years; mean age, 25.2 years) were used for the ultrasound examination. SUMMARY. Based on the vermilion border, the overall thickness of the upper and lower lip were 8.2±0.6 mm and 9.2±0.7 mm, respectively. The superior labial artery was not found in subcutaneous layer (0%) within the upper lip and in intramuscular layer was observed in 57%. In the remaining 43% of the cases, the superior labial artery was in submucosal layer (7% and 36% in dry and wet mucosa, respectively). In addition, the inferior labial artery in subcutaneous and intramuscular layer of the lower lip were in 2% and 15%, respectively. Most of the inferior labial artery (83%) were in submucosal layer, these cases were observed in dry mucosa (37%) and wet mucosa (46%), respectively. At the level of vermilion border of the lip, the average depth from the skin to the location of the superior and inferior labial artery was 4.7±0.8mm and 3.7±0.7mm, respectively. CONCLUSIONS. An anatomical guidelines based on our results could minimize the complications during the lip augmentation and contouring procedures.[Sponsored by Grant No. 2017R1A2B4003781 from the National Research Foundation of Korea (NRF) Association.]

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Three-Dimensional Territory and Depth of Asian Corrugator Supercilii Regarding to BTX-A Injection.

INTRODUCTION. Facial anatomy is known to be the most important factor when expecting better outcomes following nonsurgical procedures such as BTX-A and filler injections. An understanding of the depths of target muscles and of the thicknesses of soft tissues in the area of interest is also significantly important for a successful outcome as it allows the clinician to treat just the target muscle while preventing a diffusion of the adjacent muscle which would lead to unexpected side effects such as paralysis or facial asymmetry. Therefore, the aim of this present study was to provide information regarding the three-dimensional territory and depth of the corrugator supercilii in the forehead area to obtain a satisfactory outcome when performing non-invasive procedures. METHODS. 31 hemifaces from Korean (12 hemifaces, 12 left; mean age: 79.9 years) and Thai (19 hemifaces, 19 left; mean age 68.6 years) embalmed cadavers were dissected to expose the corrugator supercilii muscle and were scanned by a 3D scanner (Morpheus3D Co.,Ltd). Then, the precise anatomic territory and depth were observed and analyzed from the superimposed images. SUMMARY. The corrugator supercilii located consistently on the transected point between the vertical and horizontal line passing through the medial canthus and glabella, respectively. On this point, the depth from the skin to the muscle was 4.7±1.5mm. In addition, the location of the origin of the corrugator supercilii was 15.0±2.1mm superior to the intercanthal line and 7.0mm±1.9 lateral to the midline. CONCLUSIONS. The three-dimensional territory and depth of the corrugator supercilii obtained from this study could contribute to successful BTX-A injections. (Sponsored by Grant No. NRF-2017R1A2B4003781 from the National Research Foundation of Korea.)

LEE, Kangwoo[1], Hyun-Jin PARK[1], Tanvaa TANSATIT[2], and Hee-Jin KIM[1]. [1]Division in Anatomy and Developmental Biology, Department of Oral Biology, Human Identification Research institute, BK21 PLUS Project, Yonsei University College of Dentistry, Seoul, 03722, Republic of Korea. [2]The Chula Soft Cadaver Surgical Training Center and Department of Anatomy, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand.
Submental Artery Passing the Mandibular Border and Its Clinical Implications.

INTRODUCTION. The submental artery (SA) originates from the facial artery and runs on the surface of the mylohyoid muscle along with the border of the mandible. It usually penetrates the mylohyoid muscle and becomes sublingual branch at the mouth floor. In many cases, it is observed that the SA runs anteriorly and pass the border of the mandible to distributes the chin and lower lip. The aim of this study was to elucidate the variational course of the SA to the chin through the border of the mandible to clarify the reason of the of bruising after the injection procedure. METHODS. Twenty Thai adult embalmed cadaveric faces (12 males, 8 females; mean age: 84 years) were used for the conventional dissections. SUMMARY. The variational course of the SA distributing to the chin passing the border of the mandible was observed in nine cases (45%). The location the point passing the border of the mandible was in the side at 8.3±7.5 mm deviated from the midline. The diameter of this vessel was 0.69±0.36 mm. This arterial branch at the chin from SA was communicated with the inferior labial artery or the horizontal labiomental artery (30%). CONCLUSIONS. This variational course of the SA at the chin will be helpful in understanding of the cause of bruising after the injection treatment procedure. [Sponsored by Grant No. NRF-2017R1A2B4003781 from the National Research Foundation of Korea (NRF) Association].

LEE, Shin-Hyo, Tae-Jun HA, Ki-Seok KOH, and Wu-Chul SONG. Department of Anatomy, Research Institute of Medical Science, Konkuk University School of Medicine, Seoul, Korea.
Asymmetric Protrusion of Midface in the Young Population.

INTRODUCTION. Asymmetry is the frequent phenomenon in the human cranial skeleton which continues growth and aging throughout adulthood. This study evaluated the mid-facial asymmetry by alternative method comparing bilateral patterns of the zygomatico-maxillary prominence in the young population. METHODS. Three-dimensional (3D) reconstruction images based on computed tomography scan of 100 Koreans (average of 24.7 years) were evaluated referred to the radiating lines separated by 30° intervals from a center of inter-porion line from superior view. The surface inclination of the zygomatico-maxillary region was quantified by a 3D ruler. SUMMARY. In intact cranium, the values of the 30° interval line were larger for the left side than right side in both male and female, whereas the length of left 60° interval line was also dominant in the female. Left side of anterior maxilla and zygomatic arch are relatively more prognathic and inflated than those of right side in both male and female. CONCLUSIONS. Functional deviations are considered to be causes of asymmetric craniofacial growth. Post-natal growth allometry across the circummaxillary sutures excluded from this study could be useful information in craniofacial surgery.

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MEMAR, Shayan A., Jeffrey M. ALLISON, and Yun TAN. Center for Anatomical Science and Education, Department of Surgery, School of Medicine, Saint Louis University, St. Louis, MO 63104, USA.
Case Report: Rare Bilateral Branching Variations of the Suprascapular Arteries.

INTRODUCTION. A bilateral branching anomaly of the suprascapular artery was observed in a 75-year-old female cadaver during a routine dissection in one of nineteen cadavers for spring 2018 anatomy course. RESOURCES. The cadaver was obtained through the Gift Body Program at the Center for Anatomical Science and Education, Department of Surgery at Saint Louis University School of Medicine. DESCRIPTION. Bilaterally the suprascapular arteries did not arise from the thyrocervical trunk as usual. On the right, the suprascapular artery originated 13.6 mm from the beginning of the internal thoracic artery, a branch of the first part of the right subclavian artery. It traveled anterior to the lower insertion part of the anterior scalene muscle, lateral to the phrenic nerve, posterior to the medial third of the clavicle and anterior to the distal part of the subclavian artery and brachial plexus. It then crossed over these structures to meet up with the suprascapular nerve and continued along its normal route to the suprascapular notch. On the left, the suprascapular artery and internal thoracic artery shared a common origin on the first part of the left subclavian artery. It coursed anterior to the phrenic nerve and distal attachment of the anterior scalene muscle. Then it followed a similar route as the right suprascapular artery to the suprascapular notch. On both sides, the suprascapular artery traveled above the transverse suprascapular ligament, while the suprascapular nerve passed below it. SIGNIFICANCE. These variations of the suprascapular arteries are very rare and are clinically important for making accurate diagnoses, treating clavicle fractures and safely performing surgical procedures, like coronary bypass surgery.

PARK, Hyun-Jin, Kyu-Lim LEE, and Hee-Jin KIM. Division in Anatomy and Developmental Biology, Department of Oral Biology, Human Identification Research Center, BK21 PLUS Project, Yonsei University College of Dentistry, Seoul, 03722, South Korea.
Sonographic Image Analyses of the Upper Lip in Koreans.

INTRODUCTION. Perioral wrinkles including purse string lips, are frequently observed in aged persons. Botulinum toxins and fillers are frequently injected into these areas to remove the wrinkles; however, the anatomy of the orbicularis oris muscle near the vermilion border area is not well-known. Therefore, the aim of this study was to observe the morphological differences of the upper orbicularis oris via an ultrasound imaging. METHODS. Upper lip muscles from thirty-five participants (19 males and 16 females, mean age 24.3) were observed using an ultrasound device (10~15 MHz, linear probe). Five points were set up, placed perpendicular to the lips, and observed carefully while trying to avoid pressing the lips as much as possible. SUMMARY. The upper lip muscle was divided into two parts--pars peripheralis and pars marginalis. First, it was divided into two types--Type I and Type II--due to the development of the pars marginalis. Type II was divided into Type IIa and Type IIb, depending on whether the muscle fibers were well-developed and connected. Type I, in which the pars marginalis was rarely observed and appeared in traces, was observed in 20.0% (7/35). Type IIa, in which the pars marginalis was well-developed and depicted a continuous muscle pattern, was observed in 42.9% (15/35). Type IIb, in which the pars marginalis was observed but showed a discontinuous pattern, was observed in 37.1% (13/35). CONCLUSIONS. The upper pars marginalis of the orbicularis oris muscle shapes were very variable. Considering the shape of the orbicularis oris muscle and lip appearance, these type classifications of the orbicularis muscle serve as a reliable source of reference for botulinum toxin injections on upper lip. (Sponsored by Grant No. NRF-2017R1A2B4003781 from the National Research Foundation of Korea.)

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Compression of the Median Nerve, Anterior Interosseous Nerve, and Ulnar Vein by the Gantzer Muscle.

INTRODUCTION. The Gantzer muscle is a muscular variant in the proximal aspect of the volar forearm intermediate to the superficial and deep forearm muscles. Also, occupying this region are the median nerve, anterior interosseous nerve, and ulnar vein. Some researchers have implicated the presence of the Gantzer muscle may cause median nerve entrapment, similar to pronator teres syndrome. Likewise, the Gantzer muscle may cause anterior interosseous nerve syndrome (Kiloh-Nevin syndrome). Few studies have assessed the anatomical relationship between the Gantzer muscle and its surrounding neurovascular structures. METHODS. This study analyzed 46 dissected forearms in 23 cadavers to determine the prevalence of the Gantzer muscle and also to assess the potential for neurovascular entrapment due to the mass effects of the Gantzer muscle itself. SUMMARY. A total of 28 of 42 forearms (67%) were found to have the presence of at least one Gantzer muscle (15:21; 71.4% and 13:21; 61.9% of left- and right-sided forearms, respectively). The branching of the median nerve varied

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in addition to the location and orientation of the Gantzer muscle, with some of these variant muscles inserting distally into the flexor pollicis longus with other Gantzer muscles inserting at the flexor digitorum profundus. CONCLUSIONS. This study demonstrated that the varied neuromuscular anatomical relationships of the volar forearm related to a presence of a Gantzer muscle. When present, the Gantzer muscle predisposes the median nerve and/or the anterior interosseous nerve to entrapment. Likewise, the ulnar vein is susceptible to venous occlusion when a Gantzer muscle is present, which is a finding not previously reported in the scientific literature. (Sponsored by the West Virginia University Initiation to Research Opportunities - WVU INTRO Program.)

RANADE, Anu V[1], and Rajalakshmi RAI[2]. [1]College of Medicine, University of Sharjah, PO BOX 27272, Sharjah, UAE; [2]Centre for Basic Medical Sciences, KMC, Bejai, Mangalore, 575002, India.
Facial Vein Variations and its Management in Facial Transplantation.

INTRODUCTION. The incidence of variations in the formation and draining pattern of the facial vessels are of great significance during facial transplantations as the vascular pedicles of these vessels are connected to the patient to ensure free flap survival. METHODS. Twelve cadavers of both genders were dissected to study the formation, course, and termination of craniocervical veins. SUMMARY. Unusual draining and communicating pattern were observed in 25% of the cases with retromandibular mandibular vein (RMV) being undivided in them. In Case I, right facial vein (FV) communicated with internal jugular vein (IJV) at the level of hyoid bone while RMV coursed superficial to sternocleidomastoid muscle (SCM) and communicated with subclavian vein (SV). The right FV and the RMV merged forming the external jugular vein (EJV) that drained into SV in Case II. Case III showed bilateral variation with the right side being similar to that presented in Case II. However, the left side was unique with FV continuing as the transverse facial vein superficial to masseter muscle, entering the parenchyma of parotid gland, communicating with the superficial temporal vein (STV) to form RMV. At the level of hyoid bone this RMV received the lingual vein (LV) forming a common venous trunk (CVT) that communicates anteriorly with the anterior jugular vein (AJV). CONCLUSIONS. The occurrence of these type of variations are important for surgeons while conducting various procedures like cannulation, reconstructive surgeries or venegraft for carotid endarterectomies. Preoperative investigations like ultrasound should always be applied before performing these procedures to avoid undue complications.

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Structural Relationships between the Extrinsic and Intrinsic Muscles of the Tongue.

INTRODUCTION. The extrinsic muscles of the tongue extend outside the tongue and move it. The intrinsic ones are entirely within the tongue and change its shape. Because they intricately overlap one another, it is necessary to clarify their fibers arrangement for the invasive therapy without sacrificing the function of the tongue. METHODS. The structures of the extrinsic and intrinsic muscles of the tongue and their spatial relationships were examined under a binocular microscope in 20 cadavers. SUMMARY. The superior longitudinal muscle was found in the layer beneath the dorsum of the tongue, and the transverse muscle ran deeply to it and passed laterally from the lingual septum. The inferior longitudinal muscle ascended anteriorly from the root of the tongue and joined the external bundle of the styloglossus that ran along the lateral margin of the tongue. They were inserted into the dorsum of the apex from the inferior surface. The genioglossus and the anterior part of the hyoglossus fanned out and ascended, respectively, to the dorsum, and the vertical muscle was sandwiched between them. The fibers attaching to the dorsum passed between the lamellae of the transverse muscle and the bundles of the superior longitudinal muscle. The posterior part of the hyoglossus ascended to the root and spread into the layer beneath the superior longitudinal muscle. The middle bundle of the styloglossus passed between the two parts of the hyoglossus, and its fibers intersected with those of the genioglossus, and the internal bundle descended internally to the posterior part to be inserted into the root. CONCLUSIONS. According to the findings, the extrinsic and intrinsic muscles are not always separate groups. Their fibers form three-dimensional gridwork in combination, which suggests that they compose a large number of cooperative functional units. The fibers arrangement is considerable in the functional diagnosis and the surgical treatment of the tongue.

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Variant Palmaris Longus Invertus enclosing Ulnar nerve and Ulnar artery – A Case Report.

INTRODUCTION. The anatomical knowledge of variations in muscles, blood vessels and nerves are important for treating musculoskeletal diseases. RESOURCES. Regular educational dissection of forearm of an 87-year-old male cadaver was performed in the gross anatomy lab. The superficial flexor muscles, nerves and vessels were dissected. DESCRIPTION. The dissection of flexor muscles of forearm revealed a variant palmaris longus muscle in the right forearm. The right palmaris longus muscle originated by a thin long tendon from the medial epicondyle of the humerus and presented as an inverted fusiform muscle belly in the distal half of the forearm. The muscle belly of palmaris longus invertus was split at its distal end into two slips enclosing the ulnar artery and the ulnar nerve. The lateral slip of insertion of palmaris longus invertus muscle belly was attached distally to palmar aponeurosis, whereas its medial slip was fused with the abductor digiti minimi muscle. SIGNIFICANCE. It is important for a physician to be aware of this variation, as the excessive contraction of this palmaris longus invertus muscle may compress the ulnar artery and ulnar nerve with subsequent lack of blood supply to the hand and weakness/atrophy of muscles supplied by the ulnar nerve. The surgeon has to be cautious as well, while harvesting the palmaris longus tendon/muscle as a graft and observe its relationship with ulnar artery and ulnar nerve.

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Assessment of Fine-Wire Electrode Insertion into the Superior, Middle, and Inferior Infraspinatus.

INTRODUCTION. Infraspinatus (IS), a functionally important muscle of the shoulder girdle, has been shown to be partitioned into three distinct parts: superior (SP), middle (MP), and inferior (IP). Despite evidence of partitioning, no studies have investigated whether these partitions have potential for independent function. In the previous literature, only activation of the MP has been studied. The purpose was to assess the accuracy and reproducibility of placing fine-wire needle electrodes into each of the parts of IS by two investigators. METHODS. Eight embalmed specimens with mean age of 83.8±4.4 years were used. To test the needle placement protocol, each of the two investigators, independently, inserted the needles into each part using bony landmarks. Following this, the 3 parts were exposed and digitized along with the termination point of each needle. Data were modeled in 3D (Autodesk TM Maya®). The accuracy of placement of the needle was assessed and measurements between the termination of the needles placed by investigator A and B quantified. SUMMARY. When targeting SP, needle placement was accurate in 6/8 specimens (investigator A) and 3/8 (investigator B); in the inaccurate cases (n=7), the needle was placed in MP. When targeting MP, both investigators had a 100% success rate. However, when targeting IP, needle placement was accurate in 6/8 specimens for both investigators. In the inaccurate cases, the needle was placed in teres major or teres minor. In the specimens where needles were accurately placed by the investigators, the mean distance between their needles was: 1.2cm (SP), 0.7cm (MP), and 1.6cm (IP). CONCLUSIONS. In vivo EMG is feasible to assess IS activation patterns. Needle placement in SP and IP was less accurate than in the MP. For SP, needle placement needs to be more superolateral and for IP, landmarking needs to take into consideration the location of teres major and minor.

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Superficial Ulnar Artery with High Bifurcation of the Brachial Artery and its Clinical Significance.

INTRODUCTION. Variations in brachial artery branching patterns are observed in 20% of individuals, although only 2.5% exhibit a high ulnar artery variation and even fewer present with a bilateral superficial ulnar artery. The compounding variations of a high bifurcation of the brachial artery and a superficial ulnar artery may be asymptomatic, but demonstrate an important clinical significance in relation to accidental intra-arterial injections, errors in blood pressure readings, as well as orthopedic, plastic and vascular surgeries of the upper limbs. This study aims to expand upon previous literature and provide additional insight to the field of clinical anatomy, while informing physicians of the possible presentations associated with these abnormal findings. RESOURCES. A dissection was performed of the upper limbs on an 84-year-old caucasian male cadaver as part of the gross anatomy laboratory. The brachial artery terminated atypically high on the arm, and care was taken to preserve the course of the arteries through the remainder of the upper limb. DESCRIPTION. A high bifurcation of the brachial artery occurred bilaterally at the proximal one-third of each arm. The radial artery was larger than the ulnar artery, and it gave origin to the common interosseous artery. At the cubital fossa, the ulnar artery traversed medial to the median nerve, continuing superficial to all forearm muscles except the palmaris longus tendon. SIGNIFICANCE. Although the finding of a bilateral superficial ulnar artery is a rare variant, it has important clinical implications in order to prevent accidental intra-arterial injections. The high termination of the brachial artery may be of great importance during surgeries involving the upper limbs due to the necessity of blood supply localization. In addition, clinicians may need to account for the presence of two arteries when taking blood pressure in order to prevent erroneous measurements.

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Parsing Out the Relationship between Contractile and Connective Elements in the Human Trapezius.

INTRODUCTION. Musculoaponeurotic morphometry has only recently begun to be comprehensively examined for select skeletal muscles. Without a fundamental understanding of these attributes, the certainty with which clinicians may interpret musculoskeletal imaging, assess pathology, and evaluate recovery associated with these muscles is inherently restricted. The primary purpose of this pilot study was to quantify and describe the 3D musculoaponeurotic architecture of trapezius. METHODS. The connective and contractile tissue elements of trapezius in 3 embalmed specimens were meticulously dissected, serially digitized at the fibre bundle (FB) level with a MicroScribe® G digitizer, and modelled with Autodesk® Maya®. The connections between connective and contractile elements (musculoaponeurotic junctions) were mapped on the 3D models and compared between specimens. Architectural parameters were also computed for the entire muscle and partitions thereof. SUMMARY. FBs throughout the muscle volume span between independent medial and lateral aponeuroses, resulting in extensive regions of musculoaponeurotic junction. In the inferior trapezius, FBs decrease in length from superficial to deep, inserting laterally into a rhomboid-shaped aponeurosis that extends inferomedially from the base of the scapular spine. Superficial FBs of the middle trapezius insert medially on both the medial and lateral aponeuroses, whereas the deep FBs insert more laterally. In the superior trapezius, there is minimal connective tissue present along the clavicular attachment site. CONCLUSIONS. The results of this pilot study warrant further investigation into the musculoaponeurotic morphometry of trapezius. Clinically, these data could provide insights into musculoskeletal disorders commonly associated with trapezius, such as myofascial pain syndrome. (Sponsored by a Vanier Canada Graduate Scholarship from CIHR and an Educational Advancement Stipend from the University Health Network.)

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The Facial Artery in Relation to Manson's Point and the Submandibular Gland: An Ultrasound Study.

INTRODUCTION. Despite the course and branching pattern of the Facial Artery (FA) being well characterized, inconsistencies persist within published literature. The course of the FA in relation to the Submandibular Gland (SMG) remains ill defined, but has a reliable method to validate the location of the FA along the mandible and face using surface landmarks. This study uses ultrasound to investigate the relationship of the FA to the SMG, and Manson's point (MP); a surface landmark along the mandible recently reported to predict the location of the FA. METHODS. The course of 88 FAs, from 44 participants (23 male, 21 female) between 22 and 47 years of age, were identified using a GE Logiq e ultrasound system with a 12L-RS transducer by a single observer. The course of the FA was characterized based on its relation to the SMG gland and capsule. MP was identified and marked on participants bilaterally prior to ultrasound. Deviations of the FA from MP were measured by digital callipers following ultrasound scanning. SUMMARY. The FA was visualised in all participants. The FA was found to be intra-glandular or extra-glandular but still contained within the capsule in 70.5% (62/88) and 29.5% (26/88) of participants, respectively. Symmetry between right and left sides was found in 68.2% of participants. The FA was found within a 5mm radius of MP in 72.7% and 70.5% over the right and left sides, respectively. CONCLUSIONS. This study has confirmed MP to be a reliable surface landmark for the identification of the FA along the mandible, which is of clear benefit to clinical procedures. The course of the FA through the SMG tissue emphasizes the need to consider variations of the FA course during surgery. Ultrasound is a minimally invasive tool that allows visualization of underlying structures during procedures involving the SMG and can also be used to validate existing surface anatomy landmarks.

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Forward Head Posture under Backpack Loading: An Ultrasound Study of Sternocleidomastoid Thickness.

INTRODUCTION. Published literature has implicated Forward Head Posture (FHP) in regional musculoskeletal pathologies exacerbated by backpack use. Sternocleidomastoid (SCM) plays a significant role in determining head and neck position, with previous studies correlating FHP to SCM thickness. This study aims to investigate the effects of backpack loading on FHP and the thickness of SCM in-vivo using ultrasound in a healthy population. METHODS. The weight of forty participants (18 females and 22 males, aged between 22 and 35) was taken to ascertain 15% of their bodyweight as the backpack load. Lateral images taken before, during, and after backpack loading were analyzed by ImageJ software. Participants were categorized into FHP or Normal Head Posture (NHP) according to their Craniovertebral Angle (CVA); the angle between a

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horizontal line passing through C7 and a line extending between C7 and the tragus. SCM thickness was measured bilaterally at its midpoint using a GE LOGIQ e ultrasound system with a 12L-RS transducer by a single observer before, during, and after backpack loading. SUMMARY. The SCM thickness significantly decreased with backpack loading from 1.20±0.17cm to 1.16±0.17cm and then back to 1.18±0.17cm after removing the load. CVA significantly decreased with loading from 50.12±6.24 to 47.00±6.95 and returned to 50.15±6.34 after removing the load. FHP was induced in 5 participants as a result of experimental protocol. SCM thickness was not influenced by body side but was significantly influenced by sex (significance set at p-values<0.05). CONCLUSIONS. A backpack load of 15% bodyweight affected head posture, decreasing the CVA, as well as SCM thickness. Further studies could influence backpack design and load distribution to minimize the acquired FHP and reduce strain on muscles within the cervical region.

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Anatomical Study of the Sensory Nerve Distribution in the Upper Eyelid.

INTRODUCTION. Upper eyelid blepharoplasty is frequently performed in the cosmetic surgery field. However, the detailed anatomy of the sensory nerve in this region is still unknown. The purpose of this study was to increase the knowledge of the upper eyelid anatomy, thus allowing for performance of more effective surgery. METHODS. Five facial soft tissue specimens from five formalin-preserved cadavers were dissected from the deeper to superficial layers under a magnified view using an operation microscope (x6 - x16). The supraorbital, supratrochlear, and infratrochlear nerves were carefully dissected from the central toward the upper eyelid margin after confirming the nerves at the central stump. The upper eyelid branches of each nerve were ligated by 10-0 black nylon strings as markers, and photographs were taken for data analysis. SUMMARY. The supratrochlear and supraorbital nerves were distributed in the upper eyelid in all cases. Both nerves pierced the periosteum and divided into two directions: the forehead and upper eyelid. The upper eyelid branches of both nerves ran either in or under the corrugator supercilii muscle, then moved to the layer between the orbicularis oculi muscle and orbital septum in the upper eyelid. The number of branches was 6 to 8 (supratrochlear nerve, 2–4; supraorbital nerve, 2–6). The supratrochlear nerve was distributed in the medial 30% (4 cases) to 60% (1 case) of the eyelid, whereas the supraorbital nerve was distributed in the lateral 40% (1 case) to 70% (4 cases). CONCLUSIONS. The skin and orbicularis oculi muscle were usually cut or sometimes removed during upper eyelid blepharoplasty. String-like tissues are often observed on the orbital septum during the operation, and the tissues are usually cut without close attention. As shown in the present study, these tissues are considered to correspond to the sensory nerves to the upper eyelid margin. Knowledge of these nerves will reduce the complication of sensory disturbance.

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Traumatic Dislocation of the Mandible into the Middle Cranial Fossa: An Anatomical Study.

INTRODUCTION. Trauma to the mandible can occasionally be a life-threatening event. Although rare with only 56 reported cases in the English language, fracture of the skull base with protrusion of the mandibular condyle into the middle cranial fossa was first reported in 1963 by Dingman. METHODS. We performed a literature review of all previously reported cases of mandibular condyle protrusion into the middle cranial fossa. Additionally, based on this review, recreation of protrusion of the mandibular condyle into the middle fossa was performed in cadavers and analysis was made of the intracranial structures damaged and at risk for injury. SUMMARY. Understanding the surrounding anatomy as well as how these structures change throughout adolescence into adulthood is important in the diagnosis and treatment of mandibular condyle intrusion into the middle cranial fossa. CONCLUSION. The present anatomical study demonstrates the anatomical structures at potential risk with traumatic entry of the mandible into the middle cranial fossa. Craniofacial surgeons should be aware of such injuries and be aware of the possible complications that might arise in such patients.

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Abstracts – Poster Presentations Session 2

(Listed by presenting author last name)

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Dental Students' Perceptions of Effective Anatomy Teaching.

INTRODUCTION. Anatomy is a foundation course for medical/dental careers. The increase in class size has made teaching more challenging and the substandard level of anatomy knowledge among graduates is having an impact on safe medical practice. This study aimed to determine whether multimodal teaching pedagogy is perceived favourably, and which modalities were most effective. It explored different methodologies, dissection, prosection, lectures, models, small group activities and dissection videos, to understand students' ideas about the educational value of each approach. Understanding perceptions of students about methods of teaching would help to modify existing programs to be of much higher educational strategic level and would give guidance towards the generation of better objectives. METHODS. 113 dental students completed a survey that measured perceptions on different teaching methods. Univariate analyses including Chi-Square, Mann Whitney and ANOVA test were used to perform a breakdown on demographic categorization as learner's analysis is an important step in identifying the learner characteristics. SUMMARY. It was found that teaching using prosected specimens received the highest rating (mean=85.9) in providing good background for other basic subjects and for clinical disciplines, in appreciating variations and in helping to understand clinical anatomy. Moreover, lectures were the best in preparing for clinical skills and in helping to relate anatomical structures to pathology. Bonferroni Post Hoc test identified that UK students were more satisfied with teaching using models than international students (F=3.4, P=0.03). CONCLUSIONS. Results provided useful information in selecting effective methods and generating strategies. Multimodal approach to teaching is the best due to the wide diversity of students' background that led to variability of their learning styles. Furthermore, it was observed that no singular approach fulfilled all teaching objectives.

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Introducing Short Answer Questions in Anatomy Spot Test.

INTRODUCTION. Spot test is usually used in practical anatomy assessments, where students are asked to answer specific questions related to spotted anatomical structures on cadaveric parts or plastinated models. This study examines the difference between conducting a spot test with traditional specific questions and short-answer questions. METHODS. Sixty medical students (40 males and 20 females) from pre-clinical phase were invited to participate in the study. Ten spot test stations were prepared; stations were divided into two groups: five stations with specific questions (Spot Test I) and five stations with short-answer questions (Spot Test II). At the first exposure, students were randomly distributed into two groups representing the different spot tests: Group A was exposed to Spot Test I and Group B was exposed to Spot Test II. At the second exposure, students changed over to the alternate version of the test. At each station, students had one minute to answer each question. In addition, students were asked about their preference of the two spot test forms. SUMMARY. Results showed no significant differences in the mean students' scores between the two groups at the first exposure: Group A= 6.07 ± 2.5 and Group B= 6.17 ± 2.1 (P=.867). At the second exposure, students in group A achieved a higher score in Spot Test II (7.27 ± 2.1) compared to Spot Test I (6.07 ± 2.5) (P<.001). In contrast, group B students demonstrated no difference in their scores in Spot Test I (5.77 ± 2.1) compared to Spot Test II (6.17 ± 2.1) (P=.167). Student's perceptions revealed that 70% preferred the new version of Spot Test II, commenting that it was less stressful and more open to test the gained knowledge. CONCLUSIONS. Introducing short-answer questions in anatomy spot test showed high level of preference by students and less stress experienced, although there was no significant difference in the assessment scores compared to the traditional specific questions type of spot test.

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The Integration and Retrieval of Previously-learnt Material Leading to Long-term Retention.

INTRODUCTION. Learning is thought to occur only during episodes of repeated studying (episodes of reading and memorization). The literature demonstrates, however, that retrieval practice (RP) is a better tool at enhancing learning and long-term retention, when compared to studying alone. Such experiments were mostly used to evaluate the effects of RP on multiple-choice question (MCQ) exams. The current study investigates the significance of RP on student performance on bell-ringer lab evaluations in a third-year university-level anatomy course. It is hypothesized that RP will achieve greater

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long-term retention, as well as improve grades on bell-ringer lab evaluations. METHODS. All specimens (plastic, plastinated, and formalin-fixed) used in the current study were obtained from the William James Henderson Anatomy Learning Centre at Queen's University, Kingston, ON. Participation in the study was completely voluntary. During weekly lab sessions, participants (experimental group) answered bell-ringer-style questions and were given the correct answers (feedback) at the end of each lab session. In addition, half-way through the semester, the participants completed a mock bell-ringer. A bell-ringer final evaluation was completed at the end of the semester. SUMMARY. More than 200 questions were asked during lab sessions in ten consecutive weeks. The grades of the experimental group on both the mock bell-ringer and the actual bell-ringer final evaluation were analyzed. Furthermore, the grades of both the participants and the non-participants (control group) on the actual bell-ringer final evaluation were compared. Preliminary analyses indicated that the students' performances were enhanced when RP was implemented. CONCLUSIONS. The students' grades to all questions are being analyzed to test whether RP was more effective than repeated studying in enhancing the learning of, and therefore, the long-term retention of, course material.

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Evaluating the Effectiveness of Thiel-Embalmed Cadavers for Identifying a Positive Lachman Test.

INTRODUCTION. Physical examination skill education begins in the first-year of training for medical and physical therapy students. A hindrance to student physical exam competency is lack of exposure to clinical pathology. Within Quillen College of Medicine (QCOM) and East Tennessee State University's (ETSU) Department of Physical Therapy (DPT), first-year students work with Standardized Patients (SPs) in physical examination skills courses. While SPs provide a great service, students can not accurately identify positive versus negative physical examination findings unless the SPs have that specific clinical diagnosis. This research focuses on improving medical education through cadavers that have undergone a novel soft-embalming technique known as the Thiel method. METHODS. Posterior incisions in the popliteal fossa of 4 Thiel cadavers were made to create one of three scenarios: ACL tear, PCL tear, or sham incision. First year students from QCOM and ETSU's DPT with prior Lachman education and practice on SPs were given the goal of diagnosing ACL tears using the Lachman exam. A 7 question survey about their perceived ability to diagnose ACL tears was completed prior to cadaver contact. Lachman exams were performed on cadavers and students indicated if the cadaver had a positive Lachman test. SUMMARY. Students completed a post-survey that indicated the following: 1) the majority of participants prefer to use both SPs and Thiel cadavers in their physical examination skills courses 2) the session led to the vast majority of participants increasing their level of confidence in performing the Lachman exam on real patients 3) all participants found that Thiel cadavers enhanced their Lachman exam technique. CONCLUSIONS. Thiel-embalmed cadavers are a valuable resource for physical examination education for medical and PT students because they enhance student confidence and Lachman exam diagnostic capabilities.

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Evaluation of Antiseptic Properties Seen in Saturated Salt as Alternative Embalming Solution.

INTRODUCTION. Current embalming protocols are well established and nearly universally used. Formaldehyde as a fixative agent is effective in meeting aseptic and preservation standards. However, the carcinogenic nature of current formaldehyde-including solutions has long been established. While formaldehyde prevents decay, the tissues become less lifelike in color and structural integrity. These salient features of established embalming solutions are the subject of our research. We are investigating the development a Saturated Salt Solution (SSS) that satisfies both the need for tissue preservation and aseptic standards. METHODS. Cadavers were obtained through the TTUHSC Body Donation Program. Two anatomical sites, the oral cavity and anal canal, were sampled prior to embalming with sterile swabs and cultured on LB agar plates. Colonies were counted after approximately two days of growth. Sampling and culturing were repeated after embalming for both saturated salt solution and traditionally embalmed cadavers. SUMMARY. The quality of tissue preservation with SSS use appears to be superior to traditional embalming relative to optimizing the quality of the specimen. The increased lifelike characteristics include more vibrant color of tissues, considerably more tissue and joint mobility, and aseptic qualities that match standard embalming. CONCLUSIONS. Utilizing this saturated salt solution will improve both the quality of the learning experience for the student with significantly increased fidelity to living tissues. With preservation of tissue color and joint mobility, dissections and surgical practice will improve and provide as aseptic environment as traditional formaldehyde embalming.

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Virtual Autopsy Reports of Anatomical Donors Prepared by Students after the Gross Anatomy Course.

INTRODUCTION. Our goal was to integrate the basic & clinical sciences by introducing Radiology & Pathology into the Gross Anatomy course. We did so for the first time this year by having students write a virtual autopsy report of their anatomical donor. RESOURCES. Each group of 8 medical or dental students completed the dissection of 1 anatomical donor (29 donors in total). Before the course, the donors were CT scanned & at the start of the course students were provided with a CT dataset of their donor, as well as with a report written by a Radiology resident. Students took photographs & biopsies of any pathological findings with the latter processed for microscopy & staining. Slides were evaluated by a pathologist who discussed the findings with the student group. At the end of the course, each group prepared a virtual autopsy report based on radiological & pathological findings. The results were documented using relevant images of the CT scan, macroscopic & microscopic findings. Students postulated the cause of death of the anatomical donor in consultation with clinicians from both Radiology & Pathology. DESCRIPTION. Reports were received from all groups even though it was an ungraded activity. Pathologies were found in 22 of the 29 donor cadavers. These included stroke, small cell lung carcinoma, amyloidosis, liver metastases, emphysema, adenocarcinoma & cardiomegaly, among others. The reports were evaluated by the faculty & each student group received written feedback. Students were enthusiastic about the project, but will shortly be sent a survey to evaluate the success of the project. SIGNIFICANCE. Horizontal integration of the basic science curriculum exposes students to differential diagnosis early in medical school & provides closure for the Gross Anatomy experience. Student preparation of a virtual autopsy report of their anatomical donor could be adopted at all medical schools if departments are willing to provide faculty & financial support.

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Surveying Bone Lipids for the Detection of Low Bone Mineral Density.

INTRODUCTION. Early detection of osteoporosis is needed to prevent the devastating effects of fragility fractures. Due to the lack of conclusive diagnostic techniques, clinical interpretation is used to establish a diagnosis. Additionally, obesity affects over a third of the adult U.S. population and is linked to increased bone marrow fat and decreased bone mineral density. METHODS. Bone biopsies from 20 fresh-tissue human cadavers and 150 dry skeletal samples with known medical histories from the William M. Bass Donated skeletal collection were collected to identify lipids unique to bone marrow. Bone marrow biopsies were performed on the tibia, calcaneus, and fourth lumbar vertebra. A .25 mg sample of bone underwent a standardized method of organic extraction. A high-resolution orbitrap mass spectrometer (Thermo Q Exactive) was used to analyze 3,000 lipids across 35 lipid substrates to identify lipid profiles unique to individuals with severe bone mineral density loss and/or history of chronic obesity. SUMMARY. Bone marrow biopsies underwent an organic extraction process and were analyzed using high-resolution mass spectrometry. Preliminary results show that the sampling and extraction protocol established in this study successfully extracts lipids from bone marrow, even in dry skeletal material. This protocol is being used to amass a large lipid profile dataset. These data will be used to screen for lipids that show a high correlation with low bone mineral density and chronic obesity. CONCLUSIONS. Using the protocol established in this study for lipid extraction will allow for further analysis of the lipid dataset. Identification of lipids specific to bone marrow and related to decreases in bone mineral density, obesity and osteoporosis is anticipated with further analyses. The implications of the identification of a lipid biomarker for low bone mineral density could provide a precise way to diagnose osteoporosis and allow for early detection and intervention.

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Delivery of Novel Anatomy Dissector Guide using Dissection Tank-based Interactive iPad Interface.

INTRODUCTION. Undergraduate medical education currently is characterized by numerous changes, including new instructional modalities and a growing number of electronic resources. Literature is limited regarding student perception of electronic instructional resources used in the hands-on laboratory setting for gross anatomy. METHODS. Approximately 300 medical and physical therapy student pre- and post-course surveys (2015-17) were collected to determine student perceptions of the use of novel iPad-based electronic dissector guide technology in the gross anatomy laboratory to improve student dissection quality and maximize educational benefit. Student surveys were originally collected for use as an internal quality improvement project but are now retrospectively analyzed. SUMMARY. Two-hundred ninety-six pre-course surveys

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were collected to determine comfort with Apple technology, basic anatomy, and pre-existing dissection skills, in addition to dissection guide preferences. Students expressed desires for bulleted text (76.4%), figures demonstrating dissection steps (90.5%), video tutorials (79.4%), and cadaver dissection images (93.2%). Students were split on electronic dissector vs paper-bound guide and 48.3% of students had never used a dissector guide of any kind. Post-course surveys focused on student satisfaction regarding various aspects of the dissector. Ninety-four percent of students were satisfied with dissector accessibility, 97.0% were satisfied with illustrations, 85.6% were satisfied with instruction clarity, and 96.0% were satisfied with the overall product. CONCLUSION. Medical and physical therapy students were satisfied with the iPad-based electronic dissector and both groups responded favorably to the delivery platform. Dissector designers anticipated preferred content such as cadaver dissection images and dissection figures that were desired by students; pre- and post-course surveys confirmed these designs were well-received by students.

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Anatomy Practical Testing Predicts Medical Student Success and Continued Interest in Gross Anatomy.

INTRODUCTION. In a longitudinal curriculum with gross anatomy integrated into each systems-based unit, students can place variable emphasis on clinical anatomy. When optional gross anatomy review is offered to first year medical students, using such a resource correlates with exam performance in anatomy and student interest in the subject. RESOURCES. Practicals were offered as a supplemental resource for first year medical students during the first semester of medical school in association with the timing of their unit exams. Three different practicals were given with material covering the nasal cavity and pharynx, gastrointestinal system, and musculoskeletal system. Second year medical students developed the questions based on curricular materials and personal experience of what gross anatomy concepts were most important to master for unit exams in the curriculum. Forty-seven students attended the practicals, representing just under half of the first year class. Participation in exams was correlated to two major outcomes: performance in anatomy evidenced by unit exam scores, and continued interest in gross anatomy indicated by applications to join the second-year cohort responsible for writing practicals. DESCRIPTION. Anatomy practicals were intended to be used by students in need of improvement and review in anatomy as an assessment of anatomical knowledge. SIGNIFICANCE. Student participation in optional anatomy practicals was an indicator of a self-identified need for improvement in anatomy. Medical students who attended these optional practicals included students with a desired improvement in anatomy and those with a developing interest in anatomy.

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Anatomic Radiology for International Students from Underdeveloped Countries - A Pilot Program.

INTRODUCTION. In modern medical practice, radiology is one of the most important tools used in diagnosis and treatment. Most U.S. medical schools include basic interpretation of radiographic images in first-year anatomy programs. In underdeveloped countries, however, where technological and faculty resources are lacking, students may get little training in this field even during their clinical training. In response to this problem, we introduced a 4-week elective in Anatomic Radiology that was designed exclusively for a small group of international medical students from underdeveloped countries. RESOURCES. Application fees were waived by the university and cadaveric material was donated by the Anatomical Gift Program, but all other costs were assumed by the student and faculty. DESCRIPTION. One 4th year Liberian medical student participated in this pilot program. The schedule was structured around a review of basic anatomy and exposure to a full range of radiological experiences. It focused first on anatomy as it applies to interpretation of radiographic images, which included cadaveric dissection and the study of sectional anatomy, 3-dimensional imaging and clinical case studies using the Anatomage table. Secondly, it concentrated on clinical aspects of radiology including training with clinical faculty in the radiology reading rooms and participation in instructor-guided simulated ultrasound sessions. SIGNIFICANCE. The first goal of the program was to improve the student's ability to interpret x-ray and ultrasound images, since these are the primary imaging modalities available in underdeveloped countries. Expertise in these techniques will have an immediate and significant effect on patient care. The second goal was to expose the student to the value of computed tomography and magnetic resonance imaging with the hope that with this knowledge and experience they might become a driving force in their native country for improving future radiological capabilities.

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GOHEEN, Joshua C., Ronald A. EASTEAL, Mohammad B. AZZAM, Rylan G. EGAN and Carolyn J. PERRY. Department of Biomedical and Molecular Sciences, Queen's University, Kingston, ON K7L 3N6, Canada.
Labile Memory Enhancement Using Retrieval Practice.

INTRODUCTION. It has been demonstrated that test-enhanced learning in the form of retrieval practice (RP) is more effective than repeated study alone. RP questions in similar studies have been structured towards material that has already been learned in class prior to them being posed. The following study combines multiple forms of RP in attempt to maximize learning and retention through the creation of labile memories. It is hypothesized that the amount of RP conducted by students will be proportional to their test and final course grades. METHODS. Students in a large, third-year anatomy class were asked to review the content of each lecture/lab prior to sleep and underwent RP preceding a congruent lecture or lab period. Questions were structured so they might provoke the formation of labile memories where they tested content that was to be learned in lecture or lab that day. Students were tested using the online platform TopHat™ in both lecture (LRP) and in lab (LABRP). Students were given course credit as an incentive to participate in the study and this participation was monitored. SUMMARY. Over 200 questions across both LRP and LABRP were posed to the students. Preliminary analysis indicated that the amount of retrieval conducted on concepts in individual exam questions is proportional to the amount of correct responses on those questions. CONCLUSIONS. Further analysis is being conducted in order to test the significance of each category individually and collectively on student performance.

GREENE, Sarah J. Department of Pathology and Anatomy, Morehouse School of Medicine, Atlanta, GA 30310, USA.
Viewing Patterns of Course Media Based on Academic Performance.

INTRODUCTION. With increasing availability and demand for different types of media in medical education, it is important to understand if and how these media make a difference in student performance. The purpose of this study was to evaluate if the timing of the first view of optional anatomy screencast tutorials differed in high and low performing students. METHODS. Seventeen tutorials were provided to 97 first-year medical students. The total percent length viewed for each individual student and tutorial were recorded weekly using TechSmith Relay®. Viewing and not viewing media were defined as viewing ≥ 90% and < 10% of the total length of each tutorial, respectively. Students were placed into 3 categories for each tutorial: 1) Did not view the tutorial, 2) First view more than one week prior to the relevant examination (RE), and 3) First view within one week of the RE. Data were evaluated to determine if proportions differed between students who scored below the 25th percentile (Q1) and at or above the 75th percentile (Q4) on the RE. SUMMARY. A z-test revealed that for the tutorial that covered sympathetics of the thorax, the first view for a significantly higher proportion of Q1 (n = 9; 45%) than Q4 (n = 4; 14%) occurred within 1 week of the RE ($P < 0.05$). Similarly, for the arteries of the abdomen tutorial, the first view for a significantly higher proportion of Q1 (n = 5; 46%) than Q4 (n = 4; 13%) occurred within 1 week of the RE ($P < 0.05$). Finally, for the autonomics of the abdomen tutorial, the first view for a significantly higher proportion of Q4 (n = 10; 30%) than Q1 (0%) occurred more than 1 week prior to the RE ($P < 0.05$). CONCLUSIONS. Preliminary data suggest that higher performing students may tend to view course media closer to learning content in class and farther ahead of examinations, while lower performing students may tend to view these media closer to examinations. (Sponsored by NIH Grant No. P03-1B040107and G12-MD00762)

HASSAN, Sherif S[1, 2], Rajunor ETTARH[1], Fauzia NAUSHEEN[1], Robert SUSKIND[1], and Alfred TENORE[1]. [1]Department of Medical Education, California University of Science and Medicine, School of Medicine, San Bernardino, CA 92408, USA; [2]Anatomy Department, Faculty of Medicine, Cairo University, Cairo, Egypt.
I-TEAM: Interactive Table-Exercise for Applied Morphology.

INTRODUCTION. At California University of Science and Medicine, School of Medicine, we have designed a clinical presentation-driven curriculum. This curriculum demands proper hands-on laboratory sessions to support the active learning methods used during curriculum delivery. RESOURCES. Each laboratory session has been designed in relation to the week's clinical skill, clinical presentation, and clinical case sessions. DESCRIPTION. The two-hour laboratory session consists of 3 stages which begins with 'Directed self-study' where students spend about 30 minutes reviewing the information and material of the session topic using texts, atlas, plastinated specimens, models, and imaging. This is followed by the second stage which allows 'Structural localization' for 30-50 minutes where students will be required to demonstrate their understanding of material by localizing structures and relating structure to function, demonstrating these structures to preceptors for confirmation. Finally, the third stage consists of 'Integration via problem-solving exercises (PSEs)' where students will be expected to integrate their critical-thinking with an understanding of structural localization through teamwork. Teams will work on up to five PSEs for 30 minutes, then each team will present their thinking relating to one of the exercises and defend/justify their thinking. PSEs will have multiple interpretations to generate discussion among the teams. SIGNIFICANCE. This laboratory session will ensure the implementation of the team-based active learning adopted by the school, proficiently. It will also augment the clinical experience of medical students in the preclerkship years to better prepare them for the stimulating clerkship requirements and future practice.

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JACINTO, Brian[1], Heather A. BALSIGER[2], Thomas GEST[2], and Dolgor BAATAR[2]. [1]MD Program, Paul L. Foster School of Medicine, Texas Tech University Health Sciences Center El Paso, El Paso, TX 79905, USA; [2]Department of Medical Education, Paul L. Foster School of Medicine, Texas Tech University Health Sciences Center El Paso, El Paso, TX 79905, USA.
Using Common Clinical Procedures to Teach Anatomy in a Medical School.

INTRODUCTION. Clinical educators are often dissatisfied with the anatomy knowledge of medical students coming out of the pre-clerkship years. In our school we introduced teaching of common clinical procedures during anatomy labs and studied whether this affects the acquisition of anatomy knowledge relevant to the procedures. METHOD. Cadavers in the anatomy lab were prepared by faculty in order to teach the anatomy and clinical techniques relevant to the following: palpation of the dorsalis pedis pulse and needle punctures of the peripheral vein, radial artery, femoral artery, and knee joint. During the anatomy lab the research staff demonstrated the clinical technique of the procedure and reviewed the relevant anatomy. Each demonstration session had a pre- and post- test related to the anatomy of the procedure. The proportion of students who answered the pre-test correctly (P1) and those that answered the post-test correctly (P2) was compared using a McNemar analysis. SUMMARY. The P2 values were significantly higher than the P1 values for all procedures: palpation of the dorsalis pedis pulse [P1= 54.4%, P2=97.1%, p<.0001], peripheral vein puncture [P1= 63.3%, P2= 85.6%, p<.0001], radial artery puncture [P1= 42.1%, P2= 84.1%, p<.0001], femoral artery puncture [P1= 13.6%, P2= 64.1%, p<.0001], and knee joint puncture [P1=47.7%, P2=90.7%. P<.0001]. Overall, student performance on post-tests was improved almost two-fold compared to that on pre-tests (84.3% vs 44.2, respectively). CONCLUSIONS. The integration of common medical procedures into the teaching of anatomy shows promising improvement in student knowledge of clinical anatomy.

JENO, Susan H.N., and Renee MABEY. Department of Physical Therapy, University of North Dakota School of Medicine and Health Sciences, Grand Forks, ND 59202-9037, USA.
EMG Analysis of Latissimus Dorsi, Erector Spinae and Middle Trapezius During Spinal Rotation.

INTRODUCTION. Research on latissimus dorsi (LD) activation during spinal rotation is limited and it is unclear how LD activation might influence spinal rotation during functional movements. The purpose of this study was to compare LD muscle activity to that of middle trapezius (MT) and erector spinae (ES) muscle activity throughout spinal rotation during open and closed kinetic chain activities. METHODS. Healthy subjects (n=38; 24 female) volunteered to be part of this IRB approved study. Muscle activity of LD, MT, and ES was recorded by surface electrodes during spinal rotation to the left and to the right in standing (non-fixed, open kinetic chain) and quadruped (fixed, closed kinetic chain) positions. Spinal rotation was initiated by movement of the pelvis. For all muscles, activity was normalized to the maximal voluntary contraction (MVC). Repeated measures ANOVA analyzed differences between muscles and between positions. Significance was set at alpha=.05 level. Bonferroni post hoc analyses were used as appropriate for pairwise comparisons. SUMMARY. Standing non-fixed rotation-ES was significantly more active than LD and MT with pelvic rotation to the ipsilateral side (p<.001). Quadruped fixed rotation-LD was significantly more active than the contralateral LD and MT, and ipsilateral ES with pelvic rotation to the contralateral side (p<.001). Significant differences were also noted between ipsilateral ES and MT in the fixed position with rotation in the ipsilateral direction. CONCLUSIONS. LD was more active during spinal rotation when the movement of the pelvis occurred in the contralateral direction with the upper extremities fixed. ES and MT have a greater role during spinal rotation when the movement of the pelvis occurred in the ipsilateral direction with the upper extremities unfixed. Results suggest LD needs to be considered as an active participant of spinal rotation during closed kinetic chain activities.

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The Relationship between Supplemental Learning and Performance in Anatomy Practical Examinations.

INTRODUCTION. The identification of cadaveric structures during anatomy summative practical examinations is a challenge for first year medical students. To assist in cultivating this skill, we offered 12 formative laboratory activities (anatomy boot camps = ABCs) that approximated the summative practical examination format. METHODS. Students assisted in crafting the formative practical examination, then engaged in a self-review by scoring their individual answer sheets. Students performing below designated thresholds (≤ 60%) were offered laboratory review sessions led by medical student upperclassmen and faculty. Participants then retook the ABC, which was also scored to evaluate improvement between initial performance and review performance. Independent samples t-tests were used to compare performance of participants who attended the review sessions to those who did not. The relationship between student participation in ABCs and the subsequent ABC reviews was correlated with students' performance in faculty built formative practice practical and summative practical examinations. SUMMARY. Correlation analysis revealed that as the frequency of ABC attendance increased, students' performance on the formative practice practical examinations and summative practical examinations increased significantly (p< 0.001). Moreover, independent samples t-tests indicated students who qualified and attended

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the ABC review preceding each formative practice practical and summative practical examination scored consistently higher on these examinations than students who qualified for the review and chose not to attend. These findings suggest that the provision of supplemental learning experiences, such as the ABCs, contribute to improved student learning outcomes. CONCLUSIONS. This novel model, which combines self-directed learning with immediate formative feedback, appears to be an effective strategy for guiding and enhancing student success in the anatomy practical examinations.

LAMBERT, H. Wayne[1], Ashley B. PETRONE[1,2], and Matthew J. ZDILLA[1,3]. [1]Division of Anatomy, Department of Pathology, Anatomy and Laboratory Medicine, West Virginia University School of Medicine, Morgantown, WV 26506, USA; [2]Department of Neurology, West Virginia University School of Medicine, Morgantown, WV 26506, USA; [3]Department of Natural Sciences & Mathematics and Department of Graduate Health Sciences, West Liberty University, West Liberty, WV 26074, USA.
Transitioning from Educator to Administrator: A Road Map to Build Anatomy and Survive the Journey.

INTRODUCTION. Assuming an administrative role in an academic medical center presents with many challenges. As the new Director of the WVU Anatomy Division, it is learning process to develop and recruit faculty/staff members, to deal with external pressures from senior administrators, curriculum committees, and demands for teaching space and resources, and to navigate the institutional bureaucracy without appropriate institutional knowledge. RESOURCES. This presentation demonstrates that transition of an educator within the anatomical sciences into an administrative position, charged with leading the Anatomy Division at a major medical school, and highlights the necessary steps that could be taken to benefit all involved parties. DESCRIPTION. The purpose of this presentation is multi-fold: 1) To share the background and personal experiences of an educator transitioning into a major administrative position; 2) To provide strategies to make this transition more beneficial for all involved parties; 3) To discuss obstacles and pitfalls that are present during this type of transition; 4) To list resources available to administrators leading an anatomical division or department at a medical school; 5) To list ways to figure out how to advocate for your faculty and staff members; and 6) To provide examples of the challenges and successes realized during this type of transition into a leadership position. SIGNIFICANCE. This presentation will follow the path of an educator transitioning to a major administrative role within the anatomical sciences. This presentation will focus on professional development opportunities for senior faculty members within the anatomical sciences, will provide a road map for faculty members facing these type of challenges, and will facilitate discussion on how to become an effective member of administration. This presentation will also highlight ways to increase the advancement of clinical anatomy education, research, and scholarly activities.

LAWRENCE, Susan C.[1] and Susan E. LEDERER[2]. [1]Department of History, The Ohio State University, Columbus, OH 43210, USA; [2]Department of Medical History & Bioethics, University of Wisconsin-Madison, Madison, WI 53706, USA.
Cadavers: Unclaimed to Donated Bodies in Maryland, 1938-1977.

INTRODUCTION. Between the 1940s and the 1970s, the cadaver population in American medical schools changed dramatically. We use records from the Maryland State Anatomical Board and The Johns Hopkins University Alan Chesney Archives for a case study of this transition. We demonstrate that dealing with donors elicited ad hoc responses from anatomists used to managing unclaimed bodies under an established anatomy act. METHODS. We analyzed 5863 cadaver cards from 1938 to 1971 and 477 files about deceased donors from 1958 to 1974 held at the Maryland State Anatomical Board and a further 1283 files of body donors for The Johns Hopkins University Department of Anatomy. Law codes, newspaper articles and other primary historical sources were gathered as evidence of a changing climate for body donation. SUMMARY. The complexity and fragmentary nature of the cadaver cards and donor files makes a quantitative study of these records problematic. We offer cautious generalizations about the gender, age and race of the unclaimed versus donor populations. We outline a detailed timeline of how and when anatomy departments in Maryland accepted bodies donated by individuals in pre-mortem statements and how they developed donor forms for those wanting to plan for their eventual futures. We document a period of confusion and ambiguity when relatives donated the bodies of the deceased sometimes to fulfil the decedents' wishes but at other times in place of deciding not to claim a body. CONCLUSIONS. Anatomists in Maryland did not plan to establish donor registries. They emerged when individuals deliberately chose to donate their bodies and chose to do this sometimes years before they died. This work adds to our understanding of the social change underlying the rise of whole body donation in the United States.

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LEE, Vaughan H., Katie HIGGINS, Megan GATES, and Brandt L. SCHNEIDER. Department of Medical Education, School of Medicine, Texas Tech University Health Sciences Center, Lubbock, TX 79430, USA.
Formative Assessments in Anatomy: Self-Assessment Resources for Laboratory Material.

INTRODUCTION. Formative assessments provide one component of strategies for promoting self-directed learning activities in many disciplines of education. At Texas Tech University Health Sciences Center/School of Medicine we have previously reported a collection of formative assessments for laboratory concepts presented during different units to improve the efficiency of anatomical education in the 2016-17 Clinically Oriented Anatomy course. RESOURCES. More recently in 2017-18 access to formative assessments for individual dissection sessions was provided to students and integrated with the objectives of the course. This included online formative practical assessments linked to specific dissection sessions in addition to the unit formative assessments. DESCRIPTION. These assessments were created using digital images from prosections that were incorporated into simple recall or clinical application questions. Assessments were delivered through ExamSoft and made available indefinitely. Rationales were provided for each answer choice to provide feedback. SIGNIFICANCE. Preliminary evaluation of correlation between formative and summative assessments revealed varied levels of correlation for individual session assessments and moderate levels of correlation for unit formative assessments. Students' perceptions of these formative assessments were very favorable, 4.66 and 4.14 (5pt Likert), respectively. Detailed analyses of data, outcomes, limitations and future plans for continuous quality improvement will be presented. This project was funded by the Texas Tech University Health Sciences Center/School of Medicine.

LEE[1] , Vaughan H., R. Lisa POPP[1], Angela VAN SICKLE[2]. [1]Department of Medical Education, School of Medicine, [2]Department of Speech, Language, & Hearing Sciences, School of Health Professions, Texas Tech University Health Sciences Center, Lubbock, TX 79430, USA.
Demonstration and Presentation of Pharyngeal Structures in an Interprofessional Educational Activity.

INTRODUCTION. Interprofessional Collaborative Practice (ICP) among teams of different healthcare professions (HCPs) enhances patient care. Students can enhance the competencies required for ICP by participating in Interprofessional and Collaborative Practice Learning Activities (IPECPLAs) during their professional training. It is recommended that these IPECPLAs start early in the training of HCP students, but this can be challenging in the early didactic years of schooling. RESOURCES. The setting for this ICP activity was an Anatomy class and laboratory. The participants were freshman medical students, first year graduate students (Graduate Medical Sciences Master's Program, GMS) and second year Speech-Language Pathology (SLP) graduate students. DESCRIPTION. We have successfully developed an IPECPLA with the structure and function of pharyngeal components as the common theme. Students engage in peer-teaching with medical and GMS students demonstrating pharyngeal structures on dissected cadavers and SLP students presenting applied concepts used in diagnosis and treatment of speech and swallowing deficits. Thus, while learning didactic concepts in a gross anatomy laboratory, medical and GMS students begin to understand how the role of the physician-in-training and the role of the speech-language pathologist-in-training can enhance patient care. SIGNIFICANCE. Effectiveness of this activity was assessed with a pre- and post-test that focused on identification of structures, function and clinical correlates. Performance on the post-test significantly increased ($p < 0.05$) in 2016 for all cohorts of students and similarly in 2017 except for the SLP students. Detailed analyses of data, outcomes, discussion of lessons learned and future plans and challenges for continuation of this IPECPLA will be presented. This project was supported by the Texas Tech University Health Sciences Center/School of Medicine.

LEWIS, James E., and Heather H. ROSS. Department of Physical Therapy, Ivester College of Health Sciences, Brenau University, Gainesville, GA 30501, USA.
Cadaver Case Studies: An Accelerated Learning Model.

INTRODUCTION. Students' anatomy knowledge carryover and clinical instructor perception of student's knowledge can be vital tools to evaluate a programs learning models. Case studies are a valuable tool used to engage students in higher levels of learning. RESOURCES. Functional Anatomy/Kinesiology (PT 910/911) are courses taught at Brenau University (BU) Doctor of Physical Therapy (DPT) program for the 1st year students. Using a case study approach, students are required to research a clinical question relative to discovered pathology in one of their dissected joints, and then provide a written and oral account which synthesizes the observed pathology with evidence based practice regarding the condition. DESCRIPTION. At the conclusion of the students (CLASS OF 2018) first clinical (6 weeks) and final clinical experience (12 weeks), clinical instructors were/will be polled regarding students current anatomical knowledge and their knowledge base compared to other comparable program students. Students will be surveyed at the conclusion of their last clinical experience to

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determine their perception of the anatomy learning experience and its impact on remaining didactic classes and clinical education. SIGNIFICANCE. 15 clinical instructors responded to the survey and strongly agreed (47%) or agreed (53%) that BU DPT student's knowledge was sufficient for their clinical rotation. 7% strongly agreed, 50% agreed and 14% disagreed to the student's knowledge exceeding other program students. Polling for the 12 week clinical experience and surveys of student perception to learning will occur in April of 2018. Learning anatomy including the use of case studies that explore normal and pathologic anatomy could promote a salient, long term learning process that will persist in future didactic and clinical course work.

MATTINSON[1], Catherine E., and Elisa M. KONIECZKO[2]. [1]Department of Anatomy and Neurobiology, Northeast Ohio Medical University, Rootstown, OH 44272, USA. [2]Department of Biology, Gannon University, Erie, PA 16541, USA.
Should Pre-Professional Students Take This Course? A Resounding Yes from Professional Students.

INTRODUCTION. Some evidence that suggests that students with undergraduate anatomy coursework perform better in their professional gross anatomy courses. This study sought to determine if first-year professional students felt that a rigorous undergraduate gross anatomy course with cadaveric dissection was advantageous in preparing them for their medical or physical therapy (PT) gross anatomy courses. METHODS. Students that matriculated from Gannon University to medical school in 2015-2017 or to a graduate PT program in 2017 were invited to complete a survey after the first semester of their professional program. Survey questions asked students to rate their self-perceived preparation for professional-level gross anatomy courses against that of their peers. Students were also asked to compare the amount of material covered in their undergraduate gross anatomy course against the amount of material covered in their first-year professional gross anatomy courses, as a way to approximate the rigor of the undergraduate gross anatomy course. SUMMARY. Mann-Whitney tests indicate that both medical ($n = 18$, $U = 9$, $p = 0.003$) and PT ($n = 16$, $U = 9$, $p = 0.004$) students feel that they were overall better prepared than their peers, as compared to a control group ($n = 4$) that did not take the undergraduate anatomy course. Students reported that, on average, the undergraduate gross anatomy course covered 85% of the lecture content in their professional courses, and 87% of the laboratory content. All survey respondents ($n = 38$) recommend that future pre-professional students should take the undergraduate anatomy course. CONCLUSIONS. These data demonstrate that first-year medical and PT students feel that a rigorous undergraduate gross anatomy course prepares students for success in a professional program.

MESSER, Diana L.[1,2]. [1]Department of Applied Forensic Sciences, Mercyhurst University, Erie, PA, USA; [2]Department of Biomedical Education and Anatomy, College of Medicine, The Ohio State University, Columbus, OH 43210, USA.
An Anatomical Approach to Interpretation of Skeletal Trauma.

INTRODUCTION. Anatomy education can contribute to skeletal trauma analysis, which assists medico-legal investigators in determining cause/manner of death, particularly in cases where remains are decomposed or burned. RESOURCES. Four forensic cases were analyzed where extensive decomposition precluded a traditional autopsy. DESCRIPTION. Case 1 is an individual with multiple knife stab wounds (KSWs) in thorax, neck, and head. A KSW penetrating the transverse foramina of C2/C3 likely impacted the vertebral artery. Case 2 is an individual with two intraoral gunshot wounds (GSWs). One passed through the frontal sinus, the other passed through the hard palate exiting near bregma. Descriptions of location and trajectory of the initial GSW were important for the pathologist. Case 3 represents two individuals. Individual A had two GSWs. The first entered the right maxilla, passing through the hard palate but hit no other skeletal tissue. The second GSW entered the right mandibular ramus with a trajectory through the right first cervical vertebra and occipital condyle just below the foramen magnum, potentially impacting the spinal cord and/or brainstem. Individual B demonstrated a GSW to the chest with a posterior to anterior, inferior to superior, and slight right to left trajectory, which likely impacted vital organs located within the thoracic cavity. This individual also exhibited a complete blunt force fracture at the distal shaft. Case 4 is an example of a fatal car fire. Without a pathologist on site to take a toxicological sample, an appropriately trained anatomist/forensic anthropologist was able to locate the liver and remove a sample for the local coroner, which was ultimately critical to the case investigation. SIGNIFICANCE. In each case, skeletal trauma analysis relied heavily on knowledge of human anatomy to provide relevant information towards eventual determination of cause/manner of death, which suggests anatomy be an integral part of forensic anthropology.

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Assessment Styles Do Not Affect Students' Drive for Learning or Performance in Anatomy Spot Tests.

INTRODUCTION. It is usually recognised that assessment drives learning. We aim to test the hypothesis that assessment modes, summative or formative styles do not affect students' drive for learning or performance in anatomy spot tests. METHODS. At our medical school, anatomy spot tests were conducted using an online method starting in AY 2015/16. These tests were summative in nature i.e. a pass was required to be entered into the end of year exams and no feedback was given. The test could be retaken if failed at the first attempt. From AY 2017/18, the spot test format was changed to formative style i.e. feedback was given and there were no re-takes in the event of failing the test. The new test format was carried out as an iRAT (individual readiness assurance test) format followed by tRAT (team readiness assurance test) with students discussing the best answer in teams, until the correct answer was reached. iRAT scores were captured automatically and the pass mark was determined by Cohen's method. The current Year 2 cohort (AY 2017/18) experienced the new test format as well as the old format in Year 1 (AY 2016/17). Two spot tests scores of the Year 2 (AY 2017/18) cohort were compared with that of AYs 2015/16 & 2016/17. SUMMARY. There were no significant differences between mean scores of spot tests in the new formative style when compared with the summative style scores. Student feedback on the new test format highlighted positive aspects such as immediate feedback, explanations for the answers via peer learning and content expert explanations for the burning questions that are not solved through the team discussion. CONCLUSIONS. This study shows that spot test scores are not affected by formative style of assessment. From this study, we believe that self-motivation and team-test component are the main drivers for learning. Our results may allow anatomists to implement this unique spot test without fear of jeopardising student's drive for learning and performance.

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Qualitative Reasoning of a Novel Approach to the Pelvic Dissection.

INTRODUCTION. Understanding the gross anatomy of the pelvis and perineum is challenging for professional students. Dissection of this region has been hampered by the complex spatial orientation of the pelvis and perineum, limited dissection access, structural density and ambiguity as well as low anatomic efficiency (i.e. time dissecting versus number of structures identified). These limitations often result in programs minimizing dissection of the pelvis and perineum by utilizing prosected specimens as well as anatomic and computer models. RESOURCES. At The Ohio State University, we have developed a novel 'pelvic exenteration' approach to the cadaveric dissection of the pelvis and perineum that we implemented in the laboratory this past year with medical, dental and graduate students. DESCRIPTION. Upon completion of the dissection, students and faculty filled out an 'Ease, Satisfaction and Perception Survey' and an 'Ease of Structure Identification Survey' in an effort to determine the overall utility of the new dissection approach. The data from these surveys were compared to identical surveys taken from students and faculty after dissecting the pelvis and perineum using the standard approach outlined in Grant's Dissector, 16th Edition. SIGNIFICANCE. The vast majority of students and faculty surveyed were more satisfied with the novel pelvic exenteration dissection method and indicated that it had a greater anatomic efficiency and higher yield of identifiable structures.

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Variables Influencing Body Donation at McGill: Learning from the Past to Prepare for the Future.

INTRODUCTION. Recent changes from the Ministry of Health and Social Services regarding the distribution of donated bodies raised concerns within the department of Anatomy and Cell Biology as to the sustainability of body donation to McGill. RESOURCES. In an effort to ensure the continuation of body donation, this project studied body donor records and the demographic variables leading to body donation. The data collected allowed for discussion on the number of donated bodies received at McGill in a given year, the age at death, the gender as well as religious affiliation and language of the individuals donated to McGill. This information was considered in light of historical and legislative data and, in the case of age, gender, religion and language, it was compared to census data. DESCRIPTION. Records were collected for the years 1883-2015, excluding a gap from the years 1909-1943, and the years 1891, 1896, 1908, 1949-1954, 1997-1999. The average age of donors has increased and this finding correlates the increase in life body donation perceived as an alternative to organ donation. The male gender is represented in higher numbers than the female gender within the donor population. Catholic faith was predominant, surpassing the proportion of reported Catholics in the census. This correlates with the clergy influence and Catholic institutions in Quebec, Canada. A majority of donors speak French. The English-speaking proportion of donors is higher than it is within the general public. This strongly suggest that the close ties of McGil University to Anglophone community influences the donations. SIGNIFICANCE. In conclusion, keys findings from this study reveals that communities and faith groups can increase donation by endorsing the gift and a strong community tie to the institutions supports donation.

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Comparison between Hands-On-Dissections and Peer-Teaching on Comprehension of Anatomical Concepts.

INTRODUCTION. Anatomy was traditionally taught by hands-on-dissection method in medical schools. Due to growing class sizes and curriculum restraints, the trend is moving towards less dissection time and increased emphasis on peer-taught-prosections, where students are taught anatomy by other classmates. This present study determines whether this newer peer-taught-prosections is comparable to the older hands-on-dissection approach in anatomical comprehension among medical students. METHODS. 200 medical students were split into two groups where each group was responsible for dissecting and teaching half the anatomy labs. In this way, each group dissected half the labs and were taught the rest through peer teaching by the other group. The labs were stratified into axial and appendicular labs. Multiple choice examinations were given over axial and appendicular anatomy with questions specifically directed at individual labs. Paired T Test was used to determine differences in student performance between dissected labs and peer-taught labs. SUMMARY. There was no statistical difference in student performance on dissected labs versus peer-taught labs over axial anatomy [$t = 0.21$, $p = 0.84$]. Likewise, there was no statistical difference in student performance by method of instruction over appendicular anatomy [$t = 1.29$, $p = 0.20$]. Furthermore, the magnitude of difference between dissected labs and peer-taught labs was equivalent in both axial and appendicular anatomy [$t = 0.94$, $p = 0.35$]. CONCLUSIONS. The newer approach of peer-taught-prosections is comparable to the older approach of hands-on-dissection over the comprehension of both axial and appendicular anatomy.

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Transitioning from Basic Science Research to Anatomical Sciences: Challenges and Opportunities.

INTRODUCTION. Within recent years, there has been a push within medical education to move toward an integrated curriculum, with an emphasis for integrating clinical learning with basic science concepts. With this new challenge, it will be crucial to integrate faculty members with a background in basic science research into these progressive medical school curricula. Unfortunately, the transition for a research scientist, into a clinical or anatomical science department is often difficult, despite the high value. RESOURCES. N/A. DESCRIPTION. The purpose of this presentation is multi-fold: 1) To share the background and personal experiences of a basic scientist during this difficult transition from being a basic science researcher to an educator; 2) To provide strategies to make this transition more smooth and beneficial for all involved parties; 3) To discuss obstacles faced during this type of transition; 4) To list resources available to basic scientists seeking to transition into teaching within the anatomical sciences; and 5) To provide examples for improved research and scholarly activities in this newly formed basic science and clinical partnership. SIGNIFICANCE. This presentation will follow the path of a basic scientist transitioning to an educator within the anatomical sciences. With recent trends in curricular changes and challenges placed anatomists to teach the anatomical sciences, this presentation will facilitate discussion on how to get administration invested in these type of transitions as well as increase the advancement of clinical anatomy education, research and scholarly activities.

PRATT, Rebecca L.[1,2]. [1]Department of Biomedical Sciences, Oakland University William Beaumont School of Medicine, Rochester, MI 48309, USA. [2]Department of Radiology, Michigan State University School of Osteopathic Medicine, East Lansing, MI 48824, USA.
Surface Anatomy Assessment Using Near-Peer Evaluation in Gross Anatomy: Planning and Perspectives.

INTRODUCTION. The assessment of palpatory anatomy in manipulative medicine is of primary importance. Michigan State University College of Osteopathic Medicine (MSUCOM) anatomy faculty have addressed this challenge and refined the logistics of introducing touch early on in osteopathic education in a meaningful way that links cadaveric anatomy with surface anatomy exhibited on live models. This is accomplished through surface palpation, not only during the laboratory sessions, but during practicals. It was hypothesized that palpatory assessment also encourages students to feel at ease with fundamental bony surface anatomy and human touch in the first semester of osteopathic medical school. RESOURCES. First year students were assessed on surface anatomy during four cadaveric lab practicals with the novel addition of second-year students as 'station palpation models'. Upon completion of clinical gross anatomy course, the first-year students were provided a short survey on their perception of the importance of having surface anatomy synchronously with their investigation of cadaveric and bony material during semester one. An open-ended question for improvement was crafted as well as four Likert statements that focused on importance, application, comfort-level and examination style. DESCRIPTION.

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Data collected from the Class of 2021 supported our hypothesis and provided course leadership with constructive feedback on how to make this collaboration even more relevant to student training as leaders in the health community. SIGNIFICANCE. The uniqueness of this project is not only the assessment of surface anatomy during practical examinations but the near-peer instruction, encouragement and feedback given to first year students from MSUCOM second year students. It is our hope that the skill of whole body thinking will prove useful in subsequent semesters of manual medicine training and throughout the physician's medical education.

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Muscular Dystrophy – A Cadaveric Study of Anatomical Findings.

INTRODUCTION. Muscular Dystrophy (MD) is a rare group of genetic diseases that involves progressive muscle weakness and degeneration. Though a rare disease with less than 200,000 US cases per year, there are several types of MD. The most common start showing symptoms during childhood while others are not apparent until adulthood. This study investigates, through cadaveric dissection, variants in anatomical findings in a specimen with adult onset MD. METHODS. Full dissection of three embalmed adult cadavers, two males and one female, were performed on specimens of similar age and size. The cause of death for one of the male specimens was respiratory failure due to adult onset MD. The other male died of congestive heart failure while the female's cause of death was lung cancer. Dissection primarily focused on the musculature from the shoulders, upper extremities and lower extremities. Physical Assessment of skeletal muscles conditions were recorded, photographed, and compared. SUMMARY. Though the external appearance of the lower extremities and upper extremities were similar in all three specimens prior to dissection, the inspection of the musculature demonstrated pronounced dissimilarities between the cadaver with adult onset MD and the other two specimens. Examination of the muscles from the MD cadaver exhibited overall replacement of muscle tissue with fat and connective tissue in the lower extremities. A similar observation was noted in the upper extremities. Additional variations included bilateral atrophy of the trapezius muscles with the presence of connective tissue in its place. All these observations have been associated with clinical applications associated with MD. CONCLUSIONS. External appearances of embalmed cadavers may not always reveal the physical conditions present in people with adult onset MD. Anatomical examination and study of this disease through dissection provides learning opportunities for students or clinicians in the health profession.

RAOOF, Ameed[1], Avelin MALYANGO[1], Mange MANYAMA[1], Charles MSUYA[1], Nasnass NASSIR[1], Estomih MTUI[2]. [1]Medical Education Division, Weill Cornell Medicine-Qatar, Qatar Foundation, P.O. Box 24144, Doha, Qatar. [2]Radiology Program in Anatomy, Weill Cornell Medicine, New York, NY 10065, USA.
Enhancing Students' Comprehension of Anatomy Through Engagement and Formative Assessment.

INTRODUCTION. The new integrated basic sciences curriculum was implemented at Weill Cornell Medicine-Qatar in the fall 2016. In gross anatomy, a set of teaching interventions has been introduced with the aim of enhancing students' comprehension through engagement and formative assessment. Such interventions included online labeling modules and videotaped lab review sessions; audience response system. This year, measures have been reassessed based on students' feedback and performance. Application included other anatomy courses such as histology and neuroanatomy. Measures are welcomed by students. We hope that through further refinement we could achieve our goal in enhancing students' interest and performance in anatomy. METHODS. Last year's measures included videotaped review sessions; online practice labeling modules; audience response system; and measures to enhance professional attitude in lab, including recording dissection findings. New measures included assigning students on each table in lab to do alternating tasks such as dissection, reading dissection guide, and recording notes; students' tagging of a weekly mock practical exam; and a weekly discussion of clinical vignettes. In the neuroanatomy and histology courses, online labeling modules have been introduced. A survey was administered to assess satisfaction. SUMMARY. Students in the three anatomy courses overwhelmingly welcomed the new measures. The mean performance in the neuroanatomy course was about 4% higher. For the gross anatomy course, 84% of the class agreed that the new measures helped in understanding anatomical concepts and 75% agreed that the new measures helped improve their quiz performance. For the neuroanatomy course, 95% of the students agreed that the online labeling modules were helpful in understanding the subject. CONCLUSIONS. Interventions have had an obvious positive impact, we hope with further refinement goals could be achieved in improving students' learning of anatomy.

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RAREY, Kyle E.[1], Venkatesh NONABUR[1], Amanda MAXEY[1], Ziepei ZHU[2], and Ashleigh WRIGHT[3]. [1]Department of Anatomy & Cell Biology; [2]Department of Anesthesiology; [3]Department of General Internal Medicine, University of Florida College of Medicine, Gainesville, FL, USA.

Group-Based Anatomy Cumulative Oral Examinations.

INTRODUCTION. Medical gross anatomy is integrated in an Introduction to Clinical Medicine Course (ICM) at the University Of Florida College Of Medicine. The gross anatomy portion of the course is taught over four semesters during the preclinical phase of training. At the end of the fourth semester of ICM, a cumulative oral examination is administered that covers clinically relevant anatomical concepts over the entire body. This study investigates the usefulness of a cumulative examination as perceived by 2nd year medical students. METHODS. During 45 minutes' sessions, groups of four students were asked to demonstrate their competency of addressing anatomical questions in the anatomy laboratory. At the end of examination, second-year medical students completed a survey about the oral examination. SUMMARY. A 3-question survey about the oral examinations showed that: 1) 58% of the students agreed or strongly agreed that the oral examinations caused them to review the anatomy taught over four semesters, 2) 67% of the students believed that studying for the cumulative anatomy examination would help them prepare for their upcoming Step 1 examinations, and 3) 86% of the students believed that the oral questions were clinically-oriented and relevant. Qualitative data included statements that students believed preparing for the oral examination caused them to 'better synthesize clinical applications of anatomy' and they would like to have multiple oral examinations. CONCLUSIONS. The oral examinations were overall evaluated well and students believed preparing for them was beneficial in preparing for their Step 1 examinations.

RAREY, Kyle E.[1], Venkatesh NONABUR[1], Amanda MAXEY[1], Ziepei ZHU[2], and Ashleigh WRIGHT[3]. [1]Department of Anatomy & Cell Biology; [2]Department of Anesthesiology; [3]Department of General Internal Medicine, University of Florida College of Medicine, Gainesville, FL, USA.

Inclusion of Mini-Peer Teaching Sessions (MPTs) During Gross Anatomy Laboratory Periods.

INTRODUCTION. Medical gross anatomy is integrated in an Introduction to Clinical Medicine Course at the University Of Florida College Of Medicine. The gross anatomy of the human body is still primarily learned in the anatomy laboratory. The purpose of this study was to assess the effectiveness of creating min-peer teaching sessions within assigned lab times. METHODS. Multiple mini-peer teaching sessions (MPTs) were created and held during the assigned anatomy sessions for 2nd year medical students. During a MPT session, one student was assigned as the teacher at a given table; other members at the table rotated to learn about the anatomy at the other tables at 1 minute or 3 minute intervals. After the first round was concluded, the peer-teachers also rotated to other tables. The MPTs allowed each student to observe and learn the cadaveric anatomy at all 18 tables. At the conclusion of the anatomy course, students were given a two-question survey. SUMMARY. Quantitative data showed that eighty-seven percent of the students believed that the MPTs enhanced their learning in the anatomy laboratory. Qualitative data included positive feedback. For example, one student stated, "I learned and retained the most anatomy out of any the activities that we did." CONCLUSIONS. MPTs provide a means for students to maximize their learning in an already fixed laboratory window of time.

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Novice-Expert Differences/Similarities Correlating CT Images with 3D Human Simulation Setting.

INTRODUCTION. Radiology depends on correlating anatomical knowledge and medical imaging. Experts do this well, but we have little understanding of how they learn to do so. Even more problematic, we don't know how novices transition to experts. Knowing where novices begin in making this correlation can aid us in helping them transition to being experts. METHODS. 10 radiologist experts (Exp) and 11 4th-yr medical student novices (Nov) localized CT images within a specialized human simulation torso. Quantitative data was collected (image plane, time, and correctness of localization) and analyzed with ANOVAs. Qualitative think alouds were performed during the simulation. Transcripts were coded and analyzed with Chi-square. Significance assessed at $p<0.05$. SUMMARY. Exp are faster at making decisions on medical imaging than Nov ($p<0.001$). Exp rely on organ substructures ($p<0.0005$) and Nov rely on organ size/amount ($p=0.002$) for localizing an image. Exp use more correct terminology ($p<0.001$). Nov misinterpret anatomy ($p=0.004$) and use non-anatomic descriptive cues ($p=0.03$). In contrast, Exp and Nov performed equally well when evaluating the incorrect localization of an axial abdominal CT image by a peer (Nov 100%, Exp 95%; $p=0.29$), and correctness of a peer's assessment of a structure being abnormal or normal ($p=0.53$). Both Nov and Exp agreed on the safety of a biopsy approach (100%), however their reasoning and complexity of decisions differed. CONCLUSIONS. Exp and Nov differ in image processing and correlation with anatomy: the cognitive processing with respect to meaningful patterns, organized content knowledge and retrieval flexibility. Nov perform equally well as Exp in recognizing correctness in a peer assessment. Nov's depth of reasoning may not be as organized and developed as Exp. This work provides evidence of different processing occurring in recognition and recall, which may be helpful when designing curriculum and assessing learners. (Sponsored by RSNA grant.)

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Surgical Education in Crisis: Anatomists to the Rescue!

INTRODUCTION. General surgery program directors consider incoming residents to be less anatomically prepared than previously. Studies indicate surgery residents are finishing general surgery residency with a lower volume and lack of confidence in performing open operations. In the current model of surgical training, opportunity for deliberate practice of many open operations is rare. Cadavers are high fidelity simulators and are the only "true" simulator in which entire operations can be practiced. A cadaver-based simulation program to teach general surgery residents 76 open surgical operations was developed and used for 20 years at the University of North Dakota. Teaching methods emphasize surgical anatomy, technique, and operative strategy to simulate an operating room environment. METHODS. All residents who participated in the cadaver based simulation training from 1999 to 2017 and graduated from the residency program were surveyed. The survey self-assessed the value of cadaver-based simulation training by their perception of improvement in understanding open operations, and their confidence and operative skills for open operations. SUMMARY. 45 respondents are currently in general surgery practice. As residents, all (100%) had participated in the cadaver based simulation training and had graduated from the residency. 44 (98%) felt that the course helped them understand open operations. 38 (84%) felt the course increased their confidence and operative skills. CONCLUSIONS. A deficient knowledge base in anatomy and inadequate simulation methods for open surgical procedures can lead to a lack of confidence which can be addressed in the surgical anatomy lab. Cadaver based simulation training is the highest and most realistic level of simulation training currently available for open general surgery operations. This type of simulation is effective in increasing general surgery residents' understanding, confidence, and operative skills for open surgical procedures.

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Exploring Anatomist and Student Perceptions of Teaching Anatomy in the Modern Medical Curriculum.

INTRODUCTION. Dissection has long been viewed as the "gold standard" for imparting anatomical knowledge and impacting students' professional formation. That said, the demands and educational needs of current medical students is constantly evolving. This pilot study aims to explore medical student views of the most efficient teaching methods to deliver learning outcomes in comparison to that of anatomists. METHODS. A total of 44 anatomists from the United States of America and 38 medical students (18 male and 20 female) from different academic terms in St. George's University, Grenada, completed a matrix survey designed to measure how well 10 different teaching tools employed in anatomy relate to 18 learning outcomes. Participants were asked to allocate a value ranging from 0 to 5 representing how useful they perceived the method in achieving the learning outcome. SUMMARY. Students perceived anatomical models as the most important tool to teach and learn anatomy, followed by pre-dissected prosections/plastinates and imaging modalities such as radiographs and CT scan. There is a significant difference between student and anatomist perceptions of the educational value of dissection with regard to imparting anatomical knowledge. Although ranked differently, there was no significant difference in the students' perception of ultrasound vs other imaging modalities whereas; anatomists viewed the educational value of the two tools significantly different in regards to teaching and integrating anatomy to other disciplines. (Significance set at p-values <0.05). CONCLUSIONS. Despite single method being found to fit all needs of the modern medical curriculum, anatomists continue to champion dissection. There is a clear gap between student and anatomist perceptions of the most effective teaching method warranting further exploration of students' perception and outcome measures.

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Multi-Modal Gross Anatomy Education: Translating Knowledge to the Clinic.

INTRODUCTION. The study of gross anatomy has been affected by many factors and this trend is leading some programs to abandon the use of cadavers in lieu of digital technology and models, even though this practice has been shown in many studies to have a negative impact on the acquisistion of cadaveric gross anatomy skills. As such, there may exist a synergistic effect in combining the use of cadavers and electronic teaching aids. Multi-modal education incorporates active learning, exposure to imaging, efficient cadaveric labs, learning in context, use of digital teaching aids, and longitudinal learning to enhance gross anatomy education for the best outcomes and retention of knowledge. The impact of using an electronic teaching aid consisting of clinical vignettes paired with cadaver prosection images on the level and retention of gross anatomy knowledge in medical students was assessed. METHODS. This study used an electronic teaching aid to evaluate the effectiveness of a multi-modal gross anatomy education for answering clinically oriented anatomy questions on a web-based learning platform. Subjects were first and third year medical students. SUMMARY. The subjects in the clinical curriculum

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and those with more previous clinical experience performed better; there was no significant difference in the subjects with biological science degrees or higher levels of clinical experience prior to medical school. CONCLUSIONS. Increased exposure is the best way to ensure a high level of aptitude for gross anatomical knowledge, and a multi-modal curriculum impacts the ability to retain and recall anatomical knowledge. The significant difference favoring an increased amount of anatomy courses displays the ability to identify anatomy and correlate it to clinical findings, and experience gained outside of medical school (type of undergraduate degree and number of hours spent in a clinical setting) translates poorly when taking a medical school level clinical anatomy quiz.

WARD, Peter J. and Lindsey KENT. West Virginia School of Osteopathic Medicine, Lewisburg, West Virginia, USA.
A Student-Sponsored Series of Talks on the History of Medicine.

INTRODUCTION. The assessment of competencies beyond medical knowledge has become more prominent in medical education during the last decade, and the inclusion of humanities alongside the biomedical sciences is one way in which this has been done. However, it is important that these content domains reinforce each other. Medical history is a topic that can bridge both domains, refreshing learners' medical knowledge while bringing attention to social, political, spiritual, and practical influences on its development that would not be included in the regular curriculum. To explore this possibility, a series of medical history talks were presented outside of curricular time along with a short essay pilot assessment that could be induced in a student portfolio. RESOURCES. For the last seven years, a student group has hosted a lecture on the history of medicine. When other groups asked to host additional sessions and expand the topic areas, we crafted a series of lunchtime sessions that explored the development of medicine in a broad context. DESCRIPTION. Six sessions covered the history of medicine from ancient times, concepts of disease, diagnosis and treatment, surgery, and the history of excluded groups. 205 people attended at least one session and a surprising 105 people attended all six sessions and received a certificate of completion. Feedback from the sessions was overwhelmingly positive. Students who missed a single session were able to make-up the session by watching the session video and submitting a short paper related to the session. SIGNIFICANCE. Medical history has a tremendous potential to impact student motivation and to provide a nuanced view of how social factors impact the practice of medicine. Until these topics have a home in the medical school curriculum, it may be helpful for educators and students to explore alternative venues, such as club-hosted lunches, to bring medical history into medical education.

WHITAKER, Amy N.[1], James HARRIS[1], Ganesh THIAGARAJAN[2], Christina LEE[1], Sirus SAEEDIPOUR[1], Barth WRIGHT[1], and German BERBEL[1]. [1]Kansas City University of Medicine and Biosciences Division of Clinical Anatomy, Kansas City, MO 64106, USA. [2]University of Missouri-Kansas City Department of Civil and Mechanical Engineering, Kansas City, MO 64110, USA.
Investigation of Tendon Biomechanics in Soft Embalmed and Unembalmed Cadavers.

INTRODUCTION. Unembalmed cadaveric tissue samples are the current gold standard for biomechanical studies, due to minimal alteration of tissue properties. The soft embalming process is known to preserve the natural color, texture, and tensile strength of human remains better than formalin embalming. The purpose of this study is to assess the efficacy of using soft embalmed tissues as a proxy for fresh tissue in studies of tissue biomechanics. METHODS. Five tendons were harvested from two soft embalmed and one unembalmed cadaver. The two soft embalmed cadavers had been embalmed for approximately eleven and four months. Tests were conducted using a BOSE mechanical testing instrument for tensile testing. All specimens were tested uniaxially under displacement control at 0.05 mm/second to a maximum displacement of 6mm. The following mechanical variables were calculated with the collected data: stiffness, peak strain, tissue toughness, elastic modulus, and peak force at maximum displacement. RESULTS. The maximum stress, strain over time, and the elastic modulus did not differ significantly among the cadaveric specimens. However, the eleven-month-old embalmed cadaver reached a significantly higher maximum load, initial peak load, as well as stiffness (ANOVA <0.05). Of note, there was not a statically significant difference in the biomechanical properties of the tendon types regardless of the cadaveric specimen (ANOVA <0.05). CONCLUSION. Medical biomechanical research may benefit from our results by permitting the use of soft embalmed specimen which can be stored for extended periods without freezing.

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Procuring Anatomical Materials: A Look at Commercial Entities vs. Educational Donor Programs.

INTRODUCTION. Educational institutions needing cadaveric anatomical materials for research or education have different options when considering where to get the anatomical materials: they can use a commercial entity, or they can use a donor program located within an institution of education. Factoring in cost and ethical concerns will demonstrate that educational institutions are superior in meeting these needs. RESOURCES. A comparison of quoted prices from commercial entities and educational donor programs will be examined. A review of donation agreements, disposition methods, oversight,

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and investigations by law enforcement will be considered. DESCRIPTION. Here we make a thorough review of all factors considered in obtaining cadaveric anatomical materials. A clear contrast between commercial entities and educational donor programs will be provided. SIGNIFICANCE. A comparison of all of the different factors will demonstrate to those in need of anatomical materials should look to educational donor programs as opposed to commercial entities. They should also inspect any organization from which they are looking to obtain cadaveric anatomical materials.

WU, Anette[1], Heike KIELSTEIN[2], Takeshi SAKURAI[3], Geoffroy NOEL[4], Suvi VIRANTA-KOVANEN[5], Tsai-Kun LI[6], Liisa KIUKKA[5], and Paulette BERND[1]. [1]Department of Pathology and Cell Biology, Columbia University, New York, NY 10032, USA; [2]Department of Anatomy and Cell Biology, Martin Luther University Halle, Halle, 06114, Germany; [3]Department of Drug Discovery, Medical Innovation Center, Kyoto University, Kyoto, 606-8501, Japan; [4]Department of Anatomy and Cell Biology, McGill Unversity, Montreal, QC, H3A0C7, Canada, [5]Department of Anatomy, University of Helsinki, Helsinki, 00014, Finland, [6]Department of Microbiology, National Taiwan University, Taipei, 10051, Taiwan.

A New Role for the Clinical Anatomy Course - Anchor for Internationalization of Medical Education.

INTRODUCTION. At a time of globalization, internationalization has become increasingly important in medical education. Historically, Anatomy courses have established the basic foundation for medical thinking, professionalism, teamwork, communication skills, and end-of-life topics. Anatomy is a subject shared by all medical schools. Traditionally, Anatomy faculty is closely engaged in basic sciences research, providing support for student research interests. RESOURCES. Preclinical Anatomy students from 6 different countries participated in videoconferencing sessions (4 small group and 1large international student videoconference), followed by international student exchanges involving basic sciences research. Partner countries included Canada, Finland, Germany, Japan, Taiwan, and the USA. DESCRIPTION. The small group work involved discussion sessions on a) Anatomy, b) death, c) differences in healthcare education and healthcare delivery, health challenges, and d) health ethics. Group papers on healthcare topics were presented at the large international videoconference. 110 students (in 20 small groups) participated. 24 students are scheduled to visit their peers, while conducting research fellowships in the host country. Results from student questionnaire feedback indicate a favorable outcome of the program - they learned something about Anatomy, how to work with their international peers, paid more attention to cultural differences, developed a better understanding of different languages, and better appreciate diverse healthcare systems. It was a good exercise for future international collaboration. The majority of students thought that this interaction is well placed in the Anatomy course. SIGNIFICANCE. Anatomy courses can be used to initiate early international educational experiences for preclinical students, and provide the foundation for subsequent international collaboration between future healthcare leaders.

Abstracts – Poster Presentations Session 3

(Listed by presenting author last name)

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Double Inferior Vena Cava – A Rare Case Report.

INTRODUCTION. The inferior vena cava (IVC) commences at L5 vertebral level by the union of the right and left common iliac veins. It courses on the right side of the abdominal aorta in the posterior abdominal wall and enters the thorax at T8 vertebral level. IVC is a composite vessel, which develops mainly from the right subcardinal and sacrocardinal veins. Malformation of these embryological veins give rise to various anomalies of the IVC. RESOURCES. The presence of a left IVC was observed in a 58-year-old male cadaver. DESCRIPTION. The left IVC originated from the left common iliac vein, posteroinferior to the bifurcation of the aorta and then coursed along the left side of the abdominal aorta to form a communication with the left renal vein. This anomaly is due to the persistence of the left sacrocardinal vein and its connection to the left subcardinal vein. The left IVC was connected to the right IVC by an additional vein and this is due to the persistence of the subcardinal anastomosis. The course of the left testicular vein was normal and was seen draining into the left renal vein. The left renal vein was observed to course posterior to the aorta to drain obliquely into the right IVC. The origin of IVC on the right was as normally described and was seen forming by the union of the right and left common iliac veins, inferior and to the right of the bifurcation of the abdominal aorta at L5 vertebral level. SIGNIFICANCE. Duplication of the inferior vena cava has been estimated to occur in 0.2%-3% of population. Although rare, presence of double inferior vena cava is important to recognize to prevent misinterpreting radiological imaging studies. Venous anomalies may be mistaken for a pathologic process like abdominal lymphadenopathy. If such patients were to need IVC filter placements, two separate filters would be required. A surgeon needs to be aware of these anomalies while performing surgical procedures in the retroperitoneal region.

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Illustration of the Female Reproductive System from the 16th to 19th Century: A Historical Review.

INTRODUCTION. The depiction of the female reproductive system has evolved significantly in the last 5 centuries. The stylistic sketches and illustrations of the uterus, vagina and ovaries has become more detailed and realistic, coinciding with the advancement of anatomical knowledge. However, it was evident from the early drawings and the scarcity of non-gravid images that the anatomy of the female reproductive system was poorly understood. The purpose of this study was to review historical illustrations of the uterus, vagina and ovaries, and analyze how our understanding of the female reproductive system has advanced from the 16th to 19th century. RESOURCES. Illustrations of the female reproductive system from 1511 to 1866 were reviewed using anatomical plates in the Anatomia Collection, Thomas Fisher Rare Books Library, University of Toronto. DESCRIPTION. Many artists depicted the female reproductive system, however in each century there was only one or two artists who illustrated the non-gravid uterus. In early illustrations, artists used lined sketches and stylistic drawings to depict the uterus as a more spherical organ sitting in a sac, sometimes with no clear connection to the vagina or uterine tubes. In the 18th century, color was added to the illustrations and more detail introduced to the images. The blood supply was included, and the relationships of the female reproductive system to other pelvic structures was more clearly depicted. Nicolas Henri Jacob's work was unique because it showed the female reproductive system in multiple orientations and dissection sequences demonstrating the organs in situ and individually in exquisite detail. SIGNIFICANCE. Studying anatomy from the historical perspective enables us to gain insight as to how our knowledge of the female reproductive system has evolved. It is important to maintain and make accessible historic collections of anatomical drawings for future anatomists and clinicians.

BOURDKANE[1] Tony, Onyinye NNAMDI-NWOSU[1], Ruba ABDULLAH[1], Tamseela GURRU[1], James COEY[1,2] and Sara SULAIMAN[3]. [1]St. George's International School of Medicine Keith B. Taylor Global Scholars Program, Northumbria University, Newcastle upon Tyne, NE1 8ST, UK. [2]Department of Anatomy, St. George's University, Grenada, W.I. [3]Department of Applied Sciences, Faculty of Health and Life Sciences, Northumbria University, Newcastle upon Tyne, NE1 8ST,UK.
Effects of Foot Positions and BMI on the Tibial Nerve at the Tarsal Tunnel.

INTRODUCTION. Measurement of tibial nerve (TN) cross-sectional area (CSA) and circumference within the tarsal tunnel upon varying foot positions provides useful insight into TN compression, the main etiology of Tarsal Tunnel Syndrome (TTS). While previous studies have quantified a similar relation by measuring tarsal tunnel dimensions in cadaveric studies, this study aims to obtain measurements of the TN in-vivo through ultrasound. METHODS. Forty-two ankles, from 21 participants (13 male, 8 female) between the ages of 19 and 43, were scanned by a single observer using a GE Logiq e ultrasound system with a 12L-RS transducer. Transverse/short-axis ultrasound scans of the TN at the level of the medial malleolus were taken at different foot positions: 25° inversion, neutral and 25° eversion. TN-CSA and circumference were measured over the three foot positions with built-in calipers. Participants' weight and height were taken and body mass index calculated. SUMMARY. The measured TN-CSA was 20.76±8.80 mm2, 23.64±11.01 mm2 and 23.67±9.86 mm2 during inversion, neutral and eversion positions respectively. The measured circumference was 22.87±7.88mm, 23.73±7.74mm and 24.49±8.13mm during inversion, neutral and eversion positions respectively. There was a significant effect of foot position on the measured CSA of the TN. A significant difference in TN circumference between normal and overweight participants was demonstrated in the inversion and neutral positions (all P-value<0.05). CONCLUSIONS. Foot position affected the measured parameters of TN in the tarsal tunnel. These findings suggest that relying on eversion to compress the TN and thus elicit symptoms of TTS during the dorsiflexion-eversion test might not be helpful diagnostically. Ultrasound is a quick and relatively safe tool that can be used to diagnose TN compression at the ankle.

BRADSHAW, Luke R.[1], Ethan M. BREINHORST[1], Allen DUONG[3], N. Susan STOTT[2], Anne M.R. AGUR[3], and Seyed A. MIRJALILI[1]. [1]Anatomy and Medical Imaging Department and [2]Department of Surgery, School of Medicine, Faculty of Medical and Health Sciences, University of Auckland, Auckland, 1023, New Zealand; [3]Division of Anatomy, Department of Surgery, Faculty of Medicine, University of Toronto, Toronto, ON, M5S 1A8, Canada.
Architecture of the Infant Gluteus Minimus: A 3D Modelling Study.

INTRODUCTION. Anatomically an infant is not a miniature adult. Although an important muscle in weight bearing and gait, the development of the gluteus minimus (Gmin) architecture has not been studied. Thus, the aim is to determine the 3D spatial relationships of the fibre bundles, aponeuroses and tendons of an infant Gmin, quantify its architectural parameters and compare with the adult (previous study). METHODS. One 6 month old formalin embalmed specimen was used. The contractile and connective tissue elements throughout the volume of Gmin were serially dissected and digitised (Microscribe® G2X) in situ. 3D models were constructed in Autodesk® Maya® using this data. The architectural parameters, fibre bundle length (FBL), pennation angle (PA) and physiological cross-sectional area (PCSA) were calculated and the infant and adult Gmin compared. SUMMARY. The adult and infant Gmin were divided into anterior, middle and posterior parts

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based on fibre bundle arrangement and architectural parameters. In the infant, there were 2 short distal aponeuroses; superior providing attachment for the posterior/middle parts and inferior to the anterior part. The inferior 2/3 of the superficial surface of adult Gmin was covered by a large continuous aponeurosis that became tendinous as it approached the greater trochanter. Mean FBL of the anterior part was longest, and posterior part shortest in both the adult and infant, with infant FBL being approximately 1/3 adult FBL. Mean pennation angle of the middle part of the infant was similar to that of the adult, whereas the anterior and posterior parts were significantly different. CONCLUSIONS. Both adult and infant Gmin had anterior, middle and posterior parts, however, the arrangement of the connective tissue elements and attachment sites of fibre bundles differed. Further study of paediatric Gmin is necessary to elucidate the changes in morphology that occur throughout development to adulthood.

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A Case of Splenomegaly and Myelodysplastic Syndrome.

INTRODUCTION. Splenomegaly is an abnormal enlargement of the spleen which may be secondary to a variety of diseases/infections that generally cause the spleen to increase its workload. An example of a disease that may cause splenomegaly is myelodysplastic syndrome; a condition that affects the development of cells within the bone marrow, resulting in abnormal red blood cells. The purpose of this study was to explore the anatomical relationships within the abdomen of a whole-body donor with this condition. RESOURCES. During a routine dissection in the anatomy laboratory, this condition was identified in a 50-year-old male whose cause of death was myelodysplastic syndrome. DESCRIPTION. Gross measurements of the spleen were found to be approximately 22 x 9 cm, which were in stark contrast to typical measurements of the spleen. The inferior aspect of the spleen extended to approximately the level of the L3 vertebrae. The contents of the gastrointestinal tract were shifted towards the donor's right as a result of the enlarged spleen. SIGNIFICANCE. It is important to understand the anatomical location of abdominal contents in cases of splenomegaly, as well as its relationship with other diagnoses, as these may be of clinical significance. A detailed exploration of the anatomy and comorbidity of splenomegaly and myelodysplastic syndromes will be discussed.

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A High Fidelity 3D Model and Database of the Lower Limb Musculoskeletal System.

INTRODUCTION. Although new technologies have enhanced musculoskeletal modelling, there is a need for intramuscular architectural data in order to increase the fidelity of existing models. Presently, there are no 3D models of the lower limb that have captured the 3D morphology of the contractile elements at the fiber bundle(FB) level, or the location and extent of aponeuroses/tendons. Therefore, the purpose of this study was to construct an architecturally comprehensive 3D model and database of the musculoskeletal system of the lower limb at the FB level. METHODS. Each muscle of the lower limb was serially dissected and digitized, from superficial to deep, until the entire muscle volume had been digitized. A Microscribe® G2X digitizer was used to capture 3D coordinate data of the trajectory and attachment sites of each FB, and the perimeter, surface and location of aponeuroses and tendons. The digitized data was modelled in 3D using Autodesk® Maya®. A database of the digitized data was compiled, and the model used to compare muscle morphology. SUMMARY. In total, more than 40,000 FBs of 50 muscles of the lower limb were digitized. This data enabled construction of a highly detailed and anatomically accurate 3D model of the lower limb musculoskeletal system, as in situ. This model enables volumetric visualization of spatial relationships of FBs and tendons/aponeuroses to determine intramuscular partitioning patterns and regions of musculoaponeurotic junctions. The database consists of 3D coordinate data of each muscle and its architectural parameters (fiber bundle length, pennation angle, physiological cross-sectional area, and volume). CONCLUSIONS. A highly detailed, architecturally comprehensive 3D model and database of all of the lower limb musculoskeletal structures was constructed. This data could be used to develop high-fidelity biomechanical models to further enhance the understanding of the lower limb mechanics.

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Generation of Human iPSCs and Analysis of Their Potential for Osteochondral Regeneration.

INTRODUCTION. Cartilage and bone disorders are a group of acute and chronic traumatic, degenerative, malignant or congenital conditions affecting the joints and bones. Recently, cell-based therapy appears to be promising tool of regenerative medicine and it has attracted attention of many researchers and physicians. The attention is given to induced pluripotent stem cells (iPSCs). METHODS. Adipose tissue-derived stem cells (ATSCs) were isolated from lipoaspirates of healthy female donors (n=5) and expanded in vtro. ATSCs from third passage were reprogrammed by Lipofectamine 3000 reagent transfection system in combination with Epi 5 reprogramming vectors without feeder cells. Obtained iPSCs were characterized by flow cytometry, real time PCR, and by histochemistry. Moreover, their chondrogenic and osteogenic differentiation potential was assessed according to expression of specific genes. Normal fibroblasts and ATSCs were used as negative control. SUMMARY. Distinct colonies of iPSCs started to appear by day 25 after reprogramming. The presence of iPSCs colonies was proved by alkaline phosphatase (AP) live staining. After manual picking the colonies and their subsequent passaging, they did not lose ability to form embryoid bodies, they were positive for AP, Tra-1-60, and SSEA-5. Moreover, obtained iPSCs expressed pluripotency markers Oct4, Sox2 and Nanog, and the expression levels of chondrogenic and osteogenic markers were significantly higher in comparison to control ($p<0.05$). CONCLUSIONS. Obtained results showed that ATSCs are easy accessible and they are suitable for generation of iPSCs, which have potential to differentiate into chondroblasts and osteoblasts. It may be emphasized that after performing further studies focused on their bio-safety and cytogenetic stability they will represent unique tool for osteochondral regenerative medicine. (Sponsored by grant VEGA No. 1/0153/15 from the Ministry of Education, Science, Research and Sport of the Slovak Republic.)

FOGG, Quentin A.[1], Mark HAMLET[2], Casper G. THORPE LOWIS[1] and Neil ASHWOOD[2]. [1]Department of Anatomy and Neuroscience, The University of Melbourne, Melbourne, Victoria 3010, Australia; [2]Department of Trauma and Orthopaedics, Burton Hospitals NHS Foundation Trust, Burton-upon-Trent DE13 0RB, UK.
Optimising Button Fixation on the Lateral Femur for Anterior Cruciate Ligament Reconstruction.

INTRODUCTION. Reconstruction of the ruptured anterior cruciate ligament (ACL) often incorporates suspension fixation with a button for the proximal component of the repair. This typically utilises the diaphysis of the femur distally and laterally to anchor the proximal component. The angle and distance created in establishing this anchorage prohibits use of the same anchor for additional repairs/reconstructions/augmentations, such as might be done for the anterolateral ligament. A more distal anchor to the metaphysis may create opportunities for more extensive repairs. The current study therefore aims to quantify the thickness of the lateral femur distally to ascertain a region of maximum potential for suspension fixation. METHODS. Embalmed knees (n=5) were dissected to remove all soft tissues, and disarticulated. The femur was sectioned transversely 150mm proximal to the joint line, then sagitally through the intercondylar fossa. The lateral block created was then sectioned coronally into 10mm slices. Each slice was immersed in a water-based dye to improve tissue contrast and macro-photographed in high resolution. Digital deletion of trabecular bone and soft tissue remnants under magnification allowed isolated images of the cortical bone to be generated and measured. SUMMARY. Metaphysial cortical bone area diminished through the transition from diaphysis to epiphysis. By the level of the lateral epicondyle there was so little cortical bone that it was often damaged in the removal of overlying soft tissues. CONCLUSIONS. There is a dramatic decrease in cortical thickness in the distal metaphysis of the femur laterally. This suggests that more distal fixations will have diminished pull-out strength and therefore an increased risk of post-operative failure. Histological and biomechanical studies will provide further confirmation, but these data suggest that distal metaphysial fixation may increase the risk of negative outcomes from ACL reconstruction.

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Distal Interactions of the Quadratus Plantae Muscle.

INTRODUCTION. The precise anatomy of the quadratus plantae muscle (QPm) is poorly understood. It is commonly understood to attach distally to the plate of the flexor digitorum longus (FDL) tendon, but recent research has suggested that this description is insufficient. The current study aims to clearly describe the distal attachment of the quadratus plantae muscle. METHODS. Embalmed cadaver feet (n=24) were dissected using a fascicular mapping approach. The FDL tendon and QPm were initially kept intact whilst careful dissection removed the flexor digitorum brevis muscle and lumbrical muscles. Particular care was needed to separate tendons distally without disrupting the deeper tendons. SUMMARY. Most specimens (n=19; 79.2%) had superficial and deep muscle bellies clearly separated by fascia. The superficial head was less bulky than

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the deep head and was attached to the plate of the FDL tendon superficially (plantar). All specimens (n=24; 100%) had a deeper, bulkier head that did not interact directly with the FDL tendon. This muscle belly separated into tendinous slips that continued distally to the toes. Either two (35%), three (58%), or four (8%) individual tendons were observed to the second to fifth rays. These tendons were deep to the FDL tendons, bound to them by an investing fascia. CONCLUSIONS. The QPm was observed to have distal tendons for the second to fifth rays. These tendons were distinct from the FDL tendons within the foot, giving anatomical evidence to the physiologic suggestion that the QPm is the principle flexor of the lesser toes. They may easily evade detection due to their fascial entrapment to the dorsum of the FDL tendons; these separate tendons should be considered during exploration and surgical repair/harvest of tendons in this area.

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Surgical Anatomy of Heart Transplantation - 50 Years of History.

INTRODUCTION. The first human to human orthotopic heart transplant in the world took place on 6th December 1967 through the hands of Christiaan Barnard in Cape Town – South Africa.The 50th anniversary of this landmark surgery was recently celebrated worldwide.Focused on anatomy a brief resume is presented of the surgical anatomy landmarks of this iconic surgery. RESOURCES. A revision of literature is made concerning surgical anatomy of heart transplantation and its evolution across time until our days usual practice. DESCRIPTION. On the scope of clinical/surgical anatomy a resumed history of the techniques applied across time and updated in order to better anatomical and surgical outcomes are presented in what concerns this landmark and life saving surgery. SIGNIFICANCE. Looking through the past we can better understand the present and the future.Clinical application of human anatomy to the surgical context is undoubtedly a way to bring renewed interest and enthusiasm to the learning and teaching of clinical human anatomy.

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Protocol for En Bloc Removal of Viscera and Vasculature of the Thoracic and Abdominopelvic Cavities.

INTRODUCTION. Understanding the complex 3-dimensional relationships of anatomical structures is key to learning anatomy. Traditional cadaveric dissection approaches involve removal of individual organs or parts of systems. Here we describe a protocol developed for en bloc removal of viscera and major vasculature from the oral cavity, continuing through the neck, thorax, abdomen, pelvis and ending in the perineum. RESOURCES. Two people are necessary to complete this protocol. A bone saw is required in addition to traditional dissection tools. DESCRIPTION. With the cadaver in prone position, an incision is made encircling the anus and external genitalia. The cadaver is then placed in supine position. Incisions outlining the anterior trunk wall are made from the sternal notch, along the clavicles, mid-axillary lines, and inguinal region to the pubic symphysis. The clavicles and ribs are exposed then cut to allow for the bones and soft tissues of the anterior trunk wall to be removed en bloc. Care is taken to avoid structures emerging from the superficial inguinal ring. In the male, the scrotal sac is opened and the testes and spermatic cord are freed. Soft tissues of the neck are cut for access to the retropharyngeal space. Oral floor attachments to the mandible are severed. The tongue is retracted and the soft palate and oropharynx incised from bony attachments. As these structures are retracted inferiorly, soft tissue, small arteries, and veins are cut. Pelvic ligaments, fascia and parietal vasculature are incised. Muscles of the pelvic floor are cut to allow the anus and external genitalia to be pulled superiorly through the pelvis. As a result, viscera and vasculature of the neck, thorax, abdomen, pelvis and perineum, are removed en bloc along with the major vasculature. SIGNIFICANCE. The protocol described allows learners to further appreciate regional anatomy and anatomic relationships of viscera and major vessels from various views.

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Length of Insertion and Thickness of the Calcaneal Tendon: An Ultrasound Study.

INTRODUCTION. The Calcaneal Tendon (CaT) is the largest and strongest tendon frequently affected by pathologies that appear to be related to tendon thickness and age. A recent MRI study suggests a decrease in the Length of Insertion (LoI) of the CaT on the calcaneus with age. This study aims to investigate the tendon thickness and LoI in-vivo through ultrasound in a healthy population. METHODS. One hundred CaTs from 50 Participants, (32 males and 18 females) aged between 19 and 62 (mean 29.2±10.4 years) were investigated using a GE Logiq e ultrasound system with a 12L-RS transducer. Total tendon length was identified from the musculotendinous origin to the calcaneal insertion. Tendon thickness and Cross-Sectional

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Area (CSA) were measured at the midpoint of the distal half of the tendon in the transverse/short-axis and LoI measured in the longitudinal/long axis. All ultrasound measurements were taken by built-in callipers. Participants' height and weight were taken and Body Mass Index (BMI) calculated. SUMMARY. CaT LoI and CSA in males were 1.05± 0.17cm (right); 1.11±0.22cm (left) and 0.57±.10cm2 (right); 0.60 ±0.11cm2 (left) respectively. In females LoI and CSA were 0 .96±0.10cm (right); 0.93±0.10cm (left) and 0.57±0.38cm2 (right); 0.48±0.11cm2 (left) respectively. CaT LoI, CSA and thickness were significantly influenced by BMI and sex. LoI is positively correlated to intensity of exercise (All p-values<0.05). No correlation was found between age and the measured variables. CONCLUSIONS. Ultrasound assessment is an effective means of determining changes in CaT LoI, CSA and tendon thickness across individuals with differing BMI, gender and exercise level. Further work with a larger pool of elderly participants could provide insight into the effects of aging on the Calcaneus tendon and improve our understanding of the higher frequency of tendon injuries in the elderly.

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Evaluation of Bronchopulmonary Segments Variations Using Three-Dimensional Segmentation of CT Scans.

INTRODUCTION. Recognising common tracheobronchial variations helps guide bronchoscopic studies and surgical approaches. The aim of the study is to quantify the frequency of common variations in the bronchopulmonary segments. METHODS. Forty thorax CT scans were obtained from EXACT 09 segmentation study. The airways of each scan were reconstructed from the CT scans using Mialite. Two experienced subject experts (anatomist and radiologist) independently evaluated the 3D airway models. After reaching consensus, variations were classified based on type and location. SUMMARY. In the right upper lobar bronchus, the most common branching patterns were the trifurcation of apical (B1), posterior (B2) and anterior (B3) (63.9%), followed by bifurcation patterns B1, 2+3 (13.89%), B1+2, 3 (11.1%), B1+3, 2 (11.1%). In the right middle lobe, most had lateral (B4) and medial (B5) bifurcation patterns with a few accessory bronchi (8.57%). In the right lower lobe, the three most common branching patterns of basal segments were the anterior basal (B8), lateral basal (B9) + posterior basal (B10) bifurcation (60%), B8, 9, 10 trifurcation (15%), and B7, 9, 10, trifurcation (10%). In the left upper bronchus, the most common branching patterns were the B1+2,3 bifurcation (75.8%), B1+3,2 bifurcation (9.1%) and trifurcation B1, 2, 3 (6.1%). In the lingular division bronchus, bifurcation patterns B4+5 (89.2%) and accessory bronchi (10.9%) were reported. In the left lower lobe, the two most common variations include bifurcation patterns B7+8, 9+10 (72.73%) and B8, 9+10 (12.1%). Subsuperior segments were also reported in both right and left lower bronchi. CONCLUSION. Our study has reported the classification of variations in bronchopulmonary segments based on CT data that is both clinically relevant and corroborates current tracheobronchial anatomy studies. We propose radiological studies as a viable alternative to cadaveric dissection for studying anatomical variations.

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Unusual Ovarian Histologic Findings in a Case of Nager Syndrome and a Possible Shared Etiology.

INTRODUCTION. Nager acrofacial dysostosis, or Nager syndrome, is a rare condition with less than 100 reported cases and is marked primarily by abnormalities in bone development. Most cases of Nager syndrome are caused by mutations in the SF3B4 gene whose protein product is known to be involved in the bone morphogenetic protein (BMP) pathway. However, less is known about abnormalities beyond the musculoskeletal system in this condition. RESOURCES. We examine the gross, radiologic, and histologic findings from the autopsy of a 22-month old female with Nager syndrome, including both expected and previously unreported findings. DESCRIPTION. The patient was found to have the SF3B4 mutation as well as classic features of Nager syndrome including severe micrognathia, radial hypoplasia, oligodactyly of the hands, clinodactyly of the feet, and shallow-to-absent external acoustic meatuses. However, histologic examination of the ovaries also revealed follicular abnormalities including follicular cysts and developing antral follicles. Such findings are highly unusual in a patient of this age, thus suggesting they may be related to the underlying Nager mutation. SIGNIFICANCE. The SF3B4 protein is known to interact with BMPR1A, which is recruited and phosphorylated by BMPR2 when BMPR2 is bound by one of its ligands. Two such ligands for BMPR2 happen to be Gdf9 and BMP15. Interestingly, while mutations in both alleles for either Gdf9 or BMP15 are known to cause sterility in sheep, those with a single mutant allele are, paradoxically, superovulatory. Therefore, we raise the possibility that haploinsufficiency of SF3B4 has a similar effect on the pathway, resulting in the patient's ovarian histology. While the major features of Nager syndrome involve abnormalities of face and limb development, here we describe a case with atypical ovarian findings which may represent an additional manifestation of the same genetic mutation.

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Assessment of Coronary Artery Ostia Morphology by Computed Tomographic Angiography.

INTRODUCTION. Coronary arteries are the main target of diagnostic and therapeutic procedures within the human heart. However, detection of coronary artery ostium during transcatheter procedures and its catheterisation remains a challenge in some cases. Computed tomography of the heart provides accurate and noninvasive assessment for aortic root and coronary arteries. The aim of this study was to assess localization of coronary artery ostia in the aortic sinuses and to determine their morphology. METHODS. A total of 100 patients (53.0% females), who underwent contrast-enhanced electrocardiogram-gated multi-slice computed tomography of the heart were investigated. Scans were evaluated during the 70% phase using transverse projection and multiplane reconstruction, as needed. SUMMARY. Left coronary artery was present in all cases as a single vessel originating from the left aortic sinus in 91% of all cases and above the left sinoatrial junction in the remaining 9%. In 53% of hearts the left coronary ostium was located below the plane of the left node of Arantii. The mean ostium diameter for left coronary artery was 5.4 ± 1.2 mm. The right coronary artery was originated from the right aortic sinus in 83% of all hearts and above it in the remaining 17%. In 12% of cases accessory coronary artery ostium was found within the right aortic sinus. In 41% of hearts the right coronary ostium was located below the plane of right node of Arantii. The mean ostium diameter for right coronary artery was 5.0 ± 1.0 mm and it was statistically significant smaller than the left ostium ($p=0.01$). CONCLUSIONS. The coronary artery ostia are not always located within the aortic sinuses and may be situated above the sinoatrial junction. In 12% of hearts we can expect the accessory ostium of the right coronary artery in the right aortic sinus. The ostium of the right coronary artery is significantly smaller than the left coronary artery ostium.

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Bilateral Variant Hamstring Musculature with an Aberrant Sciatic Nerve and Sternalis Muscle.

INTRODUCTION. Anatomical variations of the sciatic nerve significantly impact the structure and function of nearby musculature and vasculature. The presence of an accessory muscle slip within the hamstrings with sciatic nerve variation is a rare finding. In addition, bilateral muscular slips have never been reported. This case report displays a rare sciatic nerve variant (reported in less than 1%) with multiple muscular variations in the same cadaver. The purpose of this study is to correlate the relationship between the high division of the sciatic nerve and the function of the piriformis, and to widen the knowledge on muscular slips within the hamstrings and sternalis muscle. RESOURCES. This report follows the dissection of the gluteal region, posterior thigh, and pectoral region in a 78-year-old Caucasian male cadaver. The structures in these regions were dissected and examined for variations in muscle morphology, innervation, and blood supply. DESCRIPTION. During the dissection of the right gluteal region and posterior thigh, the tibial and fibular divisions of the sciatic nerve were discovered to arise in the pelvis, directly from the lumbosacral plexus, emerging at the inferior and superior border of the piriformis respectively. The hamstrings bilaterally revealed a muscular slip in the mid-thigh with fibers coursing from the biceps femoris to the semitendinosus. A sternalis muscle was found in the right pectoral region. SIGNIFICANCE. Although muscular and nerve variants are commonly asymptomatic, sciatic nerve variation is suspected as a possible cause of piriformis syndrome. The muscular slip in the hamstring region has a potential to cause hamstring strain and sciatic nerve compression. The possibility of a sternalis muscle must be familiar to clinicians as it can be used as a pedicle flap during reconstructive surgery. Knowledge of anatomic variation is valuable for clinicians to be aware of due to its surgical and clinical implications.

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An Ultrasound Study of the Effect of Leg Crossing on Lower Limb Vasculature.

INTRODUCTION. Leg position is implicated in the pathogenesis of both Deep Vein Thrombosis (DVT) and varicose veins. Published literature correlates leg crossing with changes in the peripheral circulation and blood flow. This study aims to investigate the effect of leg crossing on the diameters of the Popliteal (PV), Great (GSV) and Small Saphenous (SSV) Veins and the effect on Mean Arterial Pressure (MAP) using ultrasound in healthy participants. METHODS. The legs of 30 participants (14 females, 16 males) between the ages of 22 and 29 were scanned bilaterally by a single observer using a GE LOGIQ e ultrasound system with a 12L-RS transducer. Participants sat with their feet flat on the ground for 2 minutes

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before initial blood pressure was taken, followed by ultrasound examination and measurement of the PV diameter at the popliteal fossa and GSV and SSV diameters above and below the expected point of compression (POC) from leg crossing. Participants were then asked to cross their legs for 2 minutes before blood pressure and vein diameter measurements were repeated. SUMMARY. The MAP significantly increased from 93.83±7.63 mmHg to 97.14±8.10 mmHg after leg crossing. All veins decreased in diameter with leg crossing with a significant change in the PV, GSV-above POC, GSV-below POC and SSV-above POC. Vein diameters were not influenced by body side but appear to be influenced by sex (all p-values<0.05). Variations in venous drainage including duplicated PV and segmental absence of the GSV were noted in 33.33% (20/60) of the legs investigated. CONCLUSIONS. Current theories imply that compression resulting from leg crossing could potentially impede venous return and result in pathologies. The results obtained from this study do not corroborate these theories, and the observed reduction in vein diameter warrants further investigation. Venous variations have important implications for the diagnosis of DVT and accurate interpretation of imaging studies of the lower leg.

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The Inferior Gluteal Nerve has a Cutaneous Branch in the Majority of Individuals.

INTRODUCTION. The inferior gluteal nerve (IGN) is traditionally described as a solely motor branch innervating the gluteus maximus. During routine dissection of the gluteal region, a cutaneous nerve of the IGN was identified. As the gluteal region is vulnerable to the development of pressure ulcers, a comprehensive understanding of its cutaneous innervation is important. Therefore, the aim of this study was to elucidate the anatomy of this cutaneous branch of the IGN in a series of cadavers. METHODS. Ten sides from five fresh-frozen cadaveric specimens were dissected. When a cutaneous branch was identified piercing the gluteus maximus, its origin from the IGN was verified and the diameter and length of it measured. Additionally, for localization, the distance from the midline to the exit point of the cutaneous branch from the gluteus maximus was measured. SUMMARY. One to two cutaneous branches were identified as arising from the IGN on six sides (60%). The branch(es) were located in the lower right quadrant of the gluteus maximus. These branches had a mean distance of 12.5 cm from the midline. Their mean diameter and length was 0.7 mm and 28.6 cm, respectively. On all sides with a cutaneous branch of the IGN, the skin over the posterior aspect of the greater trochanter was innervated by superior and inferior cluneal nerves and supplemented by cutaneous branches of the IGN. Side or sex was not a predictor of the presence of a cutaneous branch of the IGN. CONCLUSIONS. To our knowledge, a cutaneous branch derived from the IGN has not been previously described. Based on our cadaveric findings, the majority of individuals will have the area of skin over the greater trochanter innervated by this nerve. Therefore, surgeons and pain specialists should be aware of its presence and might develop surgical procedures that help avoid it or develop technical advances that target it for various pain syndromes in this area.

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Anterior Talofibular Ligament (ATFL) Relations to Surrounding Ligamentous Structures.

INTRODUCTION. The lateral collateral ligament of the ankle, especially the anterior talofibular ligament (ATFL), is commonly subject to trauma in ankle sprains. Isolated and combined injury of the ATFL with the calcaneofibular ligament (CFL) have been reported in 80% and 20% of cases respectively. METHODS. In the current study the relationship between the ATFL, CFL and lateral talocalcaneal ligament (LTCL) were investigated in 68 feet from 36 formalin embalmed cadavers. SUMMARY. The proximally formed angle between the ATFL and CFL was 117°. In the single band form the ATFL separated from the CFL 4.32 mm distal to ATFL proximal attachment. In the two band form the proximal CFL fibers blended with the inferior band (IATFL) in 86.7% of specimens, separating 5.42 mm distal to the ATFL proximal attachment: with 23.1% also being separate a further 1.5 mm proximal to the IATFL proximal attachment. Distally, 54.3% of ATFLs had an attachment to the IATFL, separating 6.07 mm proximal to ATFL distal attachment: with 78.9% ATFLs extending a further 3.14 mm distally from IATFL distal attachment. Furthermore, the IATFL had a distal attachment to the LTCL in 95.2% of specimens, separating from it 6.68 mm proximal to the IATFL distal attachment: with 45% extending a further 2.43 mm distally from the LTCL. CONCLUSIONS. Understanding the relationship and blending of the ATFL with surrounding ligaments should aid in understanding the mechanism of injury and how other ligaments may be associated with ATFL injuries.

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Anomalous Origin and Course of the Left Common Carotid Artery – A Case Report.

INTRODUCTION. Origins of the common carotid arteries differ on the right and left sides. The right common carotid artery arises from the brachiocephalic trunk whereas the left common carotid artery originates from the arch of aorta. RESOURCES. Dissection on an 85-year-old female cadaver was performed in our gross anatomy lab. The superior mediastinum and neck were dissected. The course and branches of the arch of aorta were observed and variations were noted. DESCRIPTION. The left common carotid artery was seen to be originating from the brachiocephalic trunk instead of the arch of aorta. During early development, each side of the aortic sac is connected with the corresponding dorsal aorta by six pairs of aortic arches. With further development, these aortic arches are transformed to form the normal vascular pattern. The aortic sac bifurcates into a right and left horn. The right horn forms the brachiocephalic trunk whereas the left horn forms part of the arch of aorta in between the brachiocephalic trunk and the left common carotid artery. Incomplete bifurcation of the aortic sac into its horns gives rise to the anomalous origin of the left common carotid artery from the brachiocephalic trunk, as seen in our case study. The tortuosity of the left common carotid artery is due to the curved courses taken by the aortic arch arteries from the distal portion of the aortic sac to the dorsal aorta. SIGNIFICANCE. To know of the presence of variations in the origin and course of the arteries arising from the arch of aorta is of clinical value to avoid complications when performing surgical or interventional radiological procedures in the superior mediastinum and root of the neck. Also, the incidence of cerebrovascular disease was reported to be higher in this anomaly (23.5%, whereas normally it is 12%). This may be due to the shifting of the left common carotid to the right side where it comes in a straighter alignment with the ascending aorta.

LANGLEY, Natalie R.[1], Sonya E. VAN NULAND[1], Shreya SHETTY[2], Tiffany WEIDNER[2], Patrick HANGGE[2], and Tonia M. YOUNG-FADOK[2]. [1]Department of Anatomy, Mayo Clinic College of Medicine and Science, Mayo Clinic, Scottsdale, AZ 85251, USA; [2]Department of Surgery, Mayo Clinic, Phoenix, AZ 85054, USA.
Anatomic Evidence of the Effectiveness of Modified Quadratus Lumborum Blocks.

INTRODUCTION. Anesthetic injections in the fascial plane around the quadratus lumborum (QL) muscle enable tailored intraoperative administration of anesthesia to facilitate perioperative pain management and enhance postoperative recovery. This study examines analgesic spread of modified QL blocks administered via ultrasound guidance or a laparoscopic port. Conventional QL blocks are administered within QL muscle fascia formed by the anterior layer of the thoracolumbar fascia. However, these blocks require repositioning the patient to reach the QL muscle and extend operating time. We hypothesize that a modified QL block administered within the transversus abdominus (TA) muscle fascia of a supine patient may achieve similar analgesic effect compared to conventional approaches due to the continuity of the TA fascia with the anterior layer of the thoracolumbar fascia. METHODS. A methylene blue and saline solution (40mL) was injected into 14 unembalmed cadavers. With the patient in supine position, the needle tip was placed along the midaxillary line within the TA plane using laparoscopy or ultrasound. Dissection of the injection plane was performed to determine the extent of dye spread. SUMMARY. The subcostal nerve was dyed in all specimens, iliohypogastric in 75%, and ilioinguinal in 67%. The superior-inferior extent of the dye ranged from the caudal border of the 11th to the superior border of the iliac crest. The medial to lateral spread ranged from the midaxillary line to the lateral border of the QL muscle. CONCLUSIONS. Modified QL blocks may achieve the same analgesic results as conventional approaches, interrupting innervation to the abdominal skin, muscles, and parietal peritoneum. Further studies will collect patient data on the analgesic effects of the modified QL blocks to validate conclusions in a clinical setting. This form of intraoperative pain management may reduce postoperative opioid use and help surgeons address the opioid epidemic in United States.

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Mapping the Anatomical Variations of Subcutaneous Nerves surrounding the Knee.

INTRODUCTION. Current incision locations for repair of the anterior cruciate ligament show no reason why the saphenous nerve should be affected, thus suggesting that anatomical variations of the saphenous, as well as other nerves surrounding the knee, may exist to explain post-operative numbness in the lower leg. In our study, we set out to map the pathways of subcutaneous nerves around the knee, with the purpose of noting any relevant variations that could explain post-operative paresthesia around the ankle following routine repair of the anterior cruciate ligament. METHODS. In this pilot study, dissections were performed and completed on six cadaveric lower limbs to map the nerve pathways of the lateral and anterior femoral cutaneous nerve, and the saphenous nerve, altogether. This mapping was done to see if there was any relation between their pathways, as well as to see if there were any undocumented nerve pathways that could contribute to post-operative numbness in the medial, lower leg. Pathways were photographed, and inter-subject tracings were overlaid. SUMMARY. Many of the pathways from the anterior femoral cutaneous nerve pass over the surface of the patella.

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Additionally, a large branch of the saphenous nerve passes inferior to the patella, over the location where an incision would be placed during a knee surgery. In two specimens, the saphenous nerve divided about midway down the thigh, with one portion passing inferiorly to the medial epicondyle of the femur, and the other passing above the medial epicondyle. CONCLUSION. While no common pathway was discovered between the subcutaneous nerves around the knee and the medial, lower leg, the commonality of division of the saphenous nerve above the knee suggests that a saphenous pathway that runs more anteriorly instead of medially may exist. Further study of nerve pathways and connections around the knee must be made to determine the connection between subcutaneous nerve pathways and post-operative numbness.

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Ligamentous Structure in Human Glans Penis: A Homologue of the Baculum?

INTRODUCTION. Although there is no os penis (baculum) in the human glans, a strong equivalent ligamentous structure is arranged centrally along the distal urethra as a supporting trunk for the glans penis. METHODS. Forty-two glans penis of formalin-embalmed cadavers were sagittally bisected along the course of the distal urethra and photographed. Dense connective tissues adjacent to the external urethral meatus cropped and underwent Masson's trichrome staining. SUMMARY. The mean of the maximal circumference of the glans penis was 101.8 ± 13.0 mm and mean of the diameter was 30.1 ± 3.7 mm. 59.5% of specimens had distinct fibrous bands elongated from the tunica albuginea of the corpus cavernosum in the penile shaft to the distal end of fossa terminals, whereas, the fibrous bands did not reach the distal tip of glans penis in 30.9%. Others existed as dispersed distributions in the upper corpus spongiosum (4.5%) or obscure tissues (4.5%). CONCLUSIONS. Diverse morphology of dense connective tissues on the dorsal glandular urethra is suspected to contribute to varying degrees of flexibility, rigidity, and tissue strength in human glans penis.

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Unusual Vascular Variations of the Left Kidney: A Case Study.

INTRODUCTION. Accessory renal arteries typically arise from the abdominal aorta, superior to the main renal artery and have a reported frequency of 9-76%, with an average of 28%. The incidence decreases with each additional accessory artery, such that three accessory renal arteries have only been identified in 0.2-2.0% of specimens. Accessory renal veins exit the kidney and typically enter the inferior vena cava separate from the main renal vein. They are much less common than accessory renal arteries with a frequency of 0.4-6%. RESOURCES. Using standard dissection techniques, abdominal viscera were reflected for dissection of the posterior abdominal wall. The abdominal aorta, superior mesenteric artery, inferior mesenteric artery, common iliac arteries, and renal arteries and corresponding veins were visualized and measured. DESCRIPTION. The right renal blood supply was typical. Three accessory renal arteries and two accessory renal veins were identified on the left side. One accessory artery originated from the posterolateral abdominal aorta and entered the kidney at the hilum superior to the main renal artery, and two accessory arteries originated from the left common iliac artery and entered the kidney's inferomedial and inferolateral pole. The corresponding accessory vein from the inferomedial pole of the kidney emptied into the left common iliac vein, whereas the accessory vein from the inferolateral pole emptied into a lumber vein posterior to the abdominal aorta. SIGNIFICANCE. Not only was the number of accessory renal vessels in this specimen unusual, but the branching pattern is extremely rare. Clinically, knowledge of these variations is important for surgeons to prevent accidental trauma during procedures such as transplantation, vascular reconstruction, and abdominal aortic aneurism reconstruction. Additionally, the presence of accessory renal vessels has been associated with renal pathology such as hypertension and hydronephrosis.

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Hypoplasia of Clavicular Head of Pectoralis Major with Ipsilateral Upper Extremity Anomalies.

INTRODUCTION. Poland Syndrome is a rare congenital malformation characterized by unilateral complete or partial agenesis of the Pectoralis Major muscle. It is most commonly associated with a thin subcutaneous layer of fat, ipsilateral agenesis or hypoplasia of the Pectoralis Minor, and ipsilateral brachysyndactyly. Right sided Poland Syndrome is more prevalent and is of higher occurrence in males than in females. However, there are varying degrees of associated symptoms including the upper limb and thoracic cage. METHODS. Routine cadaveric dissection of an 83-year-old male was performed. Cause of death was hypoxic respiratory failure due to aspiration pneumonia associated with chronic interstitial fibrosis. SUMMARY. Severe hypoplasia of the clavicular head of the left Pectoralis Major is associated with hypoplasia of the sternocostal head. There is ipsilateral hypoplasia of Pectoralis Minor, ipsilateral brachydactyly, and hypoplasia of the musculoskeletal structures

of the ipsilateral brachium, antebrachium, hand, and several extrinsic back muscles. Of note, the coracobrachialis is severely underdeveloped in both length and diameter. Left Biceps Brachii diameter measures 16.38 mm versus 31.06 mm on the right. Affected Humerus length is 27.5 cm versus 31.3 cm. Affected humeral diameter is 19.84 mm versus 28.30 mm. Affected Radius length is 26.2 cm versus 28.3 cm. Affected radial diameter is 14.71 mm versus 18.30 mm. Affected hand length 17.3 cm versus 19.5 cm. Diameter at the PIP of the 3rd finger measures 14.71 mm versus 18.30 mm. CONCLUSIONS. Based on our cadaveric study and osteological measurements, this cadaver is likely a case of Poland Syndrome including severe clavicular head hypoplasia and hypoplasia of the sternocostal head of Pectoralis Major. Hypoplasia of the ipsilateral Pectoralis Minor, brachydactyly, and musculoskeletal structure in relation to the movement of the upper limb is further evidence of Poland Syndrome.

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Cadaveric Study of the Aortic Zones for Resuscitative Endovascular Balloon Occlusion of the Aorta.

INTRODUCTION. The Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) catheter is a device that is percutaneously deployed for emergency control of massive hemorrhage. The REBOA catheter is positioned in Zone 1, between the left subclavian artery and celiac trunk, or Zone 3, the infrarenal aorta. This study investigates variation in the distance to the optimal Zone 1 landing zone from the right femoral artery puncture site. Variation in the distance from the puncture site to the inferior mesenteric artery (IMA) was also measured to optimize Zone 3 positioning. Zone 3 is used to control lower extremity, pelvic, and postpartum hemorrhage. A height-based equation was developed to estimate REBOA catheter placement in Zone 3. METHODS. Demographics were obtained from records of 47 dissected donors. Zone 1 vessel lengths were grossly measured on all 47 donors. The Zone 3 distances from a right femoral artery puncture to the aortic bifurcation and the IMA were measured on the 23 female donors. SUMMARY. The average age was 74 years. Average height was 167.0 cm (SD 9.8). The average distance from the right femoral artery puncture to celiac trunk was 33.6 cm (SD 3.2). The average distance from the right femoral puncture to the left subclavian artery was 58.5 cm (SD 4.3). For the female donors, the average distance from the right femoral artery puncture to the aortic bifurcation was 18.7 cm (SD 1.7), and the average distance from the right femoral artery puncture to the IMA was 23.1 cm (SD 1.9). A proposed equation of D=(H/10)+6, where D=deployment distance (cm) and H=height (cm), accurately predicted Zone 3 placement in all 23 donors, with 65% (15 of 23) caudal to the IMA. CONCLUSIONS. There is marked variation in the distances between the branches of the aorta, and a height-based equation may guide REBOA catheter placement. This study was limited by the predominantly elderly population. Anatomic cadaver studies may provide data relevant to novel medical devices.

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Popliteal Vascular Entrapment Syndrome: Accessory Slip of the Medial Head of the Gastrocnemius.

INTRODUCTION. The musculotendinous structures of the popliteal fossa (PF) create a channel for the vasculature of the lower extremity (LE). In rare cases, this channel is disrupted and can deviate or occlude the vasculature supplying the LE. This anatomical anomaly, known as popliteal vascular entrapment syndrome (PVES), is a clinically important cause of exercise induced claudication and ischemia of the distal LE that dissipates post-exercise. RESOURCES. A unilateral, abnormal relationship between the medial head of the gastrocnemius muscle (MHGM) and the vasculature of the PF was observed during routine class dissection of a traditionally embalmed sixty-three-year-old Caucasian female donor. Connective tissue was removed to observe this relationship. DESCRIPTION. Dissecting the PF of the left LE led to the discovery of an accessary slip of the MHGM. Originating in the intercondylar space, the slip ran laterally to the popliteal artery, vein, and tibial nerve before inserting distally onto the MHGM. This aberrant relationship can lead to occlusion of the vessels with flexion of the gastrocnemius. A large blood-filled area was observed surrounding dilated, engorged vessels with branches trapped within the muscular tissue. SIGNIFICANCE. This variation of PVES is very rare and literature is scarce due to limited knowledge. With this lack of knowledge and presenting similar symptoms, PVES is often misdiagnosed as chronic exertional compartment syndrome. It is very important that practitioners and surgeons be aware of PVES, because left untreated, the compression trauma to the vessel walls will eventually lead to premature localized atherosclerosis. To prevent this, athletes complaining of persistent distal LE pain, especially occurring at the same point during exercise, should be screened for PVES by use of Computed Tomography Angiography, Magnetic Resonance Imaging or Magnetic Resonance Angiography to ensure a correct diagnosis.

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Anatomical Placement of Percutaneous Neuromodulation Electrodes Suitable for Clinical Studies.

INTRODUCTION. With increased emphasis on reduction of opiates in management of post-surgical pain, suitable clinical test systems are necessary to evaluate efficacy of neuromodulation devices designed to treat acute pain. We have performed anatomical studies of human cadavers to determine suitable locations for percutaneous placement of novel neuromodulation devices adjacent to sensory nerves in the lower leg. METHODS. In 10 human cadavers, cutaneous tissue was carefully removed bilaterally from just superior to the patella to the medial malleolus. Numerous observations medially and mediolaterally were made to track the variability in the path of the saphenous nerve (SN) relative to the saphenous vein, its branches, and the tibial bone. From this data, potential locations for percutaneous neuromodulation electrode placement were identified and developed. SUMMARY. The diameter of the SN below the patella ranges from 2mm at a point just below the infrapatellar branches, to 1.5mm at the medial malleolus. Some variability in SN coursing was noted within the 10 cadavers examined, and the proximity with relative depth of the saphenous vein to the SN excluded the region representing two-thirds of the length of the tibia inferior to the patella as a potential site for electrode placement. The location for percutaneous neuromodulation electrode placement was found to be to be within a 7 to 16cm window at the lower one-third of the tibia inferior to the patella and superior to the medial malleolus. The SN at this location is readily visualized using ultrasonography to aid in placement of electrodes against the nerve. CONCLUSIONS. A suitable below-knee location on the SN for percutaneous placement of neuromodulation devices is proposed. The SN in this region represents a suitable sensory nerve in which neuromodulation devices can potentially be utilized in investigational protocols in human subjects.

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Novel Anatomical Access to the Saphenous Nerve for Pain Block Placement in Total Knee Arthroplasty.

INTRODUCTION. The saphenous nerve (SN), a sensory branch of the femoral nerve, innervates the knee joint. One of the methods for managing acute post-operative pain following total knee arthroplasty (TKA) is achieved by injecting local anesthetic directly into the adductor canal (AC) under ultrasound guidance. This SN block is typically accomplished as an additional procedure to the TKA. To obviate the need for this procedure, we investigated the feasibility of placing an infusion catheter into the AC under direct visualization at the time of TKA surgery for continued delivery of local anesthetic to the SN. METHODS. In the human cadaver, a standard AC nerve block was performed under ultrasound guidance using saline colored with green dye, a surrogate anesthesia solution. Superficial tissues above the knee were carefully retracted to visualize the sartorious and vastus medialis muscles. An incision was made in the vastus medialis, superior and medial to the patellar, to allow for the insertion and advance of the 1mm-diameter. infusion catheter to reach the AC without ultrasound guidance. The 2ml volume of saline colored with blue dye was then injected into the catheter. The thigh was dissected for visualizing the exact location of tissues colored by the solutions. SUMMARY.Tissues stained by surrogate nerve blocks were clearly visualized and co-located at the AC. Further, additional tissues located along the femoral nerve branch were stained with the blue dye (catheter block). CONCLUSIONS. In the human cadaver, this novel approach to delivering anesthetic to the nerves innervating the knee joint has potential benefit of reaching the SN and nerve branches without affecting regional motor function. We have successfully demonstrated the feasibility of a novel method to providing nerve conduction block during TKA with the advantage of eliminating additional clinical procedures.

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Stem Cell Research and It's Clinical Implications in the Kingdom of Saudi Arabia.

INTRODUCTION. Stem cells have the potential to treat a wide range of diseases and conditions that plague millions of people around the world. Stem cell therapy is a treatment that replaces dysfunctional or diseased tissues with stem cells. Stem cell therapy may hold the key for treating incurable diseases in future. There are advantages of using adipose tissue as a source of stem cells. Adipose tissue is one of the richest sources of mesenchymal stem cells in the body. Adipose derived stem cells have been proven to produce important growth factors for wound healing. They modulate the immune system, decrease inflammation, and heal the injured tissues. METHODS. In this review, we compiled the latest data from 75 articles obtained from Google Scholar, PubMed Central (PMC), National Center for Biotechnology and Information (NCBI), US Department of Human and Health Services (HHS Public Access) and articles related to ethical perspectives taken from Saudi Arabian journals to highlight the importance of advanced stem cell research in the degenerative disorders prevalent in Kingdom of Saudi Arabia. SUMMARY. The field of regenerative medicine is approaching translation to clinical practice, and significant safety concerns and knowledge gaps have become clear as clinical practitioners are considering the potential risks and

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benefits of cell-based therapy. The role of animal models for gaining this information has increased substantially. There is an urgent need for novel animal models to expand the range of current studies, most of which have been conducted in rodents. CONCLUSIONS. Since Saudi Arabia has embraced the area of new therapies that emerge from stem cell research, it is imperative that more animal model experiments should be conducted especially in the field of osteoporosis and other neurodegenerative disorders which are common in Saudi Arabia, to find out the efficacy of stem cell therapy to improve the quality of life.

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Biomechanics Behind the Age-related Changes in the Anatomy of the Achilles Tendon Insertion.

INTRODUCTION. The insertion point of the Achilles tendon (AT) into the calcaneal bone (CB) is known to be highly variable. However, only a few studies have investigated the cause of this variability. The aim of this study was to evaluate if the AT insertion point on the CB changes with age and how this influences the biomechanics of the AT. METHODS.A total of 202 foot and ankle MRI scans were evaluated to assess the AT and its insertion into the CB using the following measurements: distance from the most inferior point of the CB to the most inferior point of the AT's insertion, length of the AT's insertion, and height of the CB. The age of patients ranged from X to XX years (mean: 40.15±18.58). Patients were classified into three groups based on age: (I) <18, (II) 18-65, and (III) >65 years old. Statistical analysis included one-way analysis of variance (ANOVA) and Fisher's least significant difference (LSD) procedure. A p-value of <0.05 was considered statistically significant. SUMMARY. The mean distances from the most inferior part of the CB to the most inferior point of the AT's insertion were 1.12±0.32cm, 1.42±0.28cm, and 1.71±0.33cm for groups I, II, and III, respectively. Differences between these groups were statistically significant ($p<0.001$). To confirm the obtained results, the above mentioned distances were divided by the height of the CB and compared. The results of this analysis was also statistically significant ($p<0.002$). As the AT insertion point changes, stress in the AT lowers by 6.9% and 12.8% in group II and III as compared to group I, respectively. CONCLUSIONS. This study found that the insertion point of the AT changes with age, with the insertion point of the tendon located more superiorly on the CB in older adults as compared to younger individuals. This anatomical variability significantly influence the biomechanical properties of the tendon and may, in part, explain why AT pathologies are more commonly observed in older adults.

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The Possibility of Saint's Triad and the Diagnostic Implications for a Physical Therapy Student.

INTRODUCTION. Doctor of physical therapy(DPT)students dissect the human cadaver during their graduate DPT program. Only the cause of death is known, with no further medical history. Upon finding a large hiatal hernia, and other abnormalities, students were able to develop a possible speculation of a disease. RESOURCES. An embalmed overweight 94 year-old female cadaver(of 1 year) in a PT anatomy lab was dissected over an 8 month period. The cause of death was dementia. DESCRIPTION. Upon dissection, multiple anomalies were found. A large hiatal hernia grade 4 was found measuring 11cm length x 10 cm width and lying anterior to the heart. Additionally, cardiac hypertrophy, an umbilical hernia, bilateral inguinal hernias and an abdominal aortic aneurysm(AAA) were found. Extreme thoracic kyphosis and scoliosis were present. Evidence of diverticulosis and a previous cholecystectomy were noted. The combination of findings, including hiatal hernia, umbilical hernia, and a previous cholecystectomy, in an overweight female cadaver suggests a clinical condition of Saint's triad. Upward migration of the gastroesophageal junction may occur from a weakening of the phrenoesophageal ligament. Patients with diverticulosis and gallbladder disease are more prone to hiatal hernias, AAA, and diabetes. Students researched that herniosis, a systemic connective tissue disease, can cause diverticulosis and hernias and may be responsible for Saint's triad. Hiatal hernias occur more often in overweight females over 50 years of age. A giant hiatal hernia in a patient could lead to dyspnea and/or symptoms associated with pneumothorax. SIGNIFICANCE. Because a cadaver is a DPT student's first patient, it is important for students to relate anatomical findings with diseases that may cause physical disabilities they will encounter in practice. The presentation of this cadaver resulted in critical thinking and encouraged differential diagnosis and an understanding of pathophysiology of diseases.

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Hiatal Hernia with Intrathoracic Stomach - A Cadaveric Case Report.

INTRODUCTION. There are two main types of hiatal hernias. Sliding hiatal hernias account for 95% of cases presenting with an intrathoracic displacement of the esophageal-gastric junction. Para-esophageal hernias make up 5% of cases in which the esophageal-gastric junction remains at the level of the diaphragm, with parts of the stomach herniating into the thorax. RESOURCES. During routine dissection of a 97-year old female cadaver, the stomach could not be located, and upon further dissection, the stomach was seen in the thoracic cavity compressing the right lung. The esophageal hiatus in the diaphragm was abnormally large. DESCRIPTION. 90% of the stomach, including the body, was herniated above the diaphragm. The Cadaver's history of coronary artery disease, hypertension and COPD suggests that this defect should have been an incidental finding during routine radiography, which would have warranted surgical intervention. SIGNIFICANCE. Esophageal hiatal hernias can be characterized into 4 types: Type I as a sliding hernia, Type II as a paraesophageal hernia, Type 3 as a combination of types I and II, and Type IV as a complete herniation of the stomach. Many hiatal hernias can be asymptomatic and do not require surgical intervention. Due to the size of the cadaver's esophageal hiatus and intrathoracic stomach, complications ranging from acid reflux, dysphagia and stomach incarceration were likely. Congenital origin, such as central tendon defect is unlikely since diagnosis and surgical intervention would have been rendered in the postnatal stage. The standing hypothesis is that this cadaver had an acquired Type I sliding hernia that progressed into a type IV paraesophageal hernia with an intrathoracic stomach. Given the advanced age and comorbidities of the cadaver, surgery was most likely contraindicated due to the high risk of cardiovascular and respiratory complications.

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Cadaveric Dissection of the Femoral Nerve within Psoas Major – A New Entrapment Syndrome?

INTRODUCTION. The femoral nerve within the pelvis is described to emerge at the lateral border of the psoas major muscle to travel within a groove formed by the underlying lateral iliac and medial psoas muscles. According to our knowledge, studies describing its anatomical course within psoas are scarce. The purpose of this study was to delineate the course and formation of the femoral nerve through the psoas major muscle and to query the possibility for the femoral nerve to be entrapped within the muscle, suggesting a novel cause of compression. METHODS. Ten male and eight female human formalin-fixed cadaveric specimens were dissected bilaterally. Piecemeal removal of the psoas muscle revealed the lumbar plexus. Data were extracted from Excel sheets and photographs have been taken for analysis. Results were conveyed with descriptive statistics. SUMMARY. In 17 of 36 specimens (47%) L2 and L3 components fused within the psoas muscle then united with L4 at the lateral aspect of psoas; in 10 of 32 specimens (28%), the L3 and L4 components fused posteriorly to the psoas before uniting with L2. CONCLUSIONS. In a similar fashion to the established sciatic nerve entrapment syndrome, which is subject to compression within the piriformis muscle, the femoral nerve may be subject to compression and stretch injury since it is not only passing, but it is found to be formed within the muscle in 75% of the cases. Aberrant reports of femoral nerve compression secondary to trauma or ischemia exist. However, a clinical consideration of a possible entrapment may be more helpful in avoiding confusion with lumbar plexopathy and L4 radiculopathy. Future magnetic resonance neurography may show signal intensity alterations suggestive of an injury.

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Anatomical Study of the Soleal Venous Network Focused on the Median Septum of the Soleus Muscle.

INTRODUCTION. The soleal veins are a known site for the occurrence of deep vein thrombosis. The soleal veins are embedded in the belly of the soleus muscle, and divides into six branches: the proximal, medial, central, lateral, distal medial, and distal lateral soleal veins. The central soleal vein is clinically important due to the high frequency of thrombosis in this branch. The part of the soleus muscle through which the central soleal vein runs has a unique architectural feature characterized by a bipenniform muscular portion on its anterior surface. The purpose of this study was to clarify the anatomical distribution of the soleal venous network focused on the median septum. METHODS. Ten soleus muscles

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from 10 preserved cadavers were supplied by the anatomical dissection course in our medical school for examination. The bipenniform portion of the soleus muscle is attached to the median septum (sagittal sehnenblatt in German), which is connected to the calcaneal tendon. We divided the soleus muscle into the medial and lateral bipenniform muscular portions for examination. SUMMARY. The central soleal vein varied in accordance with the type of median septum: straight or curved types. The soleal veins had one or two branches located in the bilateral sides of the median septum. Those branches had communication through the median septum of the soleus muscle via two or three veins. Five cases had a straight type of the median septum, which had no communicating vein passing through the median septum; the other five cases had a curved type of the median septum, which had communicating branches. CONCLUSIONS. It is important for clinicians to understand the anatomical distribution of the soleal venous network to enable them to detect deep vein thrombosis using ultrasonography.

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Cadaveric Study of Vastus Medialis Obliquus Fiber Angulation.

INTRODUCTION. It is postulated that the functionality of a muscle is largely determined by the angulation of its fibers. The vastus medialis obliquus (VMO) plays an important role in patellar stability, and the angle at which the fibers contract greatly influences its effectiveness. The purpose of this study was to investigate variations of muscle fiber angulation in different individuals' VMO muscles and provide a range in which these fibers exist in the human body. METHODS. The left lower extremities of cadavers were dissected to reveal the VMO for measurement. Cadavers that had relevant prosthetic surgeries were excluded. Measurement software, namely IC Measure from The Imaging Source, LLC, was validated and used to measure the angles at 15.0 mm increments along the femoral plane. SUMMARY. Fiber angles in the cadavers were determined at 0 mm, 15.0 mm, 30.0 mm and 45.0 mm from the distal end of the VMO. The mean angle of the VMO muscle fibers was 44.9°, 39.7°, 35.3°, and 30.8° and the median was 46°, 37°, 35°, and 30° at 0 mm, 15.0 mm, 30.0 mm, and 45.0 mm, respectively. At the distal end of the VMO, the interquartile range was 40.5° - 48.5° with a minimum of 28° and a maximum of 62°. At 15.0 mm, the interquartile range was 35° - 44° with a minimum of 28° and a maximum of 64°. At 30.0 mm, the interquartile range was 28° - 40° with a minimum of 20° and a maximum of 64°. The interquartile range at 45.0 mm, was 23.5° - 37.5° with a minimum of 18° and maximum of 47°. CONCLUSIONS. The results show a trend for the VMO fibers to have increasing angles, relative to the femoral plane, the more distal the fiber is. Extreme variability seen in our pilot study calls for expanded examination of VMO fiber angulation to better document the range of fiber angles at various distances from the distal end of this muscle. Further study is also warranted in order to investigate the functional significance of the variability in fiber angles.

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A Multi-Year Quantitative Analysis of Duodenal Papilla Relationships.

INTRODUCTION. The second part of the duodenum contains two papilla involved in the drainage of liver, gall bladder, and pancreas. The major duodenal papilla drains the common bile duct and the main pancreatic duct. The minor duodenal papilla drains the accessory pancreatic duct. Historical data has reported that the major duodenal papilla lies at a distance of 7-10 cm from the pyloric sphincter and 2 cm from the minor duodenal papilla. METHODS. In our study, we investigated the duodenum from 54 individuals over the past seven years. Using calipers, we measured the distances of the pyloric sphincter, major duodenal papilla and the minor duodenal papilla. SUMMARY. We found that the distance of the pyloric sphincter to the major duodenal papilla is similar to historic data ($p=0.89$), however the distance from the major to the minor duodenal papilla is shorter than reported ($p<0.05$). CONCLUSIONS. This information is clinically relevant when performing explorative procedures such as Endoscopic Retrograde Cholangiopancreatography (ERCP), which requires accurate injection into the major duodenal papilla.

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Anatomy of the Pulmonary Valve Leaflets.

INTRODUCTION. There is a strong clinical need of accurate pulmonary valve anatomy knowledge. Thus, the aim of this study is to present detailed morphometric description of the human pulmonary valve. METHODS. A total of 200 autopsied human hearts from healthy donors (26.0% females) were investigated. We have measured several pulmonary valve parameters and noted the presence of calcifications, semilunar valve nodules and leaflets' fenestrations. SUMMARY. The mean diameter of the pulmonary valve was 20.0±4.1 mm in the frontal plane and 18.0±4.0 mm in the sagittal plane. The mean distance from the free margin to the attachment line of the leaflet (leaflet height) in its central part was 15.6±3.4 mm for left, 15.1±3.1 mm for anterior and 15.4±2.8 mm for right leaflet. The mean distance from the bottom of the pulmonary sinus to the sino-tubular junction for the left, anterior and right sinuses were: 19.0±3.8 mm, 19.1±3.7 mm and 18.4±4.1 mm, respectively. No statistically significant differences in size of leaflets and sinuses were found ($p>0.05$). Nodule of semilunar valve in the left, anterior and right leaflet was observed in 71.0%, 85.5% and 85.5% of hearts respectively. In 52.5% of cases nodules were presented in all three leaflets. In 22.0% of cases fenestrations of at least one leaflet were seen. The myocardial sleeve from the right ventricle tissue was situated higher than the bottom of the right pulmonary sinus in 87.5% of cases. The mean height of the myocardial sleeve extension onto right pulmonary sinus was 3.4±1.5 mm. Calcifications of pulmonary valve were observed only in 2.0% of cases. CONCLUSIONS. The pulmonary valve has almost always three leaflets, which are of comparable size ($p>0.05$). The myocardial sleeve of right ventricle tissue entering the pulmonary valve sinus is present in 87.5% of cases and should be taken into consideration during pulmonary valve surgical procedures. The presence of leaflets' fenestrations may be responsible for valvular leak.

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Histological Changes of the Thymus Resembling Accidental Involution and Sudden Infant Death Syndrome.

INTRODUCTION. Risk factors for Sudden Infant Death Syndrome (SIDS) are believed to include low birth weight, low Apgar score, sleeping on the stomach, socioeconomic status of parents, etc. Authors typically link all these factors by summarizing the overarching risk factors as follows: endogenous vulnerability, a critical time window during postnatal development, and exogenous stressors. This is known as the "triple-risk model," which was first described in the scientific literature in 1971. We hypothesized that we might find morphological signs of stress-related thymic involution. If this hypothesis were true, our morphological study would therefore support the "triple-risk model," demonstrating the involvement of some type of as-yet unknown exogenous stressor in the pathogenesis of SIDS. METHODS. In this study, we used an immunohistological approach to compare the cellular microenvironments of thymuses from 19 infants whose sudden death was classified as SIDS and a control group - age-matched children undergoing surgery for various congenital heart defects. SUMMARY. By comparing the thymuses of infants with SIDS to those of the controls, we concluded that the thymuses of SIDS patients have the following features (1) fewer lymphocytes, "starry sky" appearance of the thymic cortex; (2) activation of CD68-positive macrophages; (3) fewer S100-positive antigen-presenting dendritic cells within the thymic medulla; (4) fewer Ki67-positive proliferating lymphocytes in the subcapsular portion, fewer BCL2-positive mature and long-lived lymphocytes within the thymic medulla - signs of decreased lymphocytopoiesis; (6) slightly fewer desmin and smooth muscle actin positive thymic myoid cells within the medulla. CONCLUSIONS. Based on our histological findings, we suggest that changes in the thymic cellular microenvironment resembles stress-related involution, and this could have been a morphological manifestation of an ongoing undiagnosed infection or other stress factor.

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Histological Study of Capsular Synovial Metaplasia That Is Formed Around Silicone Breast Implants.

INTRODUCTION. Metaplasia is defined as transformation of one differentiated cell type into another cell type. A reversible phenomenon usually occurs in response to chronic irritation and/or inflammation. It allows for the substitution of fragile cells with those that are better able to survive under various circumstances. We describe the histology and immunohistochemistry of synovial metaplasia that formed around silicone breast implants within several months after surgery. METHODS. We analyzed samples from 22 females, who underwent delayed-staged breast reconstructions after

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surgical treatment for breast cancer. The breast reconstructions involved using temporary silicone tissue expanders, followed by permanent prosthesis implantations. The average period between expander placement and permanent implant replacement was 5.9 months. Biopsies of explanted periprosthetic capsules were processed for microscopic examination. Sections were stained with ten different primary antibodies. SUMMARY. At the interface between the tissue capsule and the silicone breast expander, we typically observed a 50–200 μm cellular lining. Immunohistochemistry showed that the cells forming the superficial layer were positive for vimentin and podoplanin and weakly positive for S100 protein. At first glance, it appeared that these cells were myofibroblasts that formed part of the granulated tissue arising during the healing process, but later we observed that they didn't express desmin or smooth muscle actin (markers of myofibroblasts). Superficial cells also didn't express CD34, which is commonly enriched in fibroblasts of breast tissue. Approximately half of these cells were positive for CD68, a marker of macrophages. These histological and immunohistochemical characteristics are indicative of synovial metaplasia. CONCLUSIONS. We conclude that the cellular lining surrounding silicone breast implants looks like a true synovial membrane consisting primarily of a fibrous form of synovium.

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Surface Anatomy of the Subclavian Vein in Relation to the Clavicle: An Ultrasound Study.

INTRODUCTION. The Subclavian vein (ScV) long favoured by surgeons offers an alternative to the internal jugular vein for central venous access but has been associated with higher rates of arterial puncture. Ultrasound can be used to locate the ScV but surface anatomy techniques; 2cm below the intersection point of the medial third and the lateral two thirds of the clavicle still prevail. This study aims to investigate (i) the location of the ScV in- vivo using ultrasound and (ii) the efficiency of predicting its location in relation to the clavicle. METHODS. Following a review of current protocol and literature describing the surface anatomy of the ScV in relation to the clavicle, sixty-six ScVs from 33 participants, (13 females, 20 males) aged between 19 and 43 years, were investigated. Participants' weight and height were taken and body mass index (BMI) calculated. The intersection between the medial ⅓ and lateral ⅔ of the clavicle was palpated and a point marked 20mm caudally representing the predicted location of the ScV. The ScV was visualised through the use of GE Logiq e ultrasound system with a 12L-RS transducer by a single observer and the respective location was marked on the participants' skin. Digital callipers were used to measure distances between these two points. SUMMARY. The ScV was visualised in all participants irrespective of their BMI. It was found beyond a 10mm radius of the predicted point in 33.3% and 21.2% in the left and right sides respectively. Less than 70% of the ScVs were located above the predicted point. Body side and sex significantly influence the position of the ScV (significance set at p-value<0.05). CONCLUSIONS. The ScV has close anatomical relationships to surrounding structures. Ultrasound is a minimally invasive tool that allows visualisation of underlying structures during procedures such as central venous catheterisation. In addition, ultrasound can be used to validate existing surface anatomy landmarks.

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The Contentious Origin of the Superior Medial Genicular Nerve.

INTRODUCTION. Following total knee arthroplasty, 40% of patients continue to suffer from chronic postoperative pain. More recently, image guided radio frequency ablation (RFA) has been used as a non opioid analgesic. The superior medial genicular nerve (SMGN) is one of the main RFA targets for knee pain, in addition to the inferior medial genicular (IMGN) and the superior lateral genicular (SLGN) nerves. The effectiveness of RFA is dependent on a detailed understanding of the course of these nerves relative to bony and soft tissue landmarks. The origin and course of SMGN remains unclear, as it has been reported in the literature to originate from the femoral (FN), obturator (ON), or tibial (TN) nerves. Therefore, the purpose was to determine the origin and course of SMGN in relation to anatomical landmarks visible with image guidance. METHODS. Articular branches of FN, ON, and TN were micro-dissected and followed to their termination in 15 embalmed specimens. The origin and course of SMGN, IMGN, and SLGN was documented. Specimens were photographed, and a frequency map of genicular nerve innervation was generated. SUMMARY. SMGN was found in all specimens to originate from FN as it branched just inferior to the inguinal ligament. SMGN coursed deep to sartorius, and then followed the descending genicular artery to the adductor tubercle, where it joined the superomedial genicular artery to terminate

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anteriorly in the superomedial quadrant of the knee joint. The IMGN and SLGN originated in all specimens from the TN in the popliteal fossa, and followed their respective genicular arteries to the anterior knee joint. CONCLUSIONS. The SMGN was found to originate from the FN and coursed distally the length of the thigh to the knee joint capsule. No TN origin, as commonly reported in the anatomic and clinical literature, was found. Knowledge of the course of SMGN is clinically important when developing RFA procedures targeting the nerves innervating the knee joint capsule.

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Innervation of the Pubic Symphysis: An Immunohistochemical Study.

INTRODUCTION. Studies documenting the innervation of the pubic symphysis are scarce, and no information exists on the type and location of nerves within the tissues of this joint. The present study aimed to investigate the detailed innervation pattern of the pubic ligaments and interpubic disc, to gain a better understanding of the possible proprioceptive and pain-generating roles of the pubic symphysis. METHODS. A total of 74 samples from the four pubic ligaments and interpubic disc were harvested from 12 cadaveric pubic symphyses (6 male, 6 female, mean age 81.8 years). The samples were processed for immunohistochemistry and stained with haematoxylin and eosin and neurofilament (ligaments) or S100 (discs). Slides were scanned and converted to digital format, and the resulting images viewed and analysed using ImageJ. The cross-section of each sample was measured and the total number and mean density (mm2) of isolated nerves and fascicles were calculated. SUMMARY. Of the obtained samples, 50 from 8 specimens were included, with the remaining excluded due to poor quality staining. Nerves were observed in all ligaments, but none were evident in the discs. The inferior pubic ligament had the greatest density (isolated nerves = 0.73±0.71 nerves/mm2; fascicles = 0.64±0.61 fascicles/mm2; median number of nerves per fascicle = 4 [range 2 – 68]) while the superior ligament contained the least (isolated nerves = 0.38±0.74 nerves/mm2; fascicles = 0.16±0.6 fascicles/mm2). CONCLUSIONS. This study confirms that that peri-articular structures of the pubic symphysis contain nerves and nerve fascicles which demonstrates sensory information is relayed from these tissues to the central nervous system. The inferior ligament appears more densely innervated, which could reflect differences in its morphology and role in mechanical force distribution; however, no specialized nerve endings were identified. Further studies in fresh cadaver tissue may optimize histological processes.



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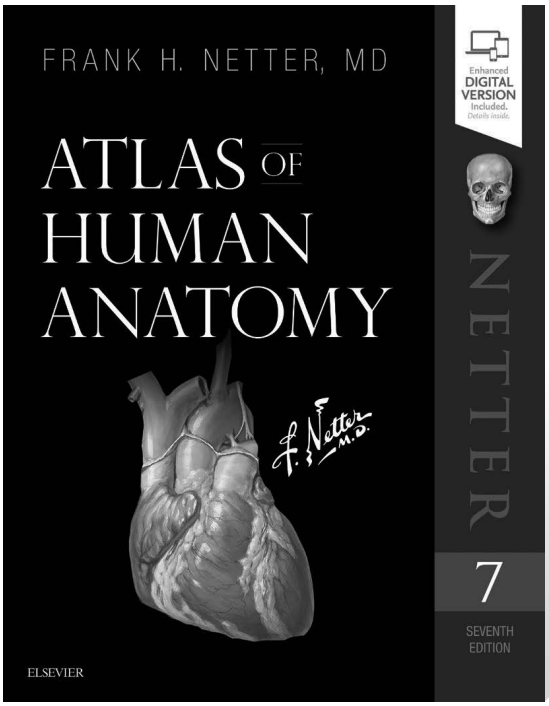
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