28th Annual Meeting: American Association of Clinical Anatomists

www.aacameeting.org

July 12-16, 2011
Columbus, Oh 43210

Hosted By:
Division of Anatomy
The Ohio State University
Cover Design: Alan J Detton, M.S.

Alan is currently a Ph.D. Candidate in the Division of Anatomy at The Ohio State University. His current research interests involve creating novel 3D Anatomical and Human Development computer-based resources, and evaluating through methods of Human Computer Interaction, their functionality, effectiveness, and user perceived usefulness as compared to 2D-image based methods of instruction.
June 22, 2010

Greetings, to the American Association of Clinical Anatomists. On behalf of our citizens, we are very proud that participants from all over the world will attend the Annual Meeting of the AACA, July 12 – 16, 2011, in our great city.

I am delighted to welcome you to our state capital and Ohio’s largest city. I like to refer to Columbus as “America’s 21st Century City”. It is a growing, vibrant metropolitan area known for its dynamic business climate, friendly neighborhoods, and modern, efficient government. Each year, an increasing number of visitors from around the country and around the world come to our city to meet, compete, trade and enjoy what Columbus has to offer.

While you are here, we invite you to explore the many things we love about our community: COSI, the world famous Columbus Zoo, The Ohio State University, the MLK Center for the Performing Arts, which features world renown artist, Brenda Aminah Lynn Robinson, the fantastic shopping, and the vibrant nightlife in places like the Short North, German Village, the Brewery District, Easton Town Center and dozens of friendly spots in every Columbus neighborhood.

There’s so much to discover in Columbus. But what we hope you’ll remember most of all is our generous hospitality and special quality of life that brings visitors back, and leads more and more people to make Columbus their home.

Best wishes for a successful event.

Sincerely,

Michael B. Coleman
Mayor

MBC/kp

The City of Columbus is an Equal Opportunity Employer
It is an honor and pleasure to welcome each of you to the Association’s 28th Annual Scientific Meeting. We are very lucky to have the Division of Anatomy at The Ohio State University College of Medicine and Ken Jones, the energetic and gracious Chair of the Local Committee, as the hosts for this year’s meeting. The Division of Anatomy has one of the nation’s largest full-time faculty of gross anatomists who teach in a wide variety of health care disciplines. The Division’s faculty also has a long and distinguished record of leadership and participation in the AACA going back to its founding in 1983.

No welcome to the meeting could fully express the gratitude that the membership and Association owe to Mark Seifert, our Program Secretary, for his industrious and determined mastery of the many nuances of our now two-year-old Meeting Organization and Program Planning (MOPP) Committee. As its chair, Mark has had considerable cooperation and input but he deserves much of the credit for reorganizing the meeting structure and creating a new process promote planning for our future meetings. For example, you will be pleased to learn that all of the special events scheduled for next year at St. George’s University on the Caribbean island of Grenada have been finalized!

Another individual who deserves special recognition is Greg Smith who painstakingly, firmly and effectively chaired the 2011 Annual Meeting Committee. He and his committee also deserve our appreciation and thanks. The third leg of our meeting triumvirate is our Meeting Manager, Julie Hewett. Julie and her team at JulNet Solutions had a hand in every aspect of meeting preparation and implementation. If you have a question or problem this week, you are well advised to begin by asking Julie.

Mark Seifert, Greg Smith, Ken Jones, and Julie Hewett have worked tirelessly over the past year to make our 28th Annual Scientific Meeting the best-organized and planned meeting in our Association’s history. Please make an opportunity to thank each of them personally for their innumerable hours of work to make your trip to Columbus informative, rewarding, enjoyable, and most of all, memorable.

Attendees at our previous meetings will immediately appreciate that the 2011 Program Book adopts the innovative format first employed last year. The 2011 Annual Meeting Committee believes the larger size and inclusion of reports and information from our committees greatly enhances the Program’s utility and value. This year the Program Book includes the Agenda for Thursday’s Annual Business Meeting (ABM) and the Minutes from the 2010 ABM in Honolulu.

Productive and creative committees that address the interests and needs of the membership are the foundation upon which all growing and enterprising professional associations are dependent. I consider the substantial work done to organize and empower our many committees to be the single most significant achievement during my two-year presidential term. Please take a few minutes to read the committee reports. After learning about their purposes,
Thanks to the efforts of Sherry Downie and the Nominating Committee she chaired, the 2011 ballot contained an impressive list of candidates for every position. As a member, it is enormously encouraging to view a ballot and to know that any of the candidates could do an excellent job and bring something special to the new Council. I wish to thank all of the 2011 candidates for their contribution to the Association. The ultimate measure of any electoral process is not who wins but the quality and character of the entire slate of candidates being considered. AACA’s nominating/electoral process is one of the healthiest aspects of our Association.

The 2011 Presidential address will be different from previous years. This year the presentation will precede the Annual Business Meeting on Thursday rather than be the opening presentation on Tuesday. In what I hope will become a recurring event in the last year of each President’s term in office, this year’s Presidential presentation will be a “State-of-the-Association Address.” The Association’s future not only depends upon an active and growing membership but also the accountability of its elected leaders and decision-makers. I think it would be very informative if all elected members, but most importantly the President, reported to the membership at the end of his or her term in office about what was accomplished, what was not, and most importantly the challenges and issues facing the Association in the future.

The new 2011-12 Council will be joined this year by President-Elect Brian MacPherson, Association Secretary Wayne Lambert, Councilors-at-Large Marios Loukas and Peter Ward, and Special Councilor for Allied Health Rick Clemente. Congratulations to all.

The prestige of our 2011 Annual Meeting is enhanced enormously by the presence of Professor Harold Ellis who will deliver the Council Presentation and is the recipient of this year’s Honored Member Award. In addition to honoring Professor Ellis for his lifetime of contributions and singularly major role in founding the modern discipline of clinical anatomy, we are awarding the R. Benton Adkins, Jr. Distinguished Service Award to Carol Scott-Connor. Carol worked closely with Benton and is a Past President of the Association (2003-2005). We will also be honored this year by the participation of Heikki Whittet the President of the British Association of Clinical Anatomists which, which together with the AACA, is a co-owner of our journal, Clinical Anatomy.

Finally, I am asking the membership to please take time during the meeting to visit the Exhibition Area. I cannot overstate the importance and value of the time you spend with our exhibitors. The Exhibitors are an essential and valuable part of each meeting. They are here to see and to hear from YOU about how they can improve upon what they do for YOU. The exhibitors not only contribute to the financial success of our meetings but more importantly their presence adds content and value that benefits everyone who attends. Please thank them for participating and supporting this year’s meeting.

Make it a great meeting,

Todd R. Olson, President
June 29, 2011

I am honored to be taking office as the next President of the AACA, and I am humbled by the thought of joining the many individuals who have preceded me in this position. Let me take this opportunity to thank each one of you for your support.

I am pleased to state to you that our membership is continually growing and increasingly vibrant. Our organization is as relevant to its members as ever. Our journal, Clinical Anatomy, has been successful in attracting a greater number of high quality submissions and for the second consecutive year has significantly increased its impact factor. We have a strong group of hard working volunteers serving on the Council, Executive Committee, Editorial Board of Clinical Anatomy and as well as in the many committees and SIGs that are vital to the AACA activities. This includes the organizing committees of our annual meetings. I congratulate this year’s team of dedicated individuals for what will be another successful conference in Columbus. It will be my pleasure to work together with each one of you to serve our membership.

At this stage in the history of the AACA, I believe it is time for us to plan for our future in a bigger way. We have taken small steps here and there, but now it is time for us to wholeheartedly invest in our future. AACA is approaching its 30th anniversary and much has changed since its creation. In the next two years, I will focus my attention on the development and implementation of a dynamic strategic plan, which will define where we stand now, where we want to go in the next 3-5 years and how we will get there.

The selection process for a professional association management team will be completed in the next year, so that we can look forward to assistance with administrative duties, allowing the Officers, Council and our committees to concentrate their efforts on planning and implementing new initiatives.

My vision for the AACA is an Association with defined goals, effective and transparent operations, good communication between the Council and our membership, increased support and promotion of our journal, Clinical Anatomy, and enhanced growth encompassing a wider and younger field of anatomists and clinicians including students.

Anne Agur
President-Elect (2009-2011)
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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 Franklin Foyer.

A.D.A.M. Software
American Association of Anatomists
Anatomage
Bone Clones, Inc.
Carolina Biological Supply
Elsevier
Hodder Arnold
Lippincott Williams & Wilkins – WKH
InfoSight Corporation
Mopec, Inc.
Mortech Manufacturing Company
Sinauer Associates, Inc
Thieme Medical Publishers
Touch of Life Technologies
Wiley-Blackwell
Program

Monday July 11

6:00 pm  Journal Committee Dinner Meeting  Champaign

Tuesday July 12

9:00 – 5:00  AACA Council Meeting  Champaign

3:00 – 6:30  Registration Desk Open  Franklin Foyer

5:00 – 6:30  Mentor Reception  Knox

6:30 – 8:30  Welcome Reception to Honor Harold Ellis and Carol Scott-Conner  Franklin ABC
68 Years of Clinical Anatomy: An Old Surgeon Looks Back
Professor Harold Ellis, CBE, FRCS

Harold Ellis, CBE, FRCS is Emeritus Professor of Surgery in the University of London and currently a professor in the Department of Anatomy and Human Sciences at King’s College London School of Medicine. He qualified as a doctor from the University of Oxford in July 1948, the same month the National Health Service began. From 1950-51 he undertook national service as a Captain in the Royal Army Medical Corps, afterwards continuing his training as a Surgical Registrar in London, Sheffield, and Oxford before taking up a post as Senior Lecturer in the University of London. In 1962, he took up the Foundation Chair of Surgery at the Westminster Hospital, a post which he held until his retirement from practice in 1989. After a stint teaching anatomy in the University of Cambridge, he took up his present position in 1993.

Harold Ellis is one of the most notable British surgeons of the past fifty years, renowned both for his inspirational teaching and as the author of the definitive student textbook Clinical Anatomy, now in its twelfth edition. He held positions as a Vice-President of the Royal College of Surgeons of England and of the Royal Society of Medicine and was President of the British Association of Surgical Oncology.

The Professor Harold Ellis Medical Student Prize for Surgery is named after him, and has been awarded by the Royal College of Surgeons since 2007. The International Journal of Surgery has awarded the Harold Ellis Prize in Surgery annually since 2003.
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

* deceased
R. Benton Adkins Jr. Distinguished Service Award, 2011

Carol Scott-Conner, M.D., Ph.D., MBA

Dr. Carol Scott-Conner has served in various roles in the AACA. She is a Founding Member, and served as Councilor 1987-1989, 1998-2000; a Local Host of our meeting in Iowa City in 1999, and a member of the Journal Committee 2002-2003. She also served in the presidential stream as President-Elect 2001-2003, President 2003-2005, and Past President 2005-2007.

Dr. Scott-Conner received her BS in Electrical Engineering from MIT in 1969, her M.D. from NYU School of Medicine in 1976, her Ph.D. in Anatomy from the University of Kentucky in 1988, and her MBA from Millsaps College, Jackson, MS in 1995.

She has been an Assistant Professor at the Marshall University School of Medicine, Associate Professor at the Marshall University School of Medicine and the University of Mississippi School of Medicine, and Professor at the University of Mississippi School of Medicine and the University of Iowa College of Medicine. During this time, she held 14 associated clinical appointments, primarily surgical in nature. From 1995 to 2004, she was Chair of the Department of Surgery at the University of Iowa College of Medicine. At that time, she was one of 6-7 female chairs of surgery departments. During this period, she received over 25 honors, awards, or outstanding achievements.

During her academic career, her teaching has focused primarily on the anatomy and surgical concerns of the abdomen and the breast. She has been the author or co-author of over 100 presentations on educational and CME presentations, and course related materials. She has over 135 peer-reviewed papers, 11 electronic publications, 75 abstracts, 45 reviews, 14 films/tapes, and over 135 invited lectures. Dr. Scott-Conner has written 60 books and book chapters. One such book is entitled, OPERATIVE ANATOMY, now in its 3rd edition. AACA Past President, Larry Ross, personally recommends this text to any AACA member not already familiar with it. This is truly "what we are all about!"
Previous R. Benton Adkins Jr. Distinguished Service Award Recipients

2004 - Robert J. Leonard
2006 - Daniel O. Graney
2007 - Ralph Ger
2009 - Arthur F. Dalley
Scientific Program
Wednesday July 13

7:00 – 8:00  Continental Breakfast  
Franklin Foyer

7:00 – 3:30  Registration Desk Open  
Franklin Foyer

7:00 – 8:00  Poster Session I – Setup  
Fairfield

7:00 – 8:00  Anatomical Services Committee Breakfast Meeting  
Marion

8:00 – 8:30  Welcome  
Franklin ABC

Teresa C. Long, M.D., M.P.H.  
Columbus Health Commissioner

Janet M. Weisenberger, Ph.D.  
Senior Associate Vice-President for Research

Philip R. Payne, Ph.D.  
Chair, Department of Biomedical Informatics

Douglas Gould, Ph.D.  
Director, Division of Anatomy

8:30 – 9:30  AACA Council Presentation by Honored Guest, Dr. Harold Ellis  
Franklin ABC

9:30 – 9:45  Break

9:45 – 11:00  TechFair  
Franklin ABC

Moderator: Greg Smith

9:45  Development and implementation of innovative media-driven testing formats.  
MACPHERSON, Brian R. Department of Anatomy and Neurobiology, University of Kentucky College of Medicine, Lexington, KY 40536, USA.

9:55  Virtual interactive presence and augmented reality (VIPAR) for remote anatomical instruction.  
SHENAI¹, Mahesh B., Marcus DILLAVOU², Corey SHUM², Douglas ROSS², R. Shane TUBBS³, Alan SHIH², and Barton L. GUTHRIE¹. ¹Division of Neurosurgery, Department of Surgery, University of Alabama, Birmingham, AL 35233, USA, ²Department of Mechanical Engineering, University of Alabama, Birmingham, AL 35233, USA, ³Division of Pediatric Neurosurgery, Children’s Hospital, Birmingham, AL 35233, USA.

10:05  A 3D reconstruction and interactive tutorial of the pterygopalatine fossa.  
RICHARDSON, April¹, Tom DOLAN², and Paul BROWN³. ¹Anatomy and Neurobiology Department, University of Kentucky, Lexington, KY 40536, USA, ²UK Information Technology, Multimedia Production, University of Kentucky, Lexington, KY 40536, USA, ³Division of Clinical Anatomy, Stanford University, Stanford, CA 94305 USA.
10:15 The evaluation of a human development learning tool using a video analytic usability test. DETTON, Alan J., and Douglas J. GOULD. The Ohio State University College of Medicine, Department of Anatomy, Columbus, OH 43210, USA.

10:25 Development of a clinical case-based endocrine histopathology learning resource for medical students. DAVIES, Joel C., David HURLBUT, and Leslie MACKENZIE. 1Department of Anatomy and Cell Biology, Queen’s University, Kingston, K7L 3N6, Canada. 2Department of Pathology and Molecular Medicine, Queen’s University, K7L 3N6, Canada. 3Division of Anatomy, Department of Surgery, University of Toronto, Toronto, ON, M5S 1A8, CANADA.

10:35 Anatomy on the move – modern technology comes of age in integrating clinical anatomy. ABRAHAMS, Peter, and Mark MOBLEY. Institute of Clinical Education, Warwick Medical School, and West Midlands Surgical Training Centre, UHCW, Warwick, CV4 7AL UK.

10:45 Developing an interactive, three dimensional virtual knee model using sequential dissection and CT imaging. GAN, Tong and Lisa M.J. LEE. Division of Anatomy, The Ohio State University, Columbus, OH 43210, USA.

11:00 – 12:30 Poster Session 1

12:30 – 1:30 Lunch on your Own / Joint Editorial Board & Past Presidents’ Lunch

1:30 – 3:00 Platform Session I - Education

Moderator: Stephen Carmichael

1:30 Rochester’s medical education pathway: A program for medical students interested in teaching. HANSEN, John T., Chin-To FONG, and Barbara DAVIS. Department of Neurobiology and Anatomy, and Pediatrics, University of Rochester School of Medicine and Dentistry, Rochester, NY 14642, USA.

1:45 Longitudinal development of anatomy education: The value of fourth-year electives. SHAH, Vandan S., Suzanne DOOLEY-HASH, Clifford L. CRAIG, and John L. ZELLER. The University of Michigan, Ann Arbor, MI 48109, USA.

2:00 Tankside grand rounds (TSGR) and a donor electronic medical record (DEMR) foster multiple ACGME core competencies. BEALE, Elmus G., Naomi L. LACY, Sherry Downie, Todd R. Olson, and Gordon L. WOODS. 1Department of Medical Education, Texas Tech University Health Sciences Center, Paul L. Foster School of Medicine (PLFSOM), El Paso, TX 79905, USA, and 2Department of Anatomy and Structural Biology, Albert Einstein College of Medicine, Bronx, NY 10461, USA.
2:15  Restoring Dr. Richard Blandau’s classic film on development of the heart. **ACLAND**, Robert D. Department of Anatomical Sciences and Neurobiology, University of Louisville School of Medicine, Louisville, KY 40292, USA.

2:30  Interactive 3D prosections – a student eLearning project.  
**MOBLEY**, Mark S.¹, Brian BURNETT², and Peter ABRAHAMS¹.  
¹Warwick Medical School (WMS), Coventry, CV4 7AL, UK. ²Surgical Training Centre, UHCW, Coventry, CV2 2DX, UK.

2:45  A digital demonstration of the cranial nerves containing parasympathetic fibers for professional health science students  
**HARMON**, Derek J. and Douglas J. GOULD. Division of Anatomy, The Ohio State University, Columbus, OH 43210, USA.

3:00 – 3:15  Break

3:15 – 5:15  **Anatomical Services Symposium**

5:30 – 6:30  **Clinical Anatomical Terminology Committee Meeting**

5:30 – 6:30  **Poster Session I Tear Down**
Scientific Program

Thursday July 14

7:30 – 8:30  Continental Breakfast  Franklin Foyer

7:30 – 3:30  Registration Desk Open  Franklin Foyer

7:30 – 8:30  Poster Session II Setup  Fairfield

7:30 – 8:30  Educational Affairs Committee Breakfast Meeting  Marion

8:30 – 10:00  Platform Session II – Head and Neck I  Franklin ABC

Moderator: Todd Hoagland

8:30  Endoscopic and CT imaging of the pterygopalatine fossa: An anatomical and surgical landmark study. GOODMURPHY, Craig W., Lucas BRYANT, Joseph HAN, Michele RETROUVEY, Stephanie T. TREXLER, Christopher MCGARY, and Michael CHU. Eastern Virginia Medical School, Norfolk, VA 23501, USA.

8:45  Craniofacial anatomy regarding buttressing and 3-D computerized tomography. OOI, JJ1 and Brion BENNINGER1,2,3,4. 1Department of Oral Maxillofacial Surgery, 2Department of Surgery, 3Department of Integrative Biosciences, 4Department of Orthopaedic Surgery and Rehabilitation, Oregon Health and Science University, Portland, OR 97239, USA.

9:00  Quantifying area of access of surgical approaches in neurosurgery using three-dimensional reconstruction. RAVICHANDIRAN, Mayoorendra1, Francesco DOGLIETTO2,4, Jimmy QIU3, Ivan RADOVONOVIC2, Gelareh ZADEH2, Walter KUCHARCZYK3, Fred GENTILI2, and Anne AGUR1. 1Division of Anatomy, 2Division of Neurosurgery, 3Department of Surgery, and Department of Medical Imaging, University of Toronto, Toronto, ON, M5S 1A8, Canada. 4Institute of Neurosurgery, Catholic University School of Medicine, Rome, ITALY.

9:15  Clinical anatomy of the lingual nerve and identification with ultrasonography. KLOENNE, Jessica3 and Brion BENNINGER1,2,3,4. 1Department of Oral Maxillofacial Surgery, 2Department of Surgery, 3Department of Integrative Biosciences, 4Department of Orthopaedic Surgery and Rehabilitation, Oregon Health and Science University, Portland, OR 97239, USA.
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<td>9:30</td>
<td>Segmental temporalis transposition – correlation with intramuscular innervation. CHANG, Youjin¹, David CANTELMI¹, Jonathan J. WISCO², Joel C. DAVIES¹, Jayc C. SEDLMAYR³, and Anne AGUR¹. ¹Division of Anatomy, Department of Surgery, University of Toronto, Toronto, ON, M5S 1A8, Canada, ²Department of Pathology and Laboratory Medicine, Division of Integrative Anatomy, David Geffen School of Medicine at UCLA, Los Angeles, CA, 90095, USA, ³Department of Cell Biology and Anatomy, LSU Health Science Center, New Orleans, LA 70112, USA.</td>
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<td>9:45</td>
<td>Segmentation and surface reconstruction of detailed ear structures in sectioned images. PARK, Hyo Seok¹, Min Suk CHUNG², Jin Seo PARK¹. ¹Department of Anatomy, Dongguk University College of Medicine, South Korea ²Department of Anatomy, Ajou University School of Medicine, SOUTH KOREA.</td>
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<td>10:00 – 11:30</td>
<td>Poster Session II</td>
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<td>11:30 – 12:30</td>
<td>Lunch on your Own / 2011 Program Committee Meeting</td>
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<td>12:30 – 2:00</td>
<td>Educational Affairs Symposium</td>
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<td>2:00 – 2:15</td>
<td>Break</td>
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<td>President’s State of the Association Address</td>
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<td>3:15 – 3:30</td>
<td>Break</td>
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<td>Business Meeting</td>
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<td>6:00 – 6:30</td>
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**Scientific Program**

**Friday July 15**

7:30 – 8:30  **Continental Breakfast**  Franklin Foyer

7:30 – 2:30  **Registration Desk Open**  Franklin Foyer

7:30 – 8:30  **Career Development Committee Breakfast Meeting**  Marion

8:30 – 10:30  **Platform Session III - Limbs**  Franklin ABC

Moderator: Rebecca Pratt

8:30  Quantification of variable scaphotrapeziotrapezoidal joint motion patterns in three dimensions. **FOGG**, Quentin A. Laboratory of Human Anatomy, School of Life Sciences, University of Glasgow, Glasgow, G12 8QQ, UK.

8:45  Percutaneous biopsy of hyaline cartilage from human cadaver distal femurs using ultrasound guidance. **BENNINGER** Brion⁴, Dennis CRAWFORD¹, Jean-Louis HORN³ and Jackson JONES¹. ¹Department of Orthopaedic Surgery & Rehabilitation, ²Department of Surgery, ³Department of Integrative Biosciences, ⁴Department of Oral Maxillofacial Surgery, ⁵Department of Radiology. Oregon Health & Science University, Portland, OR 97239, USA.

9:00  Cellular and biomechanical changes in rat gastrocnemius following calcaneal tenotomy. **SAUKS**, Katherine, Erin BOYNTON, Nancy M MCKEE, Anne M AGUR. Department of Surgery, University of Toronto, Toronto, ON, M5S 1A8, CANADA.

9:15  Morphology and relationships of the lateral antebrachial cutaneous nerve. **RAVICHANDIRAN**, Nisanthini¹, Ross BAKER¹, Herb VON SCHROEDER², Martin BOYER³, and Anne AGUR¹. ¹Division of Anatomy, ²Division of Orthopaedic Surgery, Department of Surgery, University of Toronto, Toronto, CANADA. ³Washington University Orthopedics, Saint Louis MO, USA.

9:30  Development of an architecturally comprehensive 3-D computer model of forearm flexors and extensors from a single cadaveric specimen. **LI**, Zhi, Kajeandra RAVICHANDIRAN, Nancy MCKEE, and Anne AGUR. Division of Anatomy, Department of Surgery, University of Toronto, Toronto, ON, M5S 1A8, CANADA.

9:45  Don’t believe everything you read: Intraneural ganglion cysts near the wrist do have articular connections. **SPINNER**, Robert, Huan WANG, Manish SHARMA, Kimberly AMRAMI. Mayo Clinic, Rochester, MN 55905, USA.
10:00 Ger
Assessing functional improvement in an Interprofessional Patient-Centred Hypertonicity Clinic. BAKER, E. Ross1,2, Debbie HEBERT2, Tracy PAULENKO2, George MOCHIZUKI2,3, Anne AGUR1, Denyse RICHARDSON2. 1Division of Anatomy, 2Department of Surgery; University of Toronto, Toronto ON, CANADA. Toronto Rehabilitation Institute, Toronto ON, M5S 1A8, CANADA. 3Heart and Stroke Foundation-Centre for Stroke Recovery, Brain Sciences Research Program, Sunnybrook Research Institute Toronto, ON, M4N 3M5, CANADA.

10:15 Ger
A multivariate approach to sex related differences in gluteus medius and hip joint mechanics. WOYSKI S. Dustin, Anthony OLINGER, Barth WRIGHT. Kansas City University of Medicine and Biosciences, Kansas City, MO 64106, USA.

10:30 – 10:45 Break

10:45 – 11:45 Educational Affairs Speaker
Franklin ABC

11:45 – 12:45 Lunch on your Own / 2012 Program Committee Meeting
Marion

12:45 – 2:15 Platform Session IV – Head & Neck II / Trunk
Fairfield

Moderator: Peter Ward

12:45 Ger
Anatomic study of the transverse occipital ligament with clinical relevance. LENZ1, Robin, Garrett D. MOORE1, Anthony C. DILANDRO2, Fortunato BATTAGLIA2, R. Shane TUBBS3, Marios LOUKAS4, Piotr B. KOZLOWSKI5, and Anthony V. D’ANTONI2. 1Podiatric Medical Student, 2Division of Pre-clinical Sciences, New York College of Podiatric Medicine, New York, NY 10035; 3Pediatric Neurosurgery, Children’s Hospital, Birmingham, AL 35233, USA; 4Department of Anatomical Sciences, St. George’s University, GRENA DA; 5Touro College of Osteopathic Medicine, New York, NY 10027, USA.

1:00
Clinical anatomy consideration of the relationships between paratracheal lymphatics and the recurrent laryngeal nerves (DVD dissection demonstration). SATO, Tatsuo. Tokyo Ariake University of Medical and Health Sciences, Tokyo, 135-0063, JAPAN.

1:15
Central corneal thickness directly predicts the rate of retinal neural fiber layer thinning in Caucasian patients with open angle glaucoma. SHOJA1, Mohammadali M., Alon HARRIS, Brent SIESKY, R. Shane TUBBS, and Yochai SHOSHANI. 1Department of Neuroscience, Tabriz Medical University, Tabriz, Iran; 2Pediatric Neurosurgery, Children’s Hospital, Birmingham, AL, 35233, USA.

1:30
Variation in meningeal sheaths of the spinal roots and nerves and correlation to juxtapositional tumors of the intervertebral foramen. An anatomical, immunohistochemical and radiological study. TUBBS1, R. Shane, Anthony V. D’ANTONI2, Mohammadali M.
1:45 Statistical mapping of the cervical sympathetic chain. SAFIR, Ilan, Jonathan J. WISCO and M. Elena STARK. David Geffen School of Medicine at UCLA, Department of Pathology and Laboratory Medicine, Division of Integrative Anatomy, Los Angeles, CA, 90095, USA.

2:00 A new instrumentation technique for measuring kinematics of the cervical spine of post mortem human subjects (PMHS) KANG, Yun-Seok, Kevin MOORHOUSE, and John H. BOLTE IV. Injury Biomechanics Research Laboratory, The Ohio State University, Columbus, OH 43210, USA.

2:15 – 2:30 Break

2:30 – 4:30 Career Development Symposium Fairfield

4:30 – 5:00 Closing Remarks and Adjournment Fairfield

5:00 – 6:00 New AACA Council Meeting Marion
Post Graduate Course

“SURGERY and TECHNOLOGY MEET ANATOMY”

The Ohio State University Medical Center
Saturday, July 16, 2011

Co-Hosted by:

E. Christopher Ellison, M.D., FACS
Chair, Department of Surgery
Kenneth H. Jones, Ph.D.
Division of Anatomy

Course Objectives:

Introduce Clinical Anatomists to the surgical techniques of the future. The course will demonstrate surgical and anatomical correlations using robotics, minimally invasive surgery, and endovascular procedures to enhance education and research programs.

The course will help anatomists to address the following questions:

- How do new surgical technologies change the surgical/anatomical field of view of physicians?
- Do technological changes in the way surgery is performed modify how and what anatomy should be taught in the future?

Proposed Course Offering:

Morning Session I

Overview of Minimally Invasive and Robotic Surgery
E. Christopher Ellison, M.D.

Applications of Minimally Invasive Surgery to Esophageal and Gastric Disease
Scott Melvin, M.D.

Application of Robotics to Cardiovascular Disease
Juan Crestanello, M.D.

Application of Minimally Invasive Techniques to Thoracic Surgery
Patrick Ross, M.D., Ph.D.

Minimally Invasive Esophageal Resection
Kyle Perry, M.D.

Minimally Invasive and Robotic Approaches to Surgery of the Kidney
Geoffrey Box, M.D.
Morning Session II

Robotic Applications in Gynecologic Surgery
Michael Blumenfeld, M.D.

Robotic Prostatectomy for Cancer
Ronney Abaza, M.D.

Minimally Invasive Approaches to Bariatric Surgery
Bradley Needleman, M.D.

Minimally Invasive Approaches to Inguinal Hernia Repair
Jeffrey W. Hazey, M.D.

Endovascular Treatment of Abdominal and Thoracic Aneurysms
Jean Starr, M.D.

Endovascular Treatment of Carotid Occlusive Disease
Jean Starr, M.D.

LUNCH BREAK (lunch provided)

Afternoon Laboratory Experience (Surgical Faculty)

Attendees will breakup into small groups and rotate through stations in the laboratory. Each station will be under the direction of a surgical faculty member who will demonstrate a procedure to the small group or guide attendees in a hands-on experience in the following areas:

- Minimally Invasive Techniques
- Robotics
- Endovascular Simulation
Anatomical Services Committee Symposium

Moderator: Brandi Schmitt
Director, Anatomical Services
University of California, Office of the President

Medical suitability and communicable diseases: Risks, screening and serological testing in whole body donation programs

Safety and risk management are often significant factors in the decision making process for operations of programs that provide services to students, faculty and researchers at an academic health center. This is true for whole body donation programs and often reported as the reason for or against serological testing of donations. The AACA has determined that integrating screening procedures to mitigate the risks associated with infectious diseases is a Best Practice. Screening of donors can be accomplished through a variety of means including verbal screening of the donor’s medical and/or lifestyle history, a review of medical records and/or post mortem serological testing. Any one of these techniques or a combination of them may be employed by a program in their efforts to meet the mission of their institution and mitigate both perceived and real risks. The Anatomical Services Committee is proud to present this symposium which will include presentations on risks—such as prevalence and transmission—of communicable diseases; verbal history screening and medical record review procedures; universal precautions; and, serology tests—availability, sensitivity, efficacy and interpretation of results.

Charles P. Cartwright, Ph.D.
Chief Scientific and Technical Director, ViroMed Laboratories

Dr. Cartwright earned his doctorate in Microbial Physiology and Biochemistry from the University of Bath in the United Kingdom. After undertaking programs of post-doctoral research in Molecular Microbiology at Yale University School of Medicine and the University of Massachusetts Medical School, he completed a formal fellowship in Clinical Microbiology at the National Institutes of Health. Dr. Cartwright was then employed as a Senior Research Scientist in the Nucleic Acid Diagnostics Program at Ortho-Clinical Diagnostics in Rochester, NY before moving to Minneapolis, where for almost a decade he served on the faculty of the departments of Lab. Medicine and Pathology and Medicine at the University of Minnesota Medical School, and as Medical Director of Clinical Microbiology and Molecular Diagnostics at Hennepin County Medical Center and the Veterans Affairs Medical Center. Dr. Cartwright has published more than 50 papers in the fields of molecular biology and microbiology, and holds a published patent for the molecular detection of Mycobacterium avium complex. He currently serves as the Chief Scientific and Technical Director of ViroMed Laboratories, a wholly-owned subsidiary of the Laboratory Corporation of America.
John Davis, M.D.  
Assistant Professor in Internal Medicine  
Deputy Director of Education in the Comprehensive Transplant Center at The Ohio State University

Dr. Davis joined the faculty in 2008, as a Clinician-Educator with focus on Immunocompromised Hosts. He is a Board Certified Diplomate in Internal Medicine, American Board of Internal Medicine; a Board Certified Diplomate in Infectious Diseases, American Board of Internal Medicine; a Fellow Member of the American Society of Transplantation; and a Member in Training of The Infectious Diseases Society of America. His practice covers a broad spectrum of Infectious Diseases with an emphasis on immunocompromised hosts. He earned his A.B. in Chemistry from Harvard University; his Ph.D. in Chemistry from Boston College; and his M.D. from the Yale University School of Medicine. Dr. Davis completed his residency in Internal Medicine at Massachusetts General Hospital and was a Clinical and Research Fellow in Infectious Diseases at the Combined Massachusetts General Hospital/Brigham and Women’s Hospital in Boston, MA.

Dr. Davis’ clinical interests are primarily with the infectious diseases of the immunocompromised host, broadly defined to include patients living with HIV, patients who have undergone solid-organ or bone-marrow transplantation, and patients who are maintained on immunosuppressive agents for other reasons. He also participates in clinical research involving immunocompromised hosts, and is part of the OSU AIDS Clinical Trials Unit. Dr. Davis’ educational interests and activities are diverse, and span the spectrum of medical education, from undergraduate and pre-professional education, including medical education and residency/fellowship training, through to continuing medical education for experienced physicians.

Tom Sherman  
Director of Tissue Recovery at the Lifeline of Ohio,  
Director of Organ Preservation at The Ohio State University Medical Center

Tom Sherman has a Master’s of Science from The Ohio State University and is a Certified Tissue Bank Specialist through the American Association of Tissue Banks (1990-current). He is a Charter Member of the International Society of Organ Preservation (1999-current). Mr. Sherman presently holds the positions of Director of Tissue Recovery at the Lifeline of Ohio and Director of Organ Preservation at The Ohio State University Medical Center.

Mr. Sherman has twenty-five years’ experience in organ preservation and tissue recovery. He is the Past President and board member of the International Society of Organ Preservation, is a current member of Donate Life Ohio, and a current member of Board of Governors’ of American Association of Tissue Banks.
Educational Affairs Committee Symposium

Moderator: Tom Gest
Division of Anatomical Sciences
University of Michigan

This year’s Educational Affairs Committee Symposium will focus on a few examples of research design, statistical analysis and strategies for success in medical educational research and its important role in the development of medical curricula and the anatomy teacher-scholar.

Educational Research Methods and How to Apply Them to Anatomy Surveys: Theory to Reality (Development to Implementation)

Rebecca Pratt

Rebecca Pratt completed her Ph.D. in Anatomy and Cancer Cell Biology from Purdue University. After a short postdoc at Purdue University, Dr. Pratt took an Assistant Professorship at Grand Valley State University as the Course Director for Undergraduate Anatomy and Graduate Histology, Director of the Human Cadaver Laboratories, and a participating faculty member of the team taught Anatomy of Joints, Anatomy for Physical Therapy and Physician Assistants, and the Regional Dissection Lab. In the summer of 2006, Dr. Pratt accepted a position as Assistant Professor at the West Virginia School of Osteopathic Medicine (WVSOM). For four years she acted as the Course Director for Medical Histology and as a member of the Medical Gross Anatomy faculty. She also acted as the Director of the Anatomy Tour Program at WVSOM for one year. Currently, Dr. Pratt is an Associate Professor at Michigan State University (MSU) and is the Manager of Medical Gross Anatomy Labs and Lab Director for the MSU allopathic and osteopathic Medical Gross Anatomy Courses. In 2009, she received the Keith Moore Young Anatomist’s Publication Award from the AAA for her survey-based study on histology pedagogy.

Basic Statistical Analyses of Survey Data: Surface Anatomy in Today’s Anatomical Curriculum

Jennifer Burgoon

Jennifer M. Burgoon attended the University of North Carolina at Chapel Hill where she received a MS in Cell Biology and Anatomy in 2001 and a Ph.D. in Education in 2008. She is currently an assistant professor in the Division of Anatomy at The Ohio State University College of Medicine (OSU-COM), where she teaches approximately 1,000 undergraduate students basic human anatomy per year. Jennifer is also currently serving as the co-chair of the Evaluation and Assessment Team for the new medical school curriculum (i.e. the LeadServeInspire Curriculum) being implemented at OSU-COM in August 2012. Her research focus includes student self-efficacy for the anatomy curriculum, curricular design for optimal preparation of undergraduate students in anatomy for professional programs, and the development and evaluation of learning tools for the improvement of anatomy instruction.
Qualitative Methods in Anatomy Education Research

Peter Ward

Peter J Ward is assistant professor of anatomy at the West Virginia School of Osteopathic Medicine in Lewisburg, West Virginia. Since starting at WVSOM I have had the privilege to teach in gross anatomy, histology, embryology, neuroscience, history of medicine, and musculoskeletal courses. In 2007 I received the WVSOM Osteopathic Principles and Practices Integration Faculty Teaching Award and the WVSOM’s President’s Award of Faculty Excellence in 2008. In addition to teaching, I have coordinated several dissection-based anatomy retreats for faculty and students from Japanese Osteopathic schools and have been the director of the WVSOM plastination laboratory since 2006. I am also pleased to review articles for Clinical Anatomy and other journals related to both anatomy and medical education. My own educational research program continues to use both qualitative and quantitative methods to characterize how student approaches to study affect their achievement and recall of basic science course material.

A Mixed-Methods Assessment of the Role of a Graduate Pedagogy Class on Teacher-Scholar Development

Valerie O’Loughlin

Valerie O’Loughlin is an Associate Professor of Anatomy and Cell Biology in Medical Sciences at the Indiana University School of Medicine, where she teaches undergraduate human anatomy, medical gross anatomy, and pedagogical methods in health sciences. Her research interests are in anatomy education and teaching assistant pedagogical development. She is the recipient of numerous teaching awards, including the American Association of Anatomist’s Basmajian Award for teaching excellence and outstanding accomplishments in scholarship of education.
Educational Affairs Committee Presentation

This year’s Educational Affairs Committee Symposium will focus on a few examples of research design, statistical analysis and strategies for success in medical educational research and its important role in the development of medical curricula and the anatomy teacher-scholar.

Research Methods in Anatomy and Medical Education

Graham McMahon, M.D., from the Harvard Macy Institute

Graham McMahon, M.D., MMSc is an assistant professor of medicine and member of the Academy at Harvard Medical School. He is a member of the faculty in the division of endocrinology, diabetes and hypertension at the Brigham & Women’s Hospital in Boston where he completed his postgraduate training. Dr. McMahon received his medical education at the Royal College of Surgeons in Ireland, a master’s degree in clinical research from Harvard Medical School, and his doctorate in education from the National University of Ireland. He is the editor for medical education at the New England Journal of Medicine. He also directs the endocrinology course at Harvard Medical School. He has received local and national awards for his teaching and his work in medical education and diabetes research. His work has been published in the New England Journal of Medicine, Diabetes Care, the Archives of Internal Medicine, the Journal of General Internal Medicine, and Medical Education. His research interests include systems of care for patients with diabetes, cardiovascular disease in diabetes, and medical education.
Career Development Committee Symposium

Co-Moderators:

Brion Benninger, M.D.
Department of Surgery
Oregon Health Sciences University

Todd Hoagland, Ph.D.
Department of Cell Biology, Neurobiology and Anatomy
Medical College of Wisconsin

Symposium speakers:

Title: What is translational research today and how does a clinical anatomist become a player?

Rebecca D. Jackson, M.D.
Director of Translation Research Institute
The Ohio State University, College of Medicine
Associate Dean and Professor, Endocrinology, Diabetes & Metabolism and Physical Medicine & Rehabilitation

Title: Investigating the functional anatomy of swallowing from the cadaver lab to the clinic.

William Pearson
Boston University School of Medicine
Department of Anatomy and Neurobiology

Title: From the bedside to the bench: reverse translational research with an anatomic focus

R. Shane Tubbs, Ph.D.
Division of Neurosurgery
University of Alabama
Rebecca D. Jackson, M.D., Principal Investigator. Dr. Jackson is Director of the OSU CCTS (which is the academic home of the CTSA). Dr. Jackson participated in formalized programs of clinical and translational research training as a junior faculty first through the NCRR-sponsored Clinical Associate Physician Award and later through a Physician Scientist Award to develop expertise in molecular biology and basic science discovery. She has been a faculty member at OSU since 1983, and in August 2006, with the acceptance of the position as PI and Director of the OSU CCTS, she was promoted to Associate Dean for Clinical Research with direct reporting to the Senior Vice-President of Health Sciences. Dr. Jackson is a well-recognized clinical and translational investigator in metabolic bone disease and women’s health. She has had continuous funding for the past 20 years and has been PI of two large longitudinal studies; the NHLBI-sponsored Women’s Health Initiative and the NIAMS-sponsored Osteoarthritis Initiative. Currently, Dr. Jackson is PI on U01(1) and N01(1) and co-investigator on R01(3) and in January 2007 received funding as PI of a genome-wide association study of the genetic determinants of hip fracture. She has had extensive scientific leadership and administrative responsibilities serving as the Steering Committee vice chair of the Women’s Health Initiative for the past 8 years. Her individual and collaborative research effects have resulted in peer-reviewed publications in Journal of the American Medical Association, the New England Journal of Medicine, Annals of Internal Medicine, the Journal of Bone and Mineral Research and other general medicine and sub-specialty journals. She was lead author of the WHI analyses that showed that calcium plus vitamin D had a modest but non-significant effect on reducing hip fracture in postmenopausal women and she is actively engaged in genomic, proteomic and candidate biomarkers for the prediction of hip fracture risk.

Dr. Jackson has had a significant role in education, serving as the Director of the OSU Endocrinology Fellowship Program from 1998-2001. She has mentored more than 30 undergraduate, graduate and postdoctoral students, many who now occupy positions as faculty in academia. Dr. Jackson was the founding Director of the OSU CCTS Clinical Trials Office (CTO). Under her leadership, the clinical and translational research effort at the OSU CCC was transformed to a novel, integrated, and robust shared service. The fact that this fundamental change in the conduct of clinical research at the CCC took place over less than 14 months and culminated in funding by the NCI demonstrates Dr. Jackson’s energy and commitment to working with individuals to create consensus and develop systems that are responsive to investigators.

As the PI of the CTSA and Director of the CCTS, OSU has invested Dr. Jackson the authority to lead the university’s development of clinical and translation research. She will have ultimate responsibility for programmatic functions, operations, and strategic planning for the OSU CCTS. She will be the primary contact to facilitate and maximize collaboration and interactions between the CCTS, the NIH (NCRR) and national CTSA consortium, as well as both internal and external groups and individuals. She will ensure that the OSU CCTS and its mission to support clinical and translation science is adequately represented at the highest level of administration at OSU; chair of the OSU CCTS Management Committee to integrate the needs of the OSU CCTS with OSUMC and CCC; and chair the OSU CCTS Executive Committee. She will be responsible for the management of CCTS function and will have direct responsibility for performance of co-PI’s and key program leads with the advice of the Executive Committee. She will work with the Administrative Director to maximize the value of resources and programs across the colleges at OSU by identifying priorities and new directions. She will also ensure a formal ongoing evaluation and process improvement and as need arises will negotiate and arbitrate conflicts or controversies among key programs. She will ensure the adoption of best practices in all CCTS research support programs.
William Pearson, Symposium Summary: Bill Pearson investigates the anatomical substrate of deglutition in an effort to reduce the incidence of dysphagia in head and neck cancer patients, especially those that receive therapeutic radiation exposure. He uses MRI to understand the dynamic and complex mechanisms of swallowing in patients and is looking at cadaveric specimens to elucidate surface (internal) landmarks that correspond to underlying nerve passages in the oro- and laryngo-pharynx. Bill uses a new method of analyzing pharyngeal muscles according to their vector pull based on muscle mass and fiber direction to model the movements of the pharyngeal apparatus involved with deglutition. He is now applying this same theory to swallowing studies of live patients to develop a predictive model of the most important muscles needed for normal swallowing. This should provide evidence for radiation oncologists to help them minimize radiation exposure to critically important regions of the pharynx that are crucial in deglutition. This translational research project has tremendous potential to ameliorate some of the problematic consequences of focused radiotherapy in the region of the pharynx/larynx.

Dr. R. Shane Tubbs has been practicing translational research as a clinical anatomist and physician assistant working with surgeons for almost two decades. His research team has received grants directed at translational research. His research has focused on answering clinical questions and problems with anatomic cadaveric research. Such investigations derived by needs met in the operative theater have often improved care for patients and many have provided patients with the opportunity to undergo a more minimally invasive surgical procedure with less morbidity. Dr. Tubbs works with neurosurgeons and other surgical subspecialties as well as non-surgical disciplines to improve patient care. Such collaborations have resulted in over 600 peer reviewed publications primarily published in clinical/surgical and clinical anatomic journals.
**Poster Listing**  
**Poster Session I - Wednesday July 13 11:00 – 12:30**

Full abstracts listed by presenting author name begins on page 87

**Education**

**Marks**

Comparative foot and ankle anthropometry from the US, Japan, and Australia. GUTH, J. Jared and Amanda M. AGNEW. Division of Anatomy, The Ohio State University, Columbus, OH 43210, USA.

Anatomy outreach for paramedic airway management training using cadaver simulations. JONES, Kenneth H. and Karla A. SHORT. The Ohio State University and Columbus Division of Fire, Columbus, OH 43210, USA.

Using live chroma key video capture to produce a vertically and horizontally integrated clinical anatomy experience online. GOODMURPHY, Craig W., Jonathan GELLMAN, Jason COBEN, Chris MCGARY, James COULTER, and Donald SUSSMAN. Eastern Virginia Medical School, Norfolk, VA 23501, USA.

Joint lab student teaching modules: clinical procedures demonstrated in the anatomy laboratory. FABRIZIO, Philip A. Mercer University Department of Physical Therapy, Atlanta, GA 30341, USA.

**Marks**

Does the format of powerpoint presentations affect students’ behaviors toward textbook buying and reading, lecture attendance and academic curiosity? ECKLUND, Kurt1 and Brion BENNINGER1,2,3,4. 1Department of Integrative Biosciences, 2Department of Oral Maxillofacial Surgery, 3Department of Surgery, 4Department of Orthopaedic Surgery and Rehabilitation, Oregon Health and Science University, Portland, OR 97239, USA.

Teaching ssistants in gross anatomy as an elective clerkship correlated to subsequent residency placement. WEINHAUS, Anthony J. and Kenneth P. ROBERTS. University of Minnesota, Minneapolis, MN 55455, USA.

**Marks**

The evolution of curricular change in U.S. medical schools: An anatomist’s primer. HOFFMAN, Leslie and Mark SEIFERT. Department of Anatomy and Cell Biology, Indiana University School of Medicine, Indianapolis, IN 46202, USA.

**Marks**

Abdominal ultrasonography in medical anatomy education. HUNTER, JoAnna L. and Joel A. Vilensky. Department of Anatomy and Cell Biology, Indiana University School of Medicine- Fort Wayne, Fort Wayne, IN 46805, USA.
Using cadaver teams to emphasize professional behavior through dissection, producing objectives and creating teaching videos during an anatomy course, BENNINGER, Brion1,2,3,4, 1Department of Integrative Biosciences, 2Department of Oral Maxillofacial Surgery, 3Department of Surgery, 4Department of Orthopaedic Surgery and Rehabilitation, Oregon Health and Science University, Portland, OR 97239, USA.

Competence and confidence increases with clinical skills testing in the gross anatomy lab, KEIM-JANSSEN, Sarah A. and Stephane P. VANDERMEULEN, Department of Genetics, Cell Biology and Anatomy and the Division of Physician Assistants, University of Nebraska Medical Center, Omaha, NE 68198, USA.

The anatomist and the James Gang -- Henry Wheeler and medicine on the american frontier. JACKSON, Jon. Department of Anatomy and Cell Biology, University of North Dakota, School of Medicine and Health Sciences, Grand Forks, ND 58202 USA.

Marks

Does simultaneous presentation of integrated mediums: cadaver dissection, anatomical illustrations, MRI scans and corresponding ultrasound images improve proficiency in interpreting ultrasound images? JOHNSON, Taylor3, Brion BENNINGER1,2,3,4, and Glen WOODWORTH5, 1Department of Orthopaedic Surgery and Rehabilitation, 2Department of Surgery, 3Department of Integrative Biosciences, 4Department of Oral Maxillofacial Surgery, 5Department of Radiology. Oregon Health and Science University, Portland, OR 97239, USA.

Head/Neck

Marks

Evaluating temporomandibular joint anatomy with ultrasonography and cadaver dissection, BURKHOLDER, Alison3 and Brion BENNINGER1,2,3,4, 1Department of Oral Maxillofacial Surgery, 2Department of Surgery, 3Department of Integrative Biosciences, 4Department of Orthopaedic Surgery and Rehabilitation, Oregon Health and Science University, Portland, OR 97239, USA.

Marks

Clinical anatomy and relevance of the mandibular retromolar fossa, ALSTON, Eric1 and Brion BENNINGER1,2,3,4, 1Department of Oral Maxillofacial Surgery, 2Department of Integrative Biosciences, 3Department of Surgery, 4Orthopaedic Surgery and Rehabilitation, Oregon Health and Science University, Portland, OR 97239, USA.

Marks

Maxillary sinus – is there a clinical link between its historical and surgical relevance? MALLOY, Kyle3 and Brion BENNINGER1,2,3,4, 1Department of Oral Maxillofacial Surgery, 2Department of Surgery, 3Department of Integrative Biosciences, 4Department of Orthopaedic Surgery and Rehabilitation, Oregon Health and Science University, Portland, OR 97239, USA.
| Marks | Importance of frontal sinus anatomy regarding radiology, diagnosis and frontal sinus surgery. MALLOY, Kyle[^3], Andrew WEEKS[^1], and Brion BENNINGER[^1,2,3,4]. Department of Oral Maxillofacial Surgery[^1], Department of Surgery[^2], Department of Integrative Biosciences[^3], Department of Orthopaedic Surgery and Rehabilitation[^4], Oregon Health and Science University, Portland, OR 97239, USA. |
| Marks | Clinical anatomy of the Vazirani-Akinosi method for pain relief with and without an associated concussion. PATEL, Bhavin and Brion BENNINGER[^1,2,3,4]. 1Department of Integrative Biosciences, 2Department of Oral Maxillofacial Surgery, 3Department of Surgery, 4Department of Orthopaedic Surgery and Rehabilitation, Oregon Health and Science University, Portland, OR 97239, USA. |
| Marks | Clinical anatomy of the Gow-Gates local anesthesia technique. PETERSON[^2], Andrew and Brion BENNINGER[^1,2,3,4]. 1Department of Oral Maxillofacial Surgery, 2Department of Integrative Biosciences, 3Department of Surgery, 4Orthopaedic Surgery & Rehabilitation, Oregon Health and Science University, Portland, OR 97239, USA. |
| Marks | Clinical anatomy and incidence from six continents of cleft lip and palate. SEO, Simon[^3] and Brion BENNINGER[^1,2,3,4]. 1Department of Oral Maxillofacial Surgery, 2Department of Surgery, 3Department of Integrative Biosciences, 4Department of Orthopaedic Surgery and Rehabilitation, Oregon Health and Science University, Portland, OR 97239, USA. |
| Marks | Integrating head and neck anatomy with a live modified cranial nerve examination as an exiting requirement. WANAT III, Thomas[^3] and Brion BENNINGER[^1,2,3,4]. 1Department of Oral Maxillofacial Surgery, 2Department of Surgery, 3Department of Integrative Biosciences, 4Department of Orthopaedic Surgery and Rehabilitation, Oregon Health and Science University, Portland, OR 97239, USA. |
| Marks | Can the long buccal nerve be identified intraorally using ultrasonography: its evolution into clinical relevance? YOUNG, Matt[^2] and Brion BENNINGER[^1,2,3,4]. 1Department of Oral Maxillofacial Surgery, 2Department of Surgery, 3Department of Integrative Biosciences, 4Department of Orthopaedic Surgery and Rehabilitation, Oregon Health and Science University, Portland, OR 97239, USA. |
| Limbs | Identifying the clinically relevant structures of the posterolateral-knee-unit using ultrasonography and cadaver dissection. SMITH, Sawyer[^3], Taylor DELAMARTER[^3] and Brion BENNINGER[^1,2,3,4]. 1Department of Orthopaedic Surgery and Rehabilitation, 2Department of Surgery, 3Department of Integrative Biosciences, 4Department of Oral Maxillofacial Surgery. Oregon Health and Science University, Portland, OR 97239, USA. |
Distal biceps brachii tendon and supinator muscle interactions at the elbow. FOGG, Quentin A., Zoe HIGGS, and Neil ASHWOOD. Laboratory of Human Anatomy, School of Life Sciences, University of Glasgow, Glasgow, G12 8QQ, UK; Orthopaedics and Trauma Department, Queen’s Hospital Burton NHS Foundation Trust, Burton-upon-Trent, UK.

Marks

Characterizing the structural anatomy of the supraspinatus muscle of the rotator cuff complex. PEELER, Jason1,2, Jeff LEITER1,2, Peter MACDONALD2,3, and David VANCURA4. 1Department of Human Anatomy and Cell Science, University of Manitoba, Winnipeg, MB R3E 0J9, CANADA; 2Pan Am Clinic, 75 Poseidon Bay, Winnipeg, MB R3M 3E4, CANADA; 3Department of Surgery, University of Manitoba, Winnipeg, MB R3E 0J9; 4Undergraduate Medical Education Program, University of Manitoba, Winnipeg, MB R3E 0J9, CANADA.

Marks

Intramuscular innervation of supraspinatus: a 3D modeling study. HERMENEGILDO, A. Jason1, Trevor ROBINSON1, Kajeandra RAVICHANDIRAN1, David PARENTE1, and Soo KIM2. 1Division of Anatomy, Department of Surgery, University of Toronto, Toronto, ON, MSS 1A8, CANADA, 2School of Physical Therapy, College of Medicine, University of Saskatchewan, Saskatoon, SK, S7N 0W3, CANADA.

Marks

Piriformis syndrome: A commonly misunderstood syndrome. PARENTE, David N.1, Rebecca KIM1, Philip FABRIZIO2, Richard CLEMENTE3 and Anne M. AGUR1. Division of Anatomy, Department of Surgery, University of Toronto, Toronto, ON MSS 1A8, Canada. Department of Physical Therapy2, College of Pharmacy and Health Sciences, Mercer University, Atlanta, GA 30341, USA. Department of Physical Therapy3, John G. Rangos, Sr. School of Health Sciences, Duquesne University, Pittsburgh, PA 15282, USA.

Marks

Neuromuscular partitioning of infraspinatus: a three-dimensional modelling study. ROBINSON, Trevor, Jason HERMENEGILDO, David PARENTE, Mayoorendra RAVICHANDIRAN, and Anne AGUR. Division of Anatomy, Department of Surgery. University of Toronto, Toronto, ON, MSS 1A8, CANADA.

The anterior fibulocalcaneus muscle: Confirmation of its presence in the anterior leg compartment. LAMBERT, H. Wayne1, Stavros ATSAS1, Sean C. DODSON1, Blake T. DANÉY1, Heather J. BILLINGS1, and Ferrell R. CAMPBELL2. 1West Virginia University, Morgantown, WV 26509-9128, USA. 2University of Louisville, Louisville, KY 40202, USA.

Marks

Topographic anatomy of the muscular branches of the radial nerve. CHO Hyejin, Youngchun GIL, and Hyeyeon LEE. Brain Korea 21 Project for Medical Science, Yonsei University, Seoul 120-752, KOREA.

Marks

Parametric b-spline representation of the fiber bundle architectural pattern of extensor carpi radialis longus and brevis. RAVICHANDIRAN, Kajeendra1, Karan, SINGH2, Michele, OLIVER3, Nancy MCKEE1, and Anne AGUR1. 1Department of Surgery, University of Toronto, Toronto, Ontario, CANADA. 2Department of Computer Science, University of
Marks

The ‘oblique popliteal ligament', a macro and microanalysis to determine if it is a ligament or a tendon. DELAMARTER Taylor\(^3\) and Brion BENNINGER\(^{1,2,3,4}\), 1Department of Orthopaedic Surgery & Rehabilitation, 2Department of Surgery, 3Department of Integrative Biosciences, 4Department of Oral Maxillofacial Surgery, Oregon Health and Science University, Portland, OR 97239, USA.

Trunk

Marks

Comparing morphology and orientation between the common iliac artery and vein along the left and right pelvic sides in females explains swelling and sleep habits during pregnancy. DELAMARTER Taylor\(^3\), Amy SWOFFORD, \(^3\) and Brion BENNINGER\(^{1,2,3,4}\), 1Department of Surgery, 2Department of Orthopaedic Surgery and Rehabilitation, 3Department of Integrative Biosciences, 4Department of Oral Maxillofacial Surgery, Oregon Health and Science University, Portland, OR 97239, USA.

Obstruction of the thoracic duct(s) causes chronic lymphedema of the upper limb in patients presenting with symptoms of thoracic outlet syndrome: MRI/MRA/MRV. COLLINS, James D., Ernestina H. SAXTON, Samuel S. AHN, Hugh GELABERT, and Alfred CARNES. David Geffen School of Medicine at UCLA, Los Angeles, CA 90095, USA.

Variation of the drainage pattern of the inferior mesenteric vein. WEINHAUS, Anthony J. and Aaron HENDERSON. University of Minnesota. Minneapolis, MN 55455, USA.

Marks

An alternative pericardiocentesis approach: subxiphoid-right sternoclavicular joint during blind and ultrasound-guided techniques. WAGGENER, Joshua\(^3\) and Brion BENNINGER\(^{1,2,3,4}\), 1Department of Surgery, 2Department of Orthopaedic Surgery and Rehabilitation, 3Department of Integrative Biosciences, 4Department of Oral Maxillofacial Surgery, Oregon Health and Science University, Portland, OR 97239, USA.

Low frequency of supernumerary renal arteries in patients with coronary artery disease. SHOJA, Mohammadali M., Marios LOUKAS, Hossein NAMDAR, Amir Hossein MOHAMMAD-ALIAN, Jalal ETEMADI, and R. Shane TUBBS.

Specificity of segmentary distribution concerning the additional branches of the single renal artery. Study on 300 corrosion casts. MATUSZ, Petru, Department of Anatomy, “Victor Babes” University of Medicine and Pharmacy, Timisoara, 300041, ROMANIA.
The variability of renal segmentation in a case of single renal artery. Study on 300 corrosion casts. MATUSZ, Petru¹, Petru BORDEI², Delia Elena ZAHOI¹, Elena SAPTE², Dan ILIESCU², and Ionut BULBUC².
¹Department of Anatomy, “Victor Babes” University of Medicine and Pharmacy, Timisoara 300041, ROMANIA, ²Department of Anatomy, “Ovidius” University Constanța, ROMANIA.
Poster Listing

Poster Session II - Thursday July 14 10:00 – 11:30

Full abstracts listed by presenting author name begins on page 87

Education

Marks

Challenging anatomists to an anthropological perspective: An example of the skeletal system. HUNTER, Randee¹, Jesse GOLIATH¹, and Amanda M AGNEW¹². ¹Department of Anthropology, ²Division of Anatomy, The Ohio State University, Columbus, OH, 43210, USA.

Educational value of a social networking application, Twitter, for integrated dental anatomy education. LEE Lisa M.J. and Douglas J. GOULD. The Division of Anatomy, The Ohio State University, Columbus, OH 43210, USA.

A study of podiatric student perceptions of USMLE-style items in a general anatomy course. D’ANTONI¹, Anthony V., Anthony C. DILANDRO¹, Eileen D. CHUSID¹, and Michael J. TREPAL¹. ¹New York College of Podiatric Medicine, New York, NY 10035, USA.

A ten-step chemical method to enhance dissection of the preserved foot. DILANDRO¹, Anthony C. and Anthony V. D’ANTONI¹. ¹New York College of Podiatric Medicine, New York, NY 10035, USA.

Case study: gross anatomic dissection and CT scan of a 94 year old female achondroplastic dwarf. BOUCHER, Laura C., Amanda M. AGNEW, Heath MONAT, and John H. BOLTE IV. The Ohio State University, Columbus OH 43210, USA.

Anatomy comic strips. CHUNG, Min Suk and Jin Seo PARK. Ajou University School of Medicine, Suwon 443-749, REPUBLIC OF KOREA.

Clinical anatomical terminology: A collaborative approach to clarity. RENNIE, William P., Sherry A. DOWNIE, and O. Paul GOBEE. Hofstra North Shore-LIJ School of Medicine, Hempstead, NY 11549, USA, Albert Einstein College of Medicine, Bronx, NY 10461, USA and Leiden University Medical Center, NETHERLANDS, for the CAT Committee of the AACA.

A description of gross anatomy curricula in chiropractic colleges. BALL, Jennette J, Kristina L. PETROCCO-NAPULI, Michael P. ZUMPANO. New York Chiropractic College, Seneca Falls, NY 13148, USA.

Validation of the virtual dissection table. BROWN, W. Paul, Division of Anatomy, Stanford University School of Medicine, Stanford, CA 94305, USA.
Cardiac surgery elective for first year medical students – a detailed analysis. WILSON1, Donald R., Keith F. KORVER2, and David J. ELIOT3, 1,2Cardiac Surgeons, Sutter Medical Center, Santa Rosa, CA 95404, USA, and Santa Rosa, Memorial Hospital, Santa Rosa, CA 95405, USA 1,3Basic Science – Anatomy Touro University COM, Vallejo, CA 94592, USA, 1 Department of Pathology and Human Anatomy, Loma Linda University, SOM, Loma Linda, CA 92350, USA.

Development of interprofessional application modules prepares students for a work environment of integrated clinical care. FRANKLIN, Samuel R. and Brian R. MACPHERSON, Anatomy and Neurobiology, University of Kentucky, Lexington, KY 40536, USA.

Use of online formative evaluations as active learning in medical gross anatomy. HALLIDAY, Nancy, Daniel O’DONOGHUE, Rhonda SPARKS, and Britta THOMPSON. University of Oklahoma College of Medicine, Oklahoma City, OK 73132, USA.

Use of clinically based active learning in medical gross anatomy. HALLIDAY, Nancy, Daniel O’DONOGHUE, Rhonda SPARKS, and Britta THOMPSON. University of Oklahoma College of Medicine, Oklahoma City, OK 73132, USA.

Head/Neck

Orthodontic microimplants: A three pronged cadaver study of implant bony placement, vascular supply and anchoring strength. GOODMURPHY, Craig W., Stephanie T. TRELXLER, Michele RETROUY, Jonathan W. STRAND, Jean-Marc RETROUY, and Genevieve LEMIEUX. Eastern Virginia Medical School, Norfolk, VA 23501, USA.

Condylar emissary vein to extracranial venous anastomosis: an anatomical and histological case study. MOORE1, Garrett D, Robin LENZ1, Anthony C. DILANDRO2, Fortunato BATTAGLIA2, R. Shane TUBBS3, Marios LOUKAS4, Piotr B. KOZLOWSKI5, and Anthony V. D’ANTONI2, 1Podiatric Medical Student, 2Division of Pre-clinical Sciences, New York College of Podiatric Medicine, New York, NY 10035, USA, 3Pediatric Neurosurgery, Children’s Hospital, Birmingham, AL 35233, USA, 4Department of Anatomical Sciences, St. George’s University, GRENADA, 5Touro College of Osteopathic Medicine, New York, NY 10027, USA.

Spatial relations of the hyoglossus with the muscles in the suprahyoid region. SAKAMOTO, Yujiro. Tokyo Medical and Dental University. Tokyo 113-8549, JAPAN.

Functional anatomy of laryngoscopy for endotracheal intubation. FOLGER, Walter, Ann GREGOIRE, Philip HANSEN, and Nancy WILSON-MARTINO. AMC Anesthesiology Group and Division of Anatomy Education, Albany Medical College, Albany, NY 12208, USA.
Marks

Descriptive anatomy of the interscalene triangle and costoclavicular space and their relationship to thoracic outlet syndrome. DAHLSTROM, A. Kelly and Anthony OLINGER. Kansas City University of Medicine and Biosciences, Kansas City, MO 64106, USA.

Effects of concomitant administration of lithium and cadmium on the corpus striatum of rat brain-A histological study. ALI, M. Hassan, and Nafis A FARUQI. Jawaharlal Nehru Medical College, Aligarh Muslim University, Aligarh, UP 202002, INDIA.

Bilateral absence of the sternohyoid muscles is extremely rare, demonstrating potential clinical significance BENNINGER Brion1,2,3,4. Department of Oral Maxillofacial Surgery1, Department of Surgery2, Department of Integrative Biosciences3, Department of Orthopaedic Surgery & Rehabilitation4, Oregon Health & Science University, Portland, OR, USA.

Limbs


Branching patterns of the common peroneal nerve: Literature review and cadaveric study. WATT, Tessa, Michelle CAIRD, David BRZEZINSKI, and John L. ZELLER. University of Michigan Medical School, Ann Arbor, MI 48109, USA.

Bifurcation patterns of the superficial peroneal nerve: Implications in ankle arthroscopy. DARLAND, Allison, Anish KADAKIA, and John L. ZELLER. University of Michigan Medical School, Ann Arbor, MI 48109, USA.

Anatomical course of the superficial peroneal nerve: Avoiding potential injury during fasciotomy. CANNON, Kathleen A., Allison DARLAND, Paul J. DOUGHERTY, and John L. ZELLER. University of Michigan Medical School, Ann Arbor, MI 48109, USA.

Varied anatomy of the thumb A1 pulley system: Implications for successful trigger thumb release. SCHUBERT, Maneul F., Clifford L. CRAIG, and John L. ZELLER. University of Michigan Medical School, Ann Arbor, MI 48109, USA.

Prevalence of the absence of the palmaris longus among a regional adult population. ANDERSON Francine, Ken D’AMATO, Suporn SUKPRAPRUT, and Bradley ICARD. Edward Via College of Osteopathic Medicine – Virginia Campus, Blacksburg, VA 24060, USA.
The anatomy of axillary vein accompanied by major variation of axillary artery and brachial plexus. YANG, Hee-Jun, Eun-Sook KIM, Young-Chun GIL, and Hye-Yeon LEE. Kosin University College of Medicine, Busan, 602-702, KOREA.

An anatomically based imaging sign to detect adventitial cyst derived from the superior tibiofibular joint. HÉBERT-BLOUIN, Marie-Noëlle,1,2, Elena PIROLA,1,3 Kimberly K. AMRANI,1,4 Huan WANG,1 Nicholas M. DESY,5 Robert J. SPINNER,1,6 Mayo Clinic Departments of 1Neurologic Surgery, 4Radiology, 6Orthopedics, Rochester, MN 55905, USA, McGill University Department of 2Neurosurgery, and 5Orthopedic Surgery, Montreal, CANADA, 3San Gerardo Hospital Department of Neurological Surgery, Monza, Milan, ITALY.

Investigation of fiber-type distribution within architecturally distinct regions of human supraspinatus. KIM, Soo Y.1, Richelle DYCK2, Danley LUNN2, and Benjamin W.C. ROSSER1. 1School of Physical Therapy, College of Medicine, University of Saskatchewan, Saskatoon, SK S7K 0W3, CANADA, 2Department of Anatomy and Cell Biology, College of Medicine, University of Saskatchewan, Saskatoon, SK S7N 5E5, CANADA.

Development of a survey to evaluate medical student stressors and coping strategies at the University of Toronto. RAVICHANDIRAN, Kajeandra, Vandana PARNANDI, Katie TURCHIN, Monica BRANIGAN, and Anne AGUR. Program for Advice and Support of Students, Faculty of Medicine, University of Toronto, Toronto, Ontario, CANADA.

Marks

Semimembranosus complex. KHAN, Ahmed N.1, Estomih P. MTUI1, and Petru L. MATUSZ2. 1Department of Cell Biology, Weill Cornell Medical College, New York, NY 10065, USA; 2Department of Anatomy, University of Medicine and Pharmacy, Timisoara, ROMANIA.

Anomalous fibulocalcaneus muscles associated with the ankle joint: Clinical implications. LAMBERT, H. Wayne, Stavros ATSAS, Sean C. DODSON, Blake T. DANEN, and Heather J. BILLINGS. West Virginia University, Morgantown, WV 26506, USA.

Bone quality in the elderly: the role of microfractures. AGNEW, Amanda M.1,2, and Fangfang SUN3. 1Division of Anatomy, 2Department of Anthropology, 3Department of Statistics, The Ohio State University, Columbus, OH 43210, USA.

A rare variation of the aortic arch branches. Lusoria artery accompanied by a bicarotid trunk and non-recurrent laryngeal nerve in corpse. Discussion of clinical application in a case of dysphagia lusoria. LEITE, Túlio F.O.1, Antônio C.P. de OLIVEIRA2, Rossi M. da SILVA3, Kyoshi GOKE4, Williams da C. PINTO5, Júlio G. SILVA6, Carlos A.A. CHAGAS7. Gama Filho University Rua Manoel Vitorino SN Piedade, Rio de Janeiro, Brazil and Souza Aguiar Municipal Hospital, Praça da República, 111, Centro, Rio de Janeiro, R. J. BRAZIL, 1Gama Filho University, Rio de Janeiro, BRAZIL, 2Gama Filho University and Souza Aguiar Municipal Hospital, Rio de Janeiro, BRAZIL, 3Souza Aguiar
Marks

Prevalence of the subclavius posticus muscle and its relationship with thoracic outlet syndrome. FARKAS, A. Gabrielle, Brion BENNINGER, and Anthony OLINGER. 1 Kansas City University of Medicine and Biosciences, Kansas City, MO 64119, USA, 2 Oregon Health Sciences University, Portland, OR 97239, USA.

A possible relationship between reliability of thoracic outlet syndrome diagnostic testing and the position of the axillary artery. Part III: The relationship between the axillary artery and the roots of the median nerve. OLINGER, B. Anthony, William BORMAN, and Brion BENNINGER. 1 Kansas City University of Medicine and Biosciences, Kansas City, MO 64119, USA, 2 University of Western States, Portland, OR 97230, USA, 3 Oregon Health Sciences University, Portland, OR 97239, USA.

Marks

Posterior intercostal artery tortuosity and collateral branch points: a cadaveric study. SHURTLEFF, M. Eric and Anthony OLINGER. Kansas City University of Medicine and Biosciences, Kansas City, MO 64119, USA.

Marks

Unique variation of the axillary arch muscle discovered during dissection could explain neurologic symptoms in the living patient. TELISKY, R. Ashley and Anthony OLINGER. Kansas City University of Medicine and Biosciences, Kansas City, MO 64119, USA.

A proposed anatomical explanation for perineural spread of breast adenocarcinoma to the brachial plexus. HÉBERT-BLOUIN, Marie-Noëlle, Kimberly K. AMRANI, Marios LOUKAS, and Robert J. SPINNER. 1 Departments of Neurologic Surgery and 2 Radiology, Mayo Clinic Rochester, MN 55905, USA, 3 Department of Neurosurgery, McGill University, Montreal, Qc, CANADA, 4 Department of Anatomical Sciences, St. George’s University School of Medicine, GRENAO, West Indies.

Multimodal imaging and investigation of vascular beds in amputated fingers. TUNALI, Selcuk, Mehmet A. UYSAL, Gven METE, Arzu AVCI, and Osman A. BORA. 1 Clinic of Orthopedics and Traumatology, Izmir Ataturk Education and Research Hospital, Izmir, Turkey, 2 Department of Anatomy, Hacettepe University Faculty of Medicine, Ankara, Turkey, 3 Department of Anatomy, Biochemistry and Physiology, University of Hawaii School of Medicine, Honolulu, HI, 4 Clinic of Orthopedics and Traumatology, Ardahan Government Hospital, Ardahan, Turkey, 5 Laboratory of Clinical Pathology, Izmir Ataturk Education and Research Hospital, Izmir, TURKEY.
ANNUAL BUSINESS MEETING

AGENDA

CALL TO ORDER: 3:30pm

Approval of Minutes of 2010 ABM and the 2011 Agenda

1. President’s Report
   a. 2011 Election Results: President Elect, Association Secretary, two Councilors-at-Large and the Special Councilor – Allied Health
   b. 2012 Election: Program Secretary (Seifert), two Councilors-at-Large (Benninger & Lomneth), and the Special Councilor – Anatomical Services (Schmitt)
   c. President Elect Committee Appointments - Anne Agur

2. Treasurer’s Report - Neil Norton

3. Membership Committee Report - Anne Agur
   a. Remembrance of Deceased Members - Brian MacPherson

4. Journal Committee Report - Larry Ross
   a. Report of Editor-in-Chief - Stephen Carmichael

   b. Future Meetings:
      i. 29th Annual Meeting 2012, Grenada - Marios Loukas

6. Committee Elections ** - Todd Olson
   a. Election of Members-at-Large for Bylaws: 2 vacancies
   b. Financial Affairs Committee: 1 vacancy
   c. Nominating Committee: 2 vacancies

7. Old Business

8. New Business

9. Presidential Transition - Passing of the Gavel

ADJOURNMENT: 5:00pm

* All serving members of Council, up for election in 2012, are eligible to be nominated for an additional term.

** The membership Special Interest Group (SIG) Committee’s Educational Affairs, Career Development and Anatomical Services elect members at the Committee’s meeting.
ANNUAL BUSINESS MEETING

MINUTES - Thursday, July 22, 2010
Hilton Hawaiian Village
Honolulu, HI

CALL TO ORDER: 4:30pm

The President asked if there was any objection to the Minutes of the 26th Annual Meeting held Thursday, July 16, 2009, in Bank of America A Room at the Intercontinental Hotel in Cleveland, Ohio - as circulated at the meeting. In the absence of an objection, the Minutes were adopted by Unanimous Consent of those present.

1. President’s Report (Todd Olson) The 2010 election results were reported – Shane Tubbs (Special Councilor - Clinical); Wayne Lambert and Tom Gest (Councilors-at-Large); and Neil Norton (Treasurer). Positions to fill in 2011 will be President Elect, Association Secretary, 2 Councilors-at-Large, 1 Special Councilor – Allied Health. The President announced that the latest Bylaw Amendments were approved by a 93% margin in the electronic vote and became effective on July 18, 2010.

2. Treasurer’s Report (Neil Norton) Dr. Norton presented the Association’s financials to date. He presented the 2010 Budget and answered questions from the floor.

3. Membership Report (Anne Agur) Dr. Agur presented a list of 130 newly approved members (76 regular; 53 associate; 5 affiliate) as ratified by the membership committee. She also indicated that new on-line application submission process, utilizing a new, more comprehensive form, was working well.

4. Remembrance of Deceased Members (Brian MacPherson) Members John Skandalakis (1998 Honored Member), David Scott and John Leppi were remembered by a minute of silence.

5. Report of the Journal Committee (Larry Ross) Larry Ross, Chair of the Journal Committee, announced to the membership that the AACA had signed a 3 year contract with the continuing Editor-in-Chief (EIC), Stephen Carmichael. Over the next two years, the Journal Committee will conduct a search and select a new EIC.

Stephen Carmichael gave the journal’s Annual Report. There were 465 submissions with a rejection rate of 60%; the impact factor for the journal had jumped significantly and was now just over 1.0 (1.084). The number of submissions from the United States was also up significantly to 96. Special editions help raise the journal’s profile and impact factor.

6. Report of the Local Meeting Committee (Scott Lozanoff) Dr. Lozanoff welcomed everyone to Hawaii. He emphasized the strengths and weaknesses of his experience as local host. Strengths: Additions of a Meeting Manager and the monthly Meeting Organization and Program (MOPP) Committee teleconferences significantly improved all aspects associated with hosting a meeting compared to when he hosted the meeting in 1997. Weaknesses: included the cost of the hotel in Hawaii, the need for better communications with the ISP group (and other future organizations) is essential. In addition the ability to discontinue website registration at an appropriate time prior to the start of the annual meeting needed attention.
7. **Future Meetings**
   a. The 28th Annual Meeting 2011, Columbus, OH (Ken Jones): Dr. Jones reported that the planning for the meeting in Columbus from July 12-15, 2010 was well underway and issued an invitation for all in attendance to join us in Columbus next year. Greg Smith would be meeting Chair for this meeting.
   
   b. The 29th Annual Meeting 2012, St. George’s University, Grenada (Marios Loukas) Dr. Loukas issued an invitation for all in attendance to come to Grenada in 2012. The Post Graduate Program would revolve around ultrasound in cadavers and patients. Housing would be student apartments, 1, 2, 3 and 4 bed units – each with its own bathroom. They are air-conditioned, internet equipped, and would be very reasonably priced. There are direct flights from New York and Miami to Grenada.

8. **Committee Elections** (Todd Olson) Election of Members-at-Large for Bylaws (2), Noelle Granger and Len Cleary were elected. Financial Affairs Committee (1), Ken Jones was elected. Nominating Committee (2), Rebecca Pratt and Marios Loukas were elected. All the above terms are for 1 year. The standing committees of the Association have or will have elected members for Educational Affairs (1), Career Development (1) and Anatomical Services (1) Committees and they would be reported to the President.

9. **Old Business** - none

10. **New Business** (various) Fiona Stewart reported that southern members objected to the $30 abstract submission fee, especially when abstracts were accepted but not published and this information had not been made available via notification until after the early bird registration date had passed. Mark Seifert explained the new policy had been outlined in the Call for Abstracts. A better effort to bring this to member’s attention, and get the abstract designation information disseminated prior to the early bird registration date would be made in the future.

Adjournment: 5:45 p.m.

Respectfully submitted

Brian R. MacPherson, Ph.D.
Association Secretary
2010-2011 Officers of the AACA Council

President - Todd R. Olson, Ph.D.
Past-President - Lawrence M. Ross, M.D., Ph.D.
President-Elect - Anne Agur, Ph.D.
Treasurer - Neil S. Norton, Ph.D.
Associate Secretary - Brian R. MacPherson, Ph.D.
Program Secretary - Mark F. Seifert, Ph.D.

Councilors
Brion Benninger, M.D., M.S.
David L. Bolender, Ph.D.
Thomas R. Gest, Ph.D.
H. Wayne Lambert, Ph.D.
Carol S. Lomnetth, Ph.D.
David J. Porta, Ph.D.
Rustin E. Reeves, Ph.D.
Brandi J. Schmitt, M.S.
R. Shane Tubbs, Ph.D.

2011-2012 Officers of the AACA Council

President – Anne Agur, Ph.D.
President-Elect – Brian R. MacPherson, Ph.D.
Secretary – H. Wayne Lambert, Ph.D.
Treasurer - Neil S. Norton, Ph.D.
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Marios Loukas, M.D.
David J. Porta, Ph.D.
Brandi J. Schmitt, M.S.
R. Shane Tubbs, Ph.D.
Peter Ward, 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 – Stephen W. Carmichael

AACA Co-Editors –
Thomas R. Gest, John T. Hansen,
Wojciech Pawlina, Kitt Shaffer, Robert J. Spinner, William J. Swartz, R. Shane Tubbs, Joel A. Vilensky, and John L. Zeller

BACA Editor – Stuart McDonald
ASSA Editor – Graham Louw
ANZACA Editor – Helen Nicholson
Editorial Assistant – Beverly Northouse

Founding Editors: Ralph Ger and Ray J. Scothorne

Editorial Board - 2011

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Robert D. Acland
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Changman Zhou
Anna Zurada
Committee Reports

Anatomical Services Committee

Clinical Anatomical Terminology Committee

Council & Executive Committee

Journal Committee

Meeting Oversight and Program Planning Committee

Membership Committee

Nominating Committee

Professional Association Management Committee

2011 Program Committee
Anatomical Services Committee (ASC)

2011 AACA Annual Meeting Anatomical Services Committee events include:

• The annual breakfast meeting, which takes place on Wednesday, July 13 at 7 AM. Among other agenda items, the active AACA members will be voting for a new Anatomical Services Committee member.

• The Anatomical Services Symposium takes place on Wednesday, July 13, 2011 from 3:15 to 5:15 PM. The topic this year is Medical Suitability and Communicable Diseases: Risks, Screening and Serological Testing in Whole Body Donation Programs.

The Anatomical Services Committee (ASC) represents both academic and technical members of the Association who are active in the operations and administration of institutional whole body donation programs. This special interest group functions to serve the Association’s membership through the development of symposia, courses and guidance documents and promotes technical and academic aspects of human anatomical specimen use in health care and university education and research. The group advocates informed, ethical, safe operations for students, faculty and researchers who contribute to medicine, education and research through the use of anatomical materials. The ASC meets throughout the year to discuss and act on relevant items that range from current practices, related legal and media items to pertinent Association bylaws and topics for future symposia.

The AACA maintains an active listserv specific to anatomical services, which helps to facilitate open discussion of relevant issues. We use this listserv to raise awareness, communicate with colleagues and to gather information. Surveys are distributed via this listserv as well as through the main AACA listserv. The ASC regularly interacts with members of other professional societies on topics of mutual interest.

The ASC has authored a document entitled, “Best Practices in Whole Body Donation Programs,” maintains contact information for all institutional whole body donation programs nationwide, and disseminates information on access to anatomical materials and related professional aspects of those who work in anatomical services careers.

Please come to the ASC symposium, stop by our breakfast meeting on Wednesday morning or get in touch with one of our committee members to learn more about how this Committee serves the Association and its members. The current ASC committee includes:

Appointees:
2010-2013: Len Cleary, Academic Co-Chair - Len.Cleary@uth.tmc.edu
2009-2012: Carol Lomneth - clomneth@unmc.edu
2009-2011: Dean Fisher - DFisher@mednet.ucla.edu

Elected Members:
2010-2013: Dean Mueller - deanm@umich.edu
2009-2012: Angela McArthur - dunnx057@umn.edu
2009-2011: Jon Jackson - jackson@medicine.nodak.edu

Ex Officio:
Brandi Schmitt, Technical Co-Chair - brandi.schmitt@ucop.edu
Clinical Anatomical Terminology (CAT) Ad Hoc Committee

The Clinical Anatomical Terminology (CAT) ad hoc committee has held monthly conference call meetings throughout the 2010-2011 academic year. By the steadfast efforts of its committee members, the program development phase has been completed and the CAT committee is poised to operate in 2011-2012 in fulfillment of its proposed mission – “to compile and disseminate information about clinical anatomical terms and their usage.”

The CAT committee, working with the Bylaws committee, has developed draft bylaws documents describing the mission, activities and structure of the committee, and its rules of operation. In the Spring of 2012, following eight months of CAT committee activity, these draft documents will be reviewed and amended, if necessary, prior to submitting them to the Bylaws committee for approval and presentation to the AACA membership for adoption.

The CAT committee mission will be furthered by the implementation of two mechanisms in 2011. One is the continued development and expansion of easy access website resources for clinical and anatomical terms. The other is the creation and publication of essays that will shed light on the origin of both clinical and anatomical terms and foster appreciation for their usage.

Website development has been led by Dr. Paul Gobee of Leiden University in the Netherlands who has completed wikification of his open-access website http://anatomicalterms.info/. We have defined roles for the CAT committee in collecting, vetting and posting terminology to anatomicalterms.info (AT.I), reviewing and validating its current content, and sharing data between AT.I and http://anatomy.med.umich.edu/AnatomicalTerminology.htm, the site developed by Dr. Tom Gest of Michigan University. Both sites can be accessed from the AACA website (www.clinical-anatomy.org) by opening the Web site tab.

The writing/publications arm of the CAT committee, led by Dr. Shane Tubbs, has developed both format and protocol for writing and submitting manuscripts, co-authored by an anatomist and a clinician, that deal with some interesting aspect of clinical and anatomical terms used to refer to the same body structure or anatomical concept. The CAT committee has compiled a preliminary list of terms and roster of potential authors to pen the essays which will be submitted to Clinical Anatomy for consideration of publication. CAT committee editors will support the authors in producing their manuscripts and assist in the submissions process.

The CAT committee will present a poster describing its undertakings at the AACA Annual Meeting in Columbus. Please stop by to see a visual representation of the Committee’s mission, to contribute your favorite clinical or anatomical term, and to register to be an author of a Clinical Anatomical Terminology essay.

Many thanks to the hard-working members of the 2010-2011 CAT committee.

Paul Gobee
Mark Hankin
Todd Hoagland
Ahmed Khan

Marios Loukas
Bradford Martin
Bill Rennie
Alan Richards

Bill Swartz
Pat Tank
Shane Tubbs
Ian Whitmore
The Executive Committee (ExecComm), consisting of AACA’s six officers, is charged in Article IV, Section 1 of the Bylaws with making decisions and taking actions on behalf of the Council between its meetings. Going back to August 2009, Executive Committee has met monthly via teleconference calls in order to more efficiently manage the day-to-day business that often burdens and hinders our semi-annual Council meetings and prevents Council from fully deliberating topics of broader concern to the future of the Association. The Executive Committee held its first monthly meeting on August 4th 2009 less than 3 weeks after the Cleveland meeting and has continued to meet monthly for the past two years. Our June 2011 meeting was on the 14th.

In addition our regular monthly 2010-2011 meetings, the ExecComm held 3 extra-monthly meetings in April and May to discuss the details of meeting management contracts being negotiated with JulNet Solutions. There were no Special Meetings of the Council as a whole since July 2010. Over the past twelve months, the Association Secretary, Brian MacPherson, has with only a few gaps, emailed the Minutes of the ExecComm meetings to the entire Council – as required in the Bylaws Article IV, Section 1, Subsection A. Council was also sent a copy of each monthly ExecComm agenda, again to insure that Council is fully apprised of issues under discussion. In addition to its teleconference meetings, ExecComm members exchanged 157 emails on the dedicated Listserv provided by JulNet Solutions, LLC.

In total, the Executive Committee has met 32 times during my term as Chair which began in July 2009.

Submitted by:

Todd R. Olson, President
Council and Executive Committee Chair
Journal Committee

Members: Larry Ross – Chair; Heikki Whittet (BACA) – Vice Chair; Anne Agur, Neil Norton, Todd Olson; Ex Officio: Stephen Carmichael – EIC; Tiffany McKerahan – Wiley

A contract with the Editor-in-Chief, Stephen Carmichael was signed at the Honolulu Annual Meeting, by Larry Ross and Stephen Carmichael.

Though a couple of Journal Committee teleconference meetings were held in latter part of 2010, regular teleconference meetings were held in 2011. The most important item of business during these meeting was discussion, and the eventual drafting of a call for the nomination of a new Editor-in-Chief for our journal, CLINICAL ANATOMY. This call went out to AACA and BACA members via their respective list serves, and was published in CLINICAL ANATOMY. The deadline for receipt of nominations by the Chair is July 1, 2011. The new Editor-in-Chief is expected to begin July 1, 2013.

To date (5-22-11), six (6) nominations have been received by the Chair, with one nomination still pending acceptance/declination.

We are pleased to report, though you all have been informed of this fact via our list serve that the member’s subscription rate for our journal, CLINICAL ANATOMY, will remain at $110 annually.
Membership Committee Report

Anne Agur (Chair), Larry Ross and Soo Kim

The Membership Committee has used the new electronic membership form for the past year. If completely filled out, the form has substantially shortened the review time for applications. It is important to emphasize that to ensure quick turnaround for Regular Members both the teaching and research sections must be completed. For Associate members it should be clear what program they are enrolled in and what their research interests are. All applicants must fill in the name and contact information of a reference. For Regular membership it is the Department/Division Chair and for Associate membership the students’ supervisor/mentor. In order to further increase the functionality of the form we will add a line requesting the website address of the applicant’s Department. The Committee would like to thank the applicants for their patience when the new meeting management software was instituted.

The Membership Committee CONGRATULATES all of the new AACA members listed below.

**REGULAR MEMBERS:**
Abad, Macario
Abelew, Thomas
Ahmed Abd-Alla, Mohammad
Ball, Jeannette
Behr, Sister Teresa Benedicta
Bina, Isaac
Brunelli, Donna
Bubb, Kathleen
Buch, Hasmukh
Cameron, William
Chase, Resa
Conway, Maianne
D’Amato, Kenneth
DiLandro, Anthony
Fallon, Kelly
Finlay, Rita
Fisher, Cara
Funk, Cindy
Gana, Karen
Gobee, Paul
Gurevich, Inga
Halliday, Nancy
Hernandez, Manuel Millan
Hinchion, John
Jafari, Fahim
Jones, Beth
Khamnarong, Kimaporn
Lanier, Jolanta
Lewis, Christina
Martin, Bradford
Miller, Mark
Miller, Nathan
Miska, Dan
Mohsin, Sahar
Moll, Courtney
Newton, Bruce
O’Kane, Barbara
Pilati, Stamatoula
Pipe, Kimberly
Quijeno-Majano, Claudia
Rexach, Carmen
Robbins, Kent
Sagoo, Mandeep Gill
Smith, Dean
Stickley, Christopher
Tsurumoto, Toshiyuki
Tunali, Selcuk
Vanderbrook, Robert
Wilson, Adam
Yang, Hee-Jun
Zahoi, Delia
Zizik, Debra

**ASSOCIATE MEMBERS:**
ALDahhan, Rashid
Alston, Eric
Anokwute, Miracle
Baker, Ross
Baker, Amanda
Bassey, Rosemary
Bates, Daniel
Bellary, Sharath
Benissan-Messan, Dathe
Cassidy, Lindsey
Chang, Youjin
Harmon, Derek
Henkin, Kate
Hermenegildo, Jason
Huang, Richard
Hudson, Ryan
Hulsberg, Paul
Hunter, JoAnna
Hunter, Randee
Jacques, Frederic
Jaja, Blessing
Kang, Yun Seok
Mathenge, Njambi
Mattinson, Catherine
Mobley, Mark
Pearson, William
Petrie, Alison
Piet, Valerie
Polo, Lorena
Resuehr, David
Richardson, Danielle
Robinson, Trevor
Russo, Alejandro
Charran, Ordessa
Chase, Dean
Chou, Jackie
Clouse, Melissa
Dahlstrom, Kelly
Eklund, Kurt
Farkas, Gabrielle
Gan, Tong
Garcia, Lisa
Greenberg, Michael
Gupta, Anupam
Guth, Jared
Hoffman, Leslie
Hogan, Elizabeth
Housman, Brian
Kim, Min-Jin
Kleinerman, Rachel
Klump, Kathryn
Lee, Rebecca
Lee, Sarah
Lenz, Robin
Li, Zhi
Losenno, Katie
Malenfant, Jason
Moore, Garrett
Morris, Tyler
Oelhafen, Kim
Ooi, Jia
Parente, David
Patel, Bhavin
Seo, Simon
Sharma, Manish
Shayota, Brian
Shurtleff, Eric
Smith, Sawyer
Snosek, Michael
Solyali, Veli
Swofford, Amy
Telisky, Ashley
Uppal, Kiranjit
Waggener, Josh
Walpola, Vindye
Wanat, Thomas
Woyski, Dustin
Young, Matthew

SENIOR:
Chagas, Carlos
Gupta, Anupam
Hoffman, Leslie
Hogan, Elizabeth
Housman, Brian
Sreedhar, Tirunagari

AFFILIATE:
Zavoyna, Mark

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Meeting Oversight and Program Planning Committee

The MOPP Committee is responsible for the overall organization, general content, and budget of each Annual Scientific Meeting and Postgraduate Course, and plans and sets the Association’s long-term programmatic objectives for future meetings.

Organizational and planning decisions of the MOPP are implemented through its Annual Meeting Committee structure, and include: preparing the Call for Abstracts, overseeing abstract review, selection, and author notification, organizing the content of platform, techfair, and poster sessions, and meeting program booklet preparation.

The MOPP Committee has met nearly monthly via conference call. Important items discussed or acted upon include:
- Selected Robert (Bob) DePhilip as the 2012 Annual Meeting Chair
- Recommended the purchase of Wild Apricot, a web-based membership software program designed for associations and non-profit organizations, for adoption for our meeting website with secure credit card processing via an account with Authorize.net
- Invitation to Dr. Harold Ellis, our Honored Member, to give the AACA Council Presentation this year
- Advanced planning for the 2012 Grenada meeting
- Engaged in discussions with the American Medical Illustrators association to work on a “co-located” meeting in Denver 2013, the first of its kind for both groups. Currently, both groups are reviewing a common hotel site for their meetings. Plans will include shared events, such as the welcome reception, a social event, a keynote speaker, workshops, and movement of attendees between presentations
- Future meeting sites and methodology for selecting them
- Need for strategic planning by the Association to meet the future needs of clinical anatomy and clinical anatomists

The MOPP Committee is comprised of all officers of the Association, the Chairs of the SIG committees, the Chair of each Annual Meeting Committee, and the Local Host for each annual meeting. The Meeting Manager serves as an ex officio non-voting member and the Program Secretary serves as the Chair.
This year’s MOPP Committee members are:

Executive Committee Members
Program Secretary, Mark Seifert
President, Todd Olson
Past President, Larry Ross
President-Elect, Anne Agur
Treasurer, Neil Norton
Association Secretary, Brian MacPherson

Special Interest Group Committee Chairs/Co-Chairs
Anatomical Services, Brandi Schmitt
Anatomical Services, Len Cleary
Career Development, Brion Benninger
Career Development, Todd Hoagland
Educational Affairs, Tom Gest
Educational Affairs, Rebecca Pratt

Annual Program Committee Chairs
2011 Program Chair, Greg Smith
2012 Program Chair, Robert DePhilip

Local Hosts
2011 Columbus, Kenneth Jones
2012 Grenada, Marios Loukas

AACA Meeting Manager
Julie Hewett
Nominations Committee

The 2010 Nominating Committee, in fulfilling its charge, met monthly via teleconference from September through November, 2010.

In total, twenty-four AACA members-in-good standing were considered by the committee as potential candidates for the five council positions. These individuals were either identified by the committee, suggested by the membership, or self-nominated.

The committee submitted a slate ten outstanding candidates to the Association Secretary. These candidates were individually interviewed by the Nominations Committee chair and all attested to their willingness to be candidates and their commitment to serve on council should they be elected. The slate is listed below.

The Nominations Committee report was submitted to the Association Secretary by the deadline required in the Bylaws.

President-elect:

Dr. Brian MacPherson
Dr. Brion Benninger

Association Secretary:

Dr. H. Wayne Lambert
Dr. Sherry A. Downie

Allied Health Councilor (1 position):

Dr. F. Richard Clemente
Dr. Kimberly Topp

Councilor-at-Large (2 positions):

Dr. Peter Ward
Dr. Marios Loukas
Dr. Lonie Salkowski
Ms. Angela McArthur
Professional Association Management Committee

Art Dalley, Chair
Noelle Granger, Vice Chair

Members: Larry Ross
Peter Ward
Tom Quinn
Greg Smith
Tom Gest

Ad hoc member: Rick Drake
Ex officio members: Todd Olson, Anne Agur

The Professional Association Management Committee was formed by AACA President Todd Olsen in 2009 as an ad hoc committee to assess the needs of the AACA with regard to what association activities a professional management company (PMC) could assume, in order to move our Association forward.

Committee Chair Art Dalley provided information on the functions and selection of a professional management company. During a Committee conference call in the fall of 2010, it was decided to create a survey to determine how strongly the Council felt about which activities a PMC might assume. Peter Ward designed the survey, based on a list of activities suggested by the PAM Committee, and analyzed the results. As reported during a conference call early in 2011, various aspects of membership management, the running of the annual meeting, the internet presence of the AACA, the running of Council and committee meetings, and a few activities assisting the Treasurer were considered to be helpful or very helpful by Council members.

The names of PMCs were solicited from Council and Committee members, ones recommended based on personal knowledge or the knowledge of colleagues. Five PMCs were on the final list, all of which currently manage anywhere from 5-17 professional associations. Not only do the five companies listed range widely in terms of the number of associations they manage (5-17), but they also vary widely in terms of their own size, ranging from less than half a dozen to 85 professionals employed.

The companies were given a deadline of June 1 to submit a hard copy of their proposal for becoming the professional management company that will affiliate with the AACA and were also asked from comments/recommendations from some of the associations that they represent. As of June 1, four companies have replied.

Committee members will consider each of the proposals and report to the Committee Chair and Vice-Chair their top two choices by July 1.
2011 Program Committee

28th Annual AACA Meeting, Columbus, OH

This year was a time of transition. The Association switched to a new web hosting program, Wild Apricot. Members, who paid their dues, submitted an abstract fee and abstract or registered for this year’s meeting experienced the new program. Eventually all AACA business will be conducted through this portal including our database, the Association website, and future meeting organizing.

Beginning in January, The Annual Meeting Committee conducted monthly conference calls. This facilitated the organization of the meeting by allowing committee members to stay abreast of meeting details and needs. It also allowed the members to interact in real time resulting in creative and constructive ideas.

The abstract review process was modified for this year’s meeting. A committee of 29 reviewers was assembled to evaluate the abstracts. The abstracts were “blinded” so that the reviewers only saw the body of the abstract. Each abstract was reviewed by three reviewers. This resulted in a much smaller number of abstracts that each reviewer was assigned. Each reviewer gave numerical ratings for their abstracts using Survey Monkey. The reviewers were expected to include written comments especially if a recommendation for a platform session was made. The numerical summaries and comments were used to assign the abstracts to the Poster, Techfair and Platform sessions. At the very end of the process, the identities of the authors of the abstracts were revealed. It is evident that our Associate Members are engaged in wonderful research projects as 14 of the 26 Platform presentations will be given by our Associate Members. The feedback from the review committee regarding the review process was highly positive.

The Annual Meeting Committee embarked on a media blitz. Notifications were placed in the AAA Newsletter, the Anatomical Sciences Education journal and the Human Anatomy and Physiology Society (HAPS) website. Email notifications were sent to the International Association of Medical Science Educators (IAMSE) and other groups that may be interested in our meeting.

The end result of all of this work is a meeting that will fill our days. All three Special Interest Groups (SIGs) will have a symposium with the Educational Affairs Committee also offering a special lecture by Graham McMahon from the Harvard Medical School. We are also pleased to recognize Harold Ellis as our Honored Guest. We look forward to an eventful meeting, one in which attendees should advance their knowledge in anatomy.

2011 Annual Meeting Chair, Greg Smith
2011 Host, Columbus, Kenneth Jones
Program Secretary, Mark Seifert
AACA Meeting Manager, Julie Hewett
President, Todd Olson
President-Elect, Anne Agur
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Special Interest Group Chairs/Co-Chairs
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Career Development, Todd Hoagland
Educational Affairs, Tom Gest
Educational Affairs, Rebecca Pratt
Abstracts – Platform Presentations
(listed by presenting author last name)

ACLAND, Robert D. Department of Anatomical Sciences and Neurobiology University of Louisville School of Medicine Louisville, KY 40292, USA.
Restoring Dr. Richard Blandau's classic film on development of the heart.

Dr. Richard Blandau (1911-1998) was renowned for his basic studies of ovulation, fertilization and embryonic development. He made many groundbreaking motion pictures. One of them, "Congenital Malformations of the Heart", is the subject of this presentation. The film was made in 1950 at the University of Washington, in collaboration with Dr. Robert Rushmer. It includes a 9 minute animated sequence on the development of the heart, that may be the clearest explanation of this difficult topic ever presented. The 16mm film was widely used in embryology courses. Well-worn copies of it were subsequently transferred to early videotape; and videotapes in turn have been recopied to digital media. So great is the film's instructional quality that in spite of severe degradation these twice copied versions are still in use today. It was felt that a high quality digital restoration of this classic instructional animation would be valuable, both for continued classroom use, and as an object lesson in the art of instructional animation. Using Dr. Blandau's own copy of the original film, we have created a restored version, using the best available film scanning technology. The restoration will be shown for the first time as part of this presentation, with comments on those features that give the film such enduring value. The restoration is to be made freely available online.

BAKER, E. Ross1,2, Debbie HEBERT2, Tracy PAULENKO2, George MOCHIZUKI2,3, Anne AGUR1, and Denyse RICHARDSON2. 1Division of Anatomy, Department of Surgery; University of Toronto, Toronto ON, CANADA. 2Toronto Rehabilitation Institute, Toronto ON, CANADA. 3Heart and Stroke Foundation-Centre for Stroke Recovery, Brain Sciences Research Program, Sunnybrook Research Institute.

INTRODUCTION. Spasticity has been described as an increase in skeletal muscle tone secondary to a hyperexcitable phasic stretch reflex and a velocity-dependent increase in tonic stretch reflexes. It is associated with brain and spinal cord injury and may affect over half a million people in the United States. If untreated, spasticity has a significant negative effect on function, comfort, and care delivery. Treating spasticity involves managing both neurogenic and biomechanical aspects of limb stiffness making spasticity difficult to measure and treatment challenging to evaluate. Furthermore, a paucity of valid and reliable outcome measures for spasticity rehabilitation impedes a clinician’s ability to quantify functionally significant improvement. Our objective was to evaluate the effectiveness of an interprofessional spasticity management program and identify clinical measures that are most responsive to a client’s functional improvement. METHODS. Participants 18-75 yrs with neurological injury leading to spasticity involving upper and/or lower extremity receiving focal injections of Botulinum toxin-A (BoNT-A) were included in a repeated measures, longitudinal study. A battery of clinical outcome measures, client participation questionnaires, and instrumented assessments were used to evaluate functional improvement following BoNT-A treatment and rehabilitation therapy. RESULTS. Preliminary results indicate the Fugel-Meyer, Wolf Motor Function Test, Chedoke Arm and Hand Activity Inventory, and motion analysis are responsive to upper limb change while the Six Minute Walk Test and Berg Balance Scale are responsive to lower limb change. CONCLUSION. This study will provide improved clinical methods to track functional improvement for people living with spasticity.
INTRODUCTION. The Accreditation Council for Graduate Medical Education (ACGME) lists 6 competencies that all physicians should possess: patient care skills, medical knowledge, practice-based learning, interpersonal skills, professionalism and systems-based practice. These have trickled down to undergraduate medical education programs. Medical anatomy courses traditionally focus only on medical knowledge, yet most anatomists agree that the dissection lab also develops the other 5 competencies (Gregory et al., Med Teach, 31:855-61, 2009). Beginning this year, the PLFSOM replaced laboratory practical exams with assessments of a “DEMR” and a “TSGR” to reinforce the need for our students to acquire multiple competencies while learning human anatomy. METHODS. The DEMR is a blog in which students record findings during dissection of their donor cadavers. Entries include SOAP notes, learning prescriptions, and library research with references. Students are evaluated using grading rubrics that assess 5 competencies plus integration of clinically relevant knowledge. RESULTS. Students have shown progressive competence in the quality of SOAP note and learning prescription entries. They work as professionals in their dissection teams in preparation for TSGR, an end-of-course oral presentation patterned after bedside rounds. Student feedback surveys, faculty feedback surveys and rubric evaluations will be done immediately following the first TSGR in April 2011. Students will be followed longitudinally to assess their acquisition of the competencies. CONCLUSIONS. The DEMR and TSGR, as primary assessment instruments, are expected to promote the acquisition of multiple professional competencies beyond the mastery of the anatomical knowledge needed to practice safe and effective medicine.
an anterior approach with the KF at 90°. Further studies will make this a viable option. This study suggests ultrasound guided hyaline cartilage biopsy from the distal femur could be successfully performed at 90° of KF.

CHANG, Youjin¹, David CANTELMI¹, Jonathan J. WISCO², Joel C. DAVIES¹, Jayc C. SEDLMAYR³, and Anne AGUR¹. ¹Division of Anatomy, Department of Surgery, University of Toronto, Toronto, ON, M5S 1A8, CANADA, ²Department of Pathology and Laboratory Medicine, Division of Integrative Anatomy, David Geffen School of Medicine at UCLA, Los Angeles, CA 90095, USA, ³Department of Cell Biology and Anatomy, LSU Health Science Center, New Orleans, LA 70112, USA.

Segmental temporalis transposition – correlation with intramuscular innervation.

INTRODUCTION. Smile restoration following facial paralysis has been achieved using numerous techniques including segmental temporalis muscle transposition in conjunction with facial nerve microsurgery (Terzis, JK and FS Oliveras, 2009). The middle and/or posterior third of the temporalis along with the attached fascia-periosteal strips are divided into one to four segments, and used to reanimate the facial muscles. Despite the importance of understanding the innervation patterns of temporalis when segmenting the muscle, few studies have investigated the intramuscular innervation, none using 3D modelling techniques. Therefore, the purpose of the current study is to model and document the intramuscular innervation patterns throughout the volume of the temporalis. METHODS. In ten formalin embalmed cadaveric specimens, the foramen ovale was exposed and the branches of the mandibular nerve (V3) were identified. Each branch was digitized in short segments extramuscularly and intramuscularly. 3D models were reconstructed from the digitized data using Maya®, and the innervation patterns were documented. RESULTS. The temporalis was found to have superior and inferior parts which were further grouped by innervation into segments: superoanterior, superomiddle, superoposterior, inferoanterior and inferoposterior. In all specimens, the segments were innervated respectively by the anterior, middle and posterior deep temporal, buccal and masseteric nerves. These nerves originated directly from V3, except in three specimens where the posterior deep temporal nerve arose from the masseteric nerve. CONCLUSION. These results provide a detailed mapping of innervation patterns, which combined with muscle architecture, can help optimize segmentation for temporalis transposition.

FOGG, Quentin A. Laboratory of Human Anatomy, School of Life Sciences, University of Glasgow, Glasgow, G12 8QQ, UK.
Quantification of variable scaphotrapeziotrapezoidal joint motion patterns in three dimensions.

INTRODUCTION. Understanding the morphology and movement of the STT joint remains key to improving understanding of carpal kinematics. This study aims to determine the degree of functional difference between STT joints separated into subgroups by lunate type. METHODS. Thirty embalmed and five fresh cadaveric wrists were separated into subgroups based on radiologic lunate typing and dissected to allow direct observation of the STT joint. Stabilising structures were not damaged. Each specimen was fixed to purpose-built rig with K-wires and pressure film inserted into the STT joint space. Prominent STT landmarks were reconstructed using a digital microscribe. Axial load was applied and the imprint on the pressure film measured. This was repeated in four different positions throughout the range of radial deviation. The varying relationship between the landmarks was measured in 3D, and the variable STT contact area quantified by area of film contact. The ligamentous supports were then dissected observing mechanically-based criteria to provide an anatomic rationale for the results. RESULTS. Type one (translating) joints maintained a high percentage of contact through the range of motion. There was little palmar/dorsal displacement of landmarks. Type two (flexing) joints had lower and more variable contact percentage; the small contact area was moved dorsally and proximally along
the scaphoid with increasing radial deviation. Proximal structures were clearly displaced dorsally, the joint thus being in a flexed position. CONCLUSIONS. Subtype examination of the STT joint through radial deviation demonstrates variable motion patterns with a clear anatomical basis. This will form the basis for more extensive STT studies, as well as further investigation of other carpal areas.

GOODMURPHY, Craig W., Lucas BRYANT, Joseph HAN, Michele RETROUVEY, Stephanie T. TREXLER, Christopher MCGARY, and Michael CHU. Eastern Virginia Medical School, Norfolk, VA 23501, USA.

Endoscopic and CT imaging of the pterygopalatine fossa: An anatomical and surgical landmark study.

INTRODUCTION. Endoscopic sinus surgery typically relies on soft tissue landmarks that are often obscured by pathological processes. This study aimed to improve upon the surgical landmarks that could be used for orienting surgeons. METHODS. Twenty-two dissections in eleven unfixed cadavers were performed. There were 6 females and 5 males with an average age of 84. A 64 slice CT was used to image cadavers 0.625 mm. Axial scans were made along with sagittal and coronal plane reconstructions. A Stryker HD imaging tower was used with a Storz endoscope (zero and thirty degree lenses) for surgical dissections of the PPF. An Aquarius imaging workstation (TeraRecon, Inc., version 3.6, San Mateo, CA) was used for 3D reconstructed skull visualization and measurements. All eleven cadaver heads received arterial and venous silicone injections. RESULTS. Vascular, neural and osseous landmarks were identified using endoscopic dissection. In contrast with another study 20 of 22 pterygopalatine ganglia (91%) were found below the level of the sphenopalatine foramen. The typically used sphenopalatine foramen (SPF) and pterygoid canal (PC) was seen to have a consistently identifiable ridge between the two openings (pterygoid ridge). The average length of the pterygoid ridge as measured by 3D reconstruction was 7.8 mm. CONCLUSIONS. We have been unable to find any prior anatomic or surgical reference to the pterygoid ridge. As a landmark between two important structures of the PPF this is clearly an endoscopically relevant landmark. Pre and intraoperative identification of the pterygoid ridge will help surgeons damage to their occupying structures during surgery. This is particularly true when pathological process has displaced or obscured typical relationships.

HANSEN, John T., Chin-To FONG, and Barbara DAVIS. Department of Neurobiology and Anatomy, and Pediatrics, University of Rochester School of Medicine and Dentistry, Rochester, NY 14642, USA.

Rochester's medical education pathway: A program for medical students interested in teaching.

INTRODUCTION. Rochester’s Medical Education Pathway (MEP) began in 2007. Its purpose is to provide medical students interested in medical education with the pedagogical skills and the foundational understanding of educational theory necessary for academic teaching careers. In light of the decreasing number of qualified faculty who can teach systems courses in anatomy, physiology or pharmacology, the MEP provides opportunities for students to acquire skills in these disciplines. METHODS. Students accepted into the program (31 students currently; 10 per year maximum) are required to: (1) prepare and present large-class lectures, with formative feedback; (2) serve as problem-based learning (PBL) tutors; (3) lead two different small-group teaching sessions (labs, problem conferences, clinical workshops, medical humanities seminars); (4) demonstrate proficiency in writing learning objectives; (5) demonstrate proficiency in writing high quality exam questions; (6) perform assessments and apply effective ways of giving feedback; (7) critically evaluate the medical education literature. RESULTS. Students lecture in our integrated basic science courses and, in addition to the skills listed above, participate in our Faculty Development Workshops as well as the MEP journal club and seminars. These activities
encourage discussion about teaching-learning formats, learning theory, and the realities of academic career pathways. CONCLUSIONS. The enthusiasm, interest and achievements of our MEP students is excellent. Upon the satisfactory completion of the MEP, students receive a certificate, their completion of the pathway is highlighted in their Dean’s Letter for their residency match, and is noted on their official university transcript. (Dr. Davis is the Director of the MEP)

HARMON, Derek J. and Douglas J. GOULD. The Ohio State University College of Medicine, Department of Anatomy, Columbus, OH 43210, USA.
A digital demonstration of the cranial nerves containing parasympathetic fibers for professional health science students.

INTRODUCTION. An ever-decreasing amount of time is dedicated to teaching professional health science students the various pathways of the parasympathetic fibers associated with the cranial nerves and their corresponding ganglion in the skull and on the cadaver. We hypothesize that an asynchronous learning tool will aid health science students with comprehension as measured by quiz performance and with time spent interacting with the material. Cranial nerves are important aspects for clinical practice and of more immediate concern for board exams for professional school students. METHODS. Two skulls were used in the video, one midsagittal human skull and one full human skull. The course of cranial nerves III, VII, IX and X were demonstrated, with emphasis on their parasympathetic components and branches and captured on a high-definition video camera. Two embalmed specimens were used for the dissection portion of the video. The video was edited in iMovie down to a total of 12 minutes. RESULTS. Although analyses of the results are ongoing, initial indications are that users were in favor of such a program – emphasizing its flexible use outside of the classroom. CONCLUSIONS. Short, high-definition, educational video segments such as described here are perceived as beneficial by users, as asynchronous learning tools. Increased time spent interacting with the material on the user’s own time may make a significant difference in comprehension of material.

KANG, Yun-Seok, Kevin MOORHOUSE, and John H. BOLTE IV. Injury Biomechanics Research Laboratory, The Ohio State University, Columbus, OH 43210, USA.
A new instrumentation technique for measuring kinematics of the cervical spine of post mortem human subjects (PMHS).

INTRODUCTION. Despite the fact that rear impact car collisions have been studied extensively, there is no consensus as to the mechanism of injury or most relevant injury criterion. However, there is agreement that the injuries occur due to relative rotation and displacement between adjacent vertebrae which exceeds the physiological range of motion, thus illustrating the importance of being able to measure the detailed intervertebral kinematics of the cervical spine during a rear impact. METHODS. In this study a new instrumentation and dissection technique was proposed in which 3 accelerometers and 3 angular rate sensors, capable of measuring comprehensive intervertebral kinematics, were installed with no muscular damage to the anterior structures of the neck. This was accomplished by dissecting the anterolateral aspect of the neck to access the vertebral bodies through the retropharyngeal space. CT scans were taken of each PMHS before and after rear impact testing and processed into 3D images for analysis. The 3D CT analysis allowed for transforming data measured from the instrumentation to the vertebral bodies and for indicating injuries. A post-test dissection was also completed and results were compared to the 3D CT post-test images. RESULTS. The proposed instrumentation technique proved to be capable of measuring the detailed cervical kinematics, and allowed for full-body PMHS to be tested in realistic seating environments. Injuries documented during the post-test dissections included facet subluxation, anterior longitudinal ligament tears and intervertebral disc injuries. CONCLUSION. The data obtained from this instrumentation technique
should prove useful in the investigation of rear impact injury mechanisms and aid in the development of injury criteria.

KLOENNE, Jessica and Brion BENNINGER. 1,2,3,4 Department of Oral Maxillofacial Surgery, 2 Department of Surgery, 3 Department of Integrative Biosciences, 4 Department of Orthopaedic Surgery and Rehabilitation, Oregon Health and Science University, Portland, OR 97239, USA. Clinical anatomy of the lingual nerve and identification with ultrasonography.

INTRODUCTION. The objective of this study was to investigate the pathway of the lingual nerve (LN) and whether it can be identified using ultrasonography (USS) intraorally. The LN is a dominant sensory nerve that branches from the posterior division of the mandibular aspect of the trigeminal nerve. The LN is one of the two most injured nerves during oral surgery. LN is typically described within the pterygomandibular space and passes below the pterygomandibular raphe until it lies opposite the distal root of the third molar. LN anatomy at the third molar region has been associated with LN injury with variable morphology. If the surgeon can identify its precise location using USS, we believe the morbidity will decrease. METHODS. A literature search was conducted on anatomical and specialty texts, journals and websites regarding LN location and USS. Cadavers (90 sides) were dissected to analyze the LN orientation at the medial alveolar crest (MAC). Volunteers (150 sides) had USS performed to identify the LN intraorally. RESULTS. Literature search revealed inadequate description of the LN along the MAC. No USS studies of the LN were found on humans. Dissection revealed the LN above (23%) and below (77%) the crest of the lingual plate. USS of 150 LNs was positive (100%) intraorally in 75 volunteers. CONCLUSION. The LN demonstrated a pattern of either lying high or low to the MAC, lending itself to a LN1-high and/or LN2-low classification system. USS can identify the LN and help to classify it prior to surgery to avoid injury. This study suggests the clinical anatomy of the LN include the MAC at the third and second molars due to its surgical importance. It also suggests that USS can be successfully performed to identify the LN intraorally prior to surgical procedures.

LENZ, Robin, Garrett D. MOORE, Anthony C. DILANDRO, Fortunato BATTAGLIA, R. Shane TUBBS, Marios LOUKAS, Plotr B. KOZLOWSKI, and Anthony V. D’ANTONI. 1 Podiatric Medical Student, 2 Division of Pre-clinical Sciences, New York College of Podiatric Medicine, New York, NY 10035, USA; 3 Pediatric Neurosurgery, Children’s Hospital, Birmingham, AL 35233, USA; 4 Department of Anatomical Sciences, St. George’s University, Grenada; 5 Touro College of Osteopathic Medicine, New York, NY 10027, USA. Anatomic study of the transverse occipital ligament with clinical relevance.

INTRODUCTION. Although most craniocervical ligaments have been well described, few data on the transverse occipital ligament (TOL) exist. The purpose of this study was to describe the location, incidence, characteristics, and clinical relevance of the TOL. METHODS. The craniocervical junction of 15 adult Caucasian embalmed cadavers (13 female and 2 male) was dissected to expose the TOL. RESULTS. The TOL was present in 7/15 (46.7%) cadavers. Rectangular in shape, the TOL ran transversely between the medial aspects of the occipital condyles and was superior to the alar ligaments. In the coronal plane, the TOL was positioned anterior to the superior band of the cruciform ligament and posterior to the apical ligament. Based on our data, three types of TOL were defined. Type 1 TOL was continuous with the alar ligaments bilaterally and attached to the dens in 3/7 (42.9%) cadavers. Type 2 TOL was continuous with the alar ligaments bilaterally but was not connected to the dens in 3/7 (42.9%) cadavers. Type 3 TOL had no connection to the alar ligaments and was not attached to the dens in 1/7 (14.3%) cadavers. The mean values of length, width, and thickness of the TOL were 19.52 mm, 3.17 mm, and 0.74 mm, respectively. CONCLUSIONS. The TOL was present in 46.7% of cadavers. Our data in conjunction with previous studies (10%, Standring, 2008; 40%, Lang, 2001; 78%, Tubbs et al.,
suggest that the TOL is more common than previously documented. The presence of this ligament is relevant to radiologists considering the emergence of increased MRI resolution.

Liu, Zhi, Kajeandra Ravichandiran, Nancy Mckee, and Anne Agur. Division of Anatomy, Department of Surgery, University of Toronto, Toronto, ON, M5S 1A8, Canada. Development of an architecturally comprehensive 3-D computer model of forearm flexors and extensors from a single cadaveric specimen.

INTRODUCTION. An architectural model that is representative of the actual musculotendinous architecture can offer a greater understanding of muscle morphology and function. At present there is no model of all the forearm muscles that is entirely constructed from the 3D architectural data of same specimen. The purpose of this study is to construct a 3D computer model of the musculotendinous architecture of all the forearm muscles and to quantify the architectural parameters of each muscle of the same specimen. METHOD. The forearm muscle/tendon complexes of one formalin-embalmed cadaveric specimen were digitized, using a MicroScribe™ G2 digitizer. The volume of the muscle bellies were digitized at the fibre bundle level. The outline of the tendon was digitized in situ, then sectioned at 5mm intervals and the circumference of each section was digitized. The muscle and tendon data was reconstructed in Maya® to create a volumetric 3D model of the forearm musculature. RESULTS. The 3D model can be viewed from any angle and allowed for visualization of one or any combination of forearm muscles and their tendons. The muscle bellies retained their fibre bundle architecture and the tendons, their true dimensions as in the specimen. This model also allowed for quantification of architectural parameters for each muscle (i.e. fibre bundle length, pennation angle, volume, physiological cross-sectional area). CONCLUSION. Digitization and 3D modelling allowed the creation of a detailed, anatomically accurate model of all forearm muscles from the same specimen that was not possible with previous methodologies. This model can be used to visualize and compare the musculotendinous architecture of the forearm muscles to establish clinically relevant functional parameters and relationships.

Mobley, Mark S.1, Brian Burnett2, and Peter Abraham3. 1Warwick Medical School (WMS), Coventry, CV4 7AL, United Kingdom. 2Surgical Training Centre, UHCW, Coventry, CV2 2DX, United Kingdom. Interactive 3D prostheses – a student eLearning project.

INTRODUCTION. Warwick Medical School has a unique collection of plastinated prostheses designed for anatomical instruction. However, access is limited due to their cost, fragility, and the strict regulations imposed by the UK Human Tissue Authority. To address this, a student-led project was initiated to obtain a comprehensive 3D media library of the prostheses. METHODS. Each prosection was photographed on a graduated turntable using a Fujifilm W1 3D camera, using Chroma key techniques to remove the background. After processing, the resulting images were compiled into Adobe Flash turntable animations to allow easy navigation within a website. RESULTS. A library of animations has been created that is suitable for anatomical teaching and study. These animations are interactive, and can be rotated and zoomed to allow observation of the specimens from any angle. The view can be switched from 2D to an anaglyph stereo 3D mode, allowing a better simulation of depth. Their incorporation into presentations is straightforward, resulting in a dynamic teaching aid to enliven lectures. The animations are also remotely accessible via the WMS website as an additional anatomy resource for students and clinicians. CONCLUSIONS. Both surgical trainees and medical students have shown a great deal of interest in using this resource to study anatomical specimens. Further projects are intended to document the uptake and educational value. Furthermore, this technique should be widely applicable beyond the scope of the Warwick prosection collection, suggesting the possibility of
obtaining a permanent record of many fragile anatomy and pathology specimens, both to extend their life and allow more widespread access.

OOI, J.J., and Brion BENNINGER. 1 Department of Oral Maxillofacial Surgery, 2 Department of Surgery, 3 Department of Integrative Biosciences, 4 Department of Orthopaedic Surgery and Rehabilitation, Oregon Health and Science University, Portland, OR 97239, USA. Craniofacial anatomy regarding buttressing and 3-D computerized tomography.

INTRODUCTION. The objective of this study was to investigate cadaver and 3-D computerized tomography (CT) anatomy regarding craniofacial osteology and buttressing (BSG). BSG is a concept that is applied to craniofacial osteology in order to successfully reduce fractures. The anatomy of craniofacial osteology is essential in understanding BSG, energy and support to the architecture of the craniofacial region. BSG can be thought of as internal and external. Internal BSG describes natural shapes with variability within individual bones. This can determine fracture location and is dependent on energy levels and delivery mechanism. External BSG describes the addition of autogenous or artificial material to support the fracture site. METHODS. Literature search was conducted on texts, journals and websites regarding BSG and craniofacial anatomy. Measurements were recorded from 3-D CT reconstruction and craniofacial dissections of 12 cadavers. RESULTS. Literature search revealed BSG in specialty texts and journals but not clinical anatomy texts. 3-D CT and cadaver dissection measurements revealed variable bone thickness of the frontal, maxillary, zygomatic, and temporal bones. DISCUSSION. BSG is an important concept and method of reducing fractures to craniofacial osteology. 3-D shapes and variability of the craniofacial bones can make the anatomy complicated. A training clinician should be exposed to simple dimensions initially and then progress to more detailed anatomy of the craniofacial region. CONCLUSION. This study suggests measurements of craniofacial bones are consistent between 3D CT reconstruction and cadaver dissection. Medical and Dental institutions could introduce and combine BSG terminology with detailed craniofacial osteology anatomy.

PARK, Hyo Seok, Min Suk CHUNG, Jin Seo PARK. 1 Department of Anatomy, Dongguk University College of Medicine, SOUTH KOREA, 2 Department of Anatomy, Ajou University School of Medicine, SOUTH KOREA. Segmentation and surface reconstruction of detailed ear structures in sectioned images.

INTRODUCTION. The structures of the ears, which intervene between gross anatomy and histology in size, have come to be understood based on plastic models in anatomy classes. Another learning tool could be three-dimensional (3D) surface models of ear structures, which can be virtually dissected on a computer. In particular, surface models are a source of interactive simulation contributing to clinical trials, such as tympanoplasty. The objective of this research was to prepare and distribute the elaborate surface models of detailed ear components which contribute either to learning anatomy or the practice of otology. METHODS. We produced serial sectioned images (pixel size, 0.1 mm; 48 bit color) of a male cadaver head. In the sectioned images, the external, middle, and internal ear structures and other related components were delineated on Adobe Photoshop to acquire segmented images (intervals, 0.5 mm). On the self-developed software, color-filled images from the outlined images were stacked to promptly build volume models, which were examined to verify segmentation. Subsequently, black-filled images of each structure, made of the color-filled images, were surface reconstructed to generate a surface model on Autodesk Maya software. RESULTS. The 3D surface models showed fine ear topographic anatomy, as expected. CONCLUSION. This is the first report to announce the sectioned images, segmented images, and surface models of comprehensive ear structures that will be released together. It is hoped that these image data will stimulate the development of medical simulation. The technique of segmentation and
surface reconstruction on popular software enable the manufacture of surface models from other serial images (e.g., CTs and MRIs).

RAVICHANDIRAN, Mayoorendrá, Francesco DOGLIETTO2,4, Jimmy QIU3, Ivan RADOVONOVIC2, Gelareh ZADEH2, Walter KUCHARCZYK3, Fred GENTILI2, and Anne AGUR1. 1Division of Anatomy, 2Division of Neurosurgery, Department of Surgery, and 3Department of Medical Imaging, University of Toronto, Toronto, CANADA. 4Institute of Neurosurgery, Catholic University School of Medicine, Rome, ITALY.

Quantifying area of access of surgical approaches in neurosurgery using three-dimensional reconstruction.

INTRODUCTION. Despite having entered the era of evidence-based medicine, most neurosurgeons' choice of surgical approach is influenced primarily by personal experience (Bernstein and Khu 2009). Surgeons often cite maneuverability as the reason for their choice of surgical approach; however, there have been few quantitative studies examining the advantages of one approach over another when considering maneuverability. The purpose of this study is to develop an objective method of evaluating the surgical access and area of exposure of neurosurgical approaches using 3D reconstruction and modeling. METHODS. Five surgical approaches were simulated on a phantom head using funnels of varying sizes. The Storz neuro-navigation system, a frameless stereotactic device, was used to collect 3D coordinates from the funnels representing the surgical approaches. Eight points were collected around the circumference of the superficial and deep aspects of the funnel, representing the surgical access and exposure, respectively. RESULTS. Coordinate data collected using the neuro-navigation system was imported into Autodesk® Maya® to reconstruct a model of the surgical approaches as truncated pyramids in 3D. Custom computer algorithms were created to calculate the area of the surgical access and surgical exposure as well as the height of the pyramids, allowing for quantitative comparisons between the different surgical approaches. Measurable differences in surgical access, exposure and height were found between all five approaches. CONCLUSIONS. Quantifying the area of surgical access, exposure and depth of the surgical access pyramids, provides a novel and objective method to evaluate maneuverability within various surgical approaches.

RAVICHANDIRAN, Nisanthini1, Ross BAKER1, Herb VON SCHROEDER2, Martin BOYER3, and Anne AGUR1. 1Division of Anatomy, 2Division of Orthopaedic Surgery, Department of Surgery, University of Toronto, Toronto, CANADA. 3Washington University Orthopedics, Saint Louis, MO 63110, USA. Morphology and relationships of the lateral antebrachial cutaneous nerve.

INTRODUCTION. Previous studies of lateral antebrachial cutaneous nerve (LACN) anatomy have been primarily qualitative, although one recent study quantified LACN anatomy relative to the cephalic vein and transcondylylar line. The purpose of this pilot study is to qualitatively and quantitatively describe the branching pattern and nerve diameter of LACN, and the relation of LACN to the cephalic vein and superficial branch of the radial nerve (SBRN). METHODS. Seven formalin-embalmed cadaveric specimens were dissected to expose the LACN as it emerged lateral to the biceps brachii. The course and branching of the nerve through the forearm was followed, and the relation of LACN to the cephalic vein, and presence of communicating branches to the SBRN were documented. A micrometer was used to measure the diameter of LACN along its course, and the distance from the transcondylylar line to the major branch points of LACN. RESULTS. All specimens had nerves with volar branches, usually emerging in the middle third of the nerve (37.5 to 62.5% of the distance between the transcondylylar line and the radial styloid), and all volar branches ramified to the styloid. The diameter of LACN was 2.4 mm (1.5-3.6) at the midforearm, and 1.1 mm (0.8-1.4) at the radial styloid. Three of the seven specimens had direct communication between LACN and SBRN. Six of seven specimens had a single trunk,
while one specimen had two major trunks. CONCLUSIONS. LACN has complex anatomy, with variation in its relation to the cephalic vein and SBRN. Knowledge of LACN anatomy is important in localizing LACN for nerve block, planning grafts for nerve repair, and avoiding injury to LACN during surgery and venipuncture.

SAFIR, Ilan, Jonathan J. WISCO, and M. Elena STARK. David Geffen School of Medicine at UCLA, Department of Pathology and Laboratory Medicine, Division of Integrative Anatomy, Los Angeles, CA 90095, USA. Statistical mapping of the cervical sympathetic chain.

INTRODUCTION. Discrepancies in the description of the detailed anatomy of the cervical sympathetic chain (CSC) ganglia has been a factor contributing to complications in surgical procedures involving the cervical vertebral column and spine. The goal of this study was to map the anatomical details and variations of the CSC. Specifically, we quantified the number and locations of identifiable ganglia to one another and their spatial relationships to the vertebral artery, an easily identifiable anatomical and clinical landmark. METHODS. Detailed dissections of the neck and upper thorax regions (C1-T1) were performed to expose the CSC in 104 neck specimens (both sides from 52 embalmed human cadavers). The specimens were photographed and analyzed using Adobe Photoshop CS3 to trace the sympathetic chain, ganglia, and vertebral artery and to measure all pertinent lengths and distances. We plotted the location of ganglia relative to the vertebral artery onto a 2D contour map that indicated the presence and absence of ganglia along the CSC across subjects. We repeated the procedure to ascertain the relative frequency of different types of ganglia by plotting relative to the superior pole of the superior cervical ganglion. RESULTS. Although the exact location of CSC ganglia is greatly variable across subjects, the presence of a superior ganglion and a stellate group of ganglia is consistent. The presence of a middle cervical ganglion is highly variable. CONCLUSION. Our statistical results are consistent with previous observations of CSC ganglia locations. The 2D contour map developed here provides a quantitative description for clinicians to determine the location of ganglia for surgical planning purposes.

SATO, Tatsuo. Tokyo Ariake University of Medical and Health Sciences, Tokyo, 135-0063, JAPAN. Clinical anatomy consideration of the relationships between paratracheal lymphatics and the recurrent laryngeal nerves (DVD dissection demonstration).

INTRODUCTION. In lung and esophageal cancer operations the regional anatomy of the paratracheal nodes and their relationships to the recurrent laryngeal nerves is critical for QOL. The asymmetrical arrangement of the arch of aorta and the recurrent laryngeal nerves influences the arrangement of the lymphatics. METHODS. Using student dissection practice cadavers, dissection of lymphatics and autonomic nerves was carried out and DVD recording was made. RESULTS. The right paratracheal nodes are well developed between the subclavian artery and the arch of the azygus. Their relationships to the vagus and the recurrent laryngeal nerve are shown. From the left tracheobronchial nodes there are three ascending lymphatic pathways: 1) that to the right over the trachea to join the paratracheal node group, 2) that ascending along the left margin of the trachea, along the recurrent laryngeal nerve (not so developed), and 3) that which ascends obliquely to the left and drains into the thoracic duct. CONCLUSION. Such a dissection video may facilitate 3D comprehension of this complex region.
SAUKS, Katherine, Erin BOYNTON, Nancy H. MCKEE, and Anne M. AGUR. Department of Surgery, University of Toronto, Toronto, ON, M5S 1A8, CANADA. Cellular and biomechanical changes in rat gastrocnemius following calcaneal tenotomy.

INTRODUCTION. Following a tendon tear, cellular and biomechanical alternations occur within the musculotendinous unit, observed clinically as retraction, fibrosis, muscle atrophy, and increased repair tension. The purpose of this pilot study was to develop a rat calcaneal tenotomy model to investigate changes in repair tension, percent collagen area, and red/white muscle minferet within the calcaneal tendon, gastrocnemius muscle and myotendinous junction. METHODS. Twenty Sprague-Dawley rats underwent unilateral calcaneal tenotomy and the nontenotomized leg served as control. Rats were sacrificed directly after, 48 hours, two, four or six weeks post tenotomy. Repair tension was measured as the force (N) required to reappose the tendon end back to its insertion site. Polarizing and brightfield microscopy were used for histological analysis of percent collagen area and muscle fibre minferet. RESULTS. Two weeks following tenotomy, repair tension was significantly increased (p<0.05) compared to control limbs but the tendon could still be reapposed to its attachment site, whereas by four weeks, the tendon could no longer be reapposed. Histological analysis at four and six weeks showed a significant increase (p<0.05) in percent collagen area in the myotendon, and a significant difference (p<0.05) in the minferet of white muscle fibres in tenotomized limbs. CONCLUSION. The threshold of reversibility, the point at which repair tension increases to the extent that the tenotomized tendon cannot be re-approximated, occurred between two and four weeks post tenotomy. Understanding the threshold of reversibility and histological changes in muscle and tendon is important for directing surgical repair and the use of treatments to minimize tension and promote healing.

SHAH, Vandan S., Suzanne DOOLEY-HASH, Clifford L. CRAIG, and John L. ZELLER. The University of Michigan, Ann Arbor, MI 48109, USA. Longitudinal development of anatomy education: The value of fourth-year electives.

INTRODUCTION. Over the last 30 years, time spent by first-year medical students in gross anatomy has decreased significantly. This reduction raises the question whether the current state of anatomy education properly equips graduates for clinical practice. The present study aimed to investigate the educational value of fourth-year electives in applied clinical anatomy. METHODS. For the last three years, 2 courses in applied clinical anatomy have been offered to senior medical students; one exploring the musculoskeletal system and the other in emergency medical procedures. Course content included morning didactic sessions followed by afternoon labs. For each class, a pre-course examination was administered consisting of three parts: musculoskeletal, physical exam, and radiology. A post-course examination of identical format was administered at the end of each elective. Test scores were compared to a control group of fourth-year students who did not participate in either course. Students were subsequently surveyed for feedback on how the course impacted their first year of residency. RESULTS. Students who took one of the electives scored significantly higher on exams testing musculoskeletal anatomy, physical exam skills, and interpretation of medical imaging studies that students who did not participate in these course electives. CONCLUSIONS. Improvements in standardized exam scores demonstrate the effectiveness of a longitudinal anatomy curriculum. Having finished third-year rotations, students have a better understanding of clinical medicine and are better prepared to integrate anatomy into their medical training. Test scores demonstrate that these electives add to the student’s anatomical knowledge base and provide the student with a higher degree of self-confidence.
SHOJA, Mohammadali M., Alon HARRIS, Brent SIESKY, R. Shane TUBBS, and Yochai SHOSHANI. Central corneal thickness directly predicts the rate of retinal neural fiber layer thinning in Caucasian patients with open angle glaucoma.

INTRODUCTION. Open angle glaucoma (OAG) is progressive optic neuropathy characterized by loss of retinal ganglion cells, thinning of the retinal nerve fiber layer (RNFL) and irreversible vision loss. Morphological features of the eye may be an important determinant of rate of glaucomatous progression. Although controversial, recent studies have indicated that eyes with OAG that have a thin cornea are more likely to experience OAG progression. The mechanism by which corneal thickness affects the rate of OAG progression is currently unclear. In this study, the relationship between baseline central corneal thickness and 1.5-year rate of RNFL thinning was assessed in OAG patients participating in Indianapolis Glaucoma Progression Study (IGPS).

METHODS. 116 patients (mean age of 66.9 years; 70 females and 46 males) with OAG were enrolled in a prospective, observational study aimed at assessing the rate of OAG progression in relation to ocular hemodynamics and structural features. As a part of study, all patients underwent topographic analysis by Stratus optical coherence tomography to measure peripapillary RNFL thickness at baseline and 1.5-year follow-up visits. Central corneal thickness (CCT) was measured by ultrasound pachymetry. Intraocular pressure (IOP) was measured by Goldmann applanation tonometry, and mean ocular perfusion pressure (MPP) was calculated from measured IOP and systemic blood pressure. Statistical analysis was performed by multivariate linear regression analysis to assess independent association between 1.5-year RNFL thickness changes and CCT adjusted for the effects of age, gender, MPP and baseline RNFL thickness. P values <0.05 were considered statistically significant. RESULTS. A statistically significant positive association was found between CCT and 1.5-year thinning of RNFL (baseline RNFL minus 1.5-year RNFL thickness) among Caucasian patients aged between 60 and 80 years (n = 52); this effect was independent of age, gender, MPP and baseline RNFL thickness. In patients with thin cornea (CCT <= 537 µm, n = 27) and those with thick cornea (CCT > 537, n = 25), the 1.5-year rate of RNFL losses were 1.63 µm and 3.79 µm. CONCLUSIONS. This is the first study to show that OAG patients with thick cornea may have a higher rate of RNFL thinning. In contrast to prior studies that indicate a thick cornea is associated with thicker RNFL, the current results indicated that thick cornea may not be protective against glaucomatous damage. Our data suggests that in a subgroup of OAG patients (Caucasians aged between 60 and 80 years), 1.5-year rate of RNFL thinning increased by 2.4 micron with every 40 micron increase in baseline CCT. This data suggests that the association between CCT and RNFL thinning needs to be further investigated.

SPINNER, Robert, Huan WANG, Manish SHARMA, and Kimberly AMRAMI. Mayo Clinic, Rochester, MN 55905, USA.

INTRODUCTION. The pathogenesis for formation of intraneural ganglion cysts remains controversial, especially for cysts found at unusual sites. The anatomic basis for the formation of these intraneural cysts has operative implications. Recurrence frequently occurs when the articular branch connection is not addressed. METHODS. A patient with a deep ulnar intraneural ganglion cyst was recently treated. High resolution MRI and surgery confirmed an articular origin. A review of the world’s literature of intraneural ganglion cysts occurring at the wrist region was performed. RESULTS. Thirty cases of ulnar intraneural cysts at the wrist region was performed. Thirty cases of ulnar intraneural cysts at the wrist were identified including in the main ulnar nerve (16), the deep branch (11), and the dorsal cutaneous branch (3). Only eight (26.7%) were found to have wrist joint connections. These included the earliest case found in a cadaver over 120 years ago as well as all 4 cases reported in the past decade. Nine additional cases near the wrist were identified involving the median nerve (3) and its palmar cutaneous branch (1), superficial radial nerve (3) as well as lateral and posterior antebrachial
cutaneous branches (1 each). Of these 9 additional cases, only 2 involving the median nerve had joint connections identified. CONCLUSIONS. In our opinion, joint connections are present in all intraneural ganglia, including these rare cases of para-articular intraneural cysts near the wrist. The fact that only 10 of 39 cases (25.6%) had joint connections identified is not surprising. The relatively low percentage of these intraneural ganglia with joint connections is similar to findings with the most common intraneural ganglion cysts, those affecting the deep fibular nerve at the fibular neck region; in them, mounting evidence has demonstrated a consistent origin from the superior tibiofibular joint. The joint origin of these intraneural cysts at the wrist is easily explained by the extensive articular branch anatomy and the unifying articular (synovial) theory and supported by the earliest cadaveric finding and the most recent cases. We believe that increased awareness of the articular theory, more frequent use of high resolution MRI and experience with these rare lesions will demonstrate the joint connection in these unusual cases, and will ultimately improve clinical outcomes.

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Variation in meningeal sheaths of the spinal roots and nerves and correlation to juxtapositional tumors of the intervertebral foramen. An anatomical, immunohistochemical and radiological study.

INTRODUCTION. Anecdotal observations have shown that tumors juxtaposed to the intervertebral foramen may be more easily excised based on the region of the vertebral column that they present. Because the literature regarding the layering of the spinal meninges onto the spinal nerve is scant, the present study aimed to elucidate further this anatomy with the goal of providing a morphological etiology for these observations. METHODS. Twenty adult human cadavers and five rhesus monkeys underwent dissection of the intervertebral foramina with special attention given to the meningeal enshrouding at these levels. Following gross observations, specimens from various vertebral levels were sent for histological analysis. Additionally, comparable samples were imaged using a 9.4 Tesla MRI. RESULTS. We found variation in the meningeal sheaths surrounding the spinal nerves based on vertebral level. As the nerve roots passed from the cord, they received their perineural covering from the pia mater and after crossing the subarachnoid space to reach the apertures in the dura mater, two looser sheaths, an outer from the dura mater and an inner from the arachnoid mater covered them. The pia mater always ended proximal to the arachnoid mater and the pia and arachnoid layers extended more laterally with caudal descent. The dorsal and ventral roots generally exited through separate dural openings in all regions, however, in the cervical region, two dural openings were often found. Thin intradural septations were almost always found separating the dorsal and ventral rootlets. CONCLUSIONS. Knowledge of the variations in meningeal layering near the intervertebral foramina may help explain previous experiences with tumor resections in these regions and may assist in predicting tumor spread on imaging.

WOYSKI, S. Dustin, Anthony OLINGER, and Barth WRIGHT. Kansas City University of Medicine and Biosciences, Kansas City, MO 64106, USA.

A multivariate approach to sex related differences in gluteus medius and hip joint mechanics.

INTRODUCTION. There is a 4:1 incidence of gluteus medius tears in women as opposed to men, with the majority occurring at its insertion on the greater trochanter of the femur. An increased propensity for gluteal medius tears could be a consequence of decreased efficiency in lever mechanics as a consequence of a higher ratio of load arm (center of mass to femoral head) to
lever arm (gluteal insertion to femoral head), as well as smaller muscle insertion area. Our goal was to identify the variable or combination of variables that may account for an increased tendency of gluteus medius tears within and between a sample of male and female cadaveric specimens. METHODS. Forty-one (15F, 26M) embalmed cadaveric hips were dissected to reveal the gluteus medius. Muscles were excised and manually outlined proximally and distally permitting three dimensional representations of their insertion sites to be created and their areas to be measured after laser scanning. Pelvic (load arm) and gluteal (lever arm) moments, and femur length (as a proxy for stature) were measured using a 3D digitizer. We calculated descriptive statistics for each measure, statistically compared female and male moments and insertion areas with two-sample t-tests, and regressed these measures against femur length. RESULTS. Moment arm lengths and ratios were found to be statistically comparable. Although pelvic load arm and gluteal lever arm all increased with femur length, insertion area did not. Female insertion areas were significantly smaller than those for males. CONCLUSIONS. Evidence of smaller insertion areas in women accompanied by comparable moment arm lengths in males and females, provides a possible explanation for the prevalence of gluteus medius tears in females.
Abstracts – Tech Fair Presentations
(listed by presenting author last name)

ABRAHAMS, Peter and Mark MOBLEY. Institute of Clinical Education Warwick Medical School, and West Midlands Surgical Training Centre UHCW, Warwick, CV4 7AL, UK.

Anatomy on the move – modern technology comes of age in integrating clinical anatomy.

INTRODUCTION. Contemporary anatomical education requires a multitude of resources found in the clinic, dissection room and radiology department. These so vary in availability that it is difficult for students to experience or access them all in a time-efficient manner for easy learning. METHOD. So how to integrate portable, handheld software packages that provide a method of learning clinical anatomy, outside the conventional academic environment? RESULTS. A series of nearly 40 anatomy videos were designed, using mainly the dissection room tutorial approach and plastinated prosections, as well as 3D animations combined with narrative and visual explanations; these films were then packaged into an Apple apps including “spotter” tests and MCQs on each 3-5 minutes video. Audio and on-screen text of all anatomical terminology is used in conjunction with digital highlighting techniques to explain the clinical relevance of anatomy. CONCLUSION. Other anatomy apps of a complete radiology textbook on the iPad provide a widely accessible method for teaching integrated clinical whenever needed. Furthermore using 3D computing we have digitised our prosection collection and although technology cannot replace traditional learning, these new innovations provide a unique educational opportunity for learning "on the move", even in between conventional lectures!

DAVIES, Joel C.1,3, David HURLBUT2, and Leslie MACKENZIE1. 1Department of Anatomy and Cell Biology, Queen’s University, Kingston, K7L 3N6, Canada, 2Department of Pathology and Molecular Medicine, Queen’s University, K7L 3N6, Canada, 3Division of Anatomy, Department of Surgery, University of Toronto, Toronto, ON, M5S 1A8, CANADA.

Development of a clinical case-based endocrine histopathology learning resource for medical students.

INTRODUCTION. Changes to medical curricula have resulted in: 1) reductions in time allocated for teaching histology and pathology (Bloodgood et al., 2006) and 2) increased links between pre-clinical and clinical years (Kinkade, 2005). Online resources have been shown to be useful in managing these changes. The purpose of this study was to develop a prototype for an online clinical case-based learning resource with the first module focussing on the histopathology of the endocrine system. METHODS. The most common pathologies of the endocrine system were identified. To make the module clinical case-based, patient specific data including history, findings at physical examination, laboratory tests, and diagnostic imaging studies, were collected from the hospital medical records, along with gross and microscopic images of corresponding pathology specimens. An interface was developed using Microsoft® FrontPage and Microsoft® Expression Web and all aspects of the clinical cases were incorporated. RESULTS. An interactive online learning module was designed to present medical students with an opportunity to work through real clinical cases, examine images and pathologic specimens. Throughout the module, the students receive feedback. By utilizing a clinical case-based format, the normal anatomy and pathology of the endocrine system could be learned in the context of patient clinical presentations. Students were able to learn the anatomy and pathology of this system while simultaneously understanding its clinical relevance. Preliminary feedback was favourable. CONCLUSION. By simulating the progression through a clinical case, it is hoped that this online learning resource will aid medical students in developing a deeper understanding of the histopathology of the endocrine system.
DETTON, Alan J. and Douglas J. GOULD. The Ohio State University College of Medicine, Department of Anatomy, Columbus, OH 43210, USA.
The evaluation of a human development learning tool using a video analytic usability test.

INTRODUCTION. The goal of the current project was to evaluate an interactive human development learning tool depicting early stages of CNS formation. METHODS. The interface of the learning tool was designed to be highly interactive offering omni-directional rotation, as well as dynamic labeling of 3D models based on MRI scans of human embryos. Evaluation of the learning tool was investigated using Morae 3, a software package designed to record and assist in interpretation of data gathered in Human Computer Interaction (HCI) studies. RESULTS. The novel learning tool interface was evaluated through a video analytic usability test, a commonly used method in HCI analysis. The test was performed to identify potential areas of usability problems in an effort to create an effective resource. The effectiveness of the learning tool was identified through evaluation of the interactive interface accompanied by a qualitative survey concerning user-satisfaction. CONCLUSIONS. To our knowledge, this is the first study using a video analytic usability test applied specifically to human development educational software. The results and methods of the study are meant to demonstrate an evaluation technique for software analysis in human development as well as more broadly to the anatomical fields. It is hoped the creation of more effective and user-friendly resources will result through incorporating video analytic usability tests during the design of future anatomical resources.

GAN, Tong and Lisa M.J. LEE. Division of Anatomy, The Ohio State University, Columbus, OH, 43210, USA.
Developing an interactive, three dimensional virtual knee model using sequential dissection and CT imaging.

INTRODUCTION. Teaching anatomy in medical education relies heavily on visualization such as human dissections or use of textbook images and diagrams. The current trend of reducing basic science curricular hours in medical education necessitates development of ancillary resources for anatomy. To this end, three-dimensional, virtual models of the knee were created using real cadaver dissection images and serial computed tomography (CT) of the knee. The interactive models were designed to rotate in sync for side-by-side comparison between the real knee structures versus structures identifiable on CT scan images. METHODS. An embalmed knee was dissected in layers and photographed at the skin, muscle, and ligament levels on a rotating stage. The digital images capturing 360 degrees for each layer were digitally processed to remove background and other distracting artifacts. Serial CT scan images of the knee were collected to render a three dimensional, virtual model of the knee for comparison to the dissected knee. RESULTS. An interactive, side-by-side slideshow of the virtual knee models comparing the real dissection and CT scan images was created. The models will be demonstrated. CONCLUSIONS. To promote comprehensive anatomical knowledge of the knee, three-dimensional, interactive virtual models of the knee, using real dissection photographs and serial CT scan images, were created. The ancillary educational resource is expected to supplement the traditional anatomy lecture and dissection labs by functioning as a preview or review resource.

MACPHERSON, Brian R. Anatomy and Neurobiology, University of Kentucky College of Medicine, Lexington, KY 40506, USA.
Development and implementation of innovative media-driven testing formats.

INTRODUCTION. Computer-based testing has been utilized for many years. While this format should lend itself to incorporating different enrichment sources (x-rays, pictures, etc.) they have been used sparingly – at least in the Part 1 of the National Dental Board Examinations. This
project reports on the development of media-driven question formats that will enrich computer-based exams as well as enhance the way the student interfaces with the question. METHODS. A robust on-line testing software, PerceptionTM by Questionmark, was utilized to develop a database of question stems to which questions from all four anatomical disciplines could be linked. Questions were designed to be stand-alone or could "develop" as the questions linked to the stem were presented. RESULTS. Question formats included orally-delivered questions using patient-oriented videoclips; dissection-based images with a built-in moveable magnifier; radiographs; histological images – or any combination of these required as the clinical scenario developed. Questions could be used in a "learning" or "testing" format. In the former, responses were provided for each correct or incorrect selection, whereas in the latter the user was provided with their result at the end of the exam. CONCLUSIONS. A recent publication in Science documented that students learn better from repetitive testing than from studying. While this has also been a trend in Kaplan, Princeton MCAT/DAT testing programs we wanted to push this further. Listening skills are often not well developed in our students. Incorporation of spoken question stems using videoclips of standardized patients, helps develop this skill. The use of a magnifier in dissection-based images has greatly enhanced their usability in testing formats.

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A 3D reconstruction and interactive tutorial of the pterygopalatine fossa.

INTRODUCTION. The pterygopalatine fossa (PPF) is a deep facial region that transmits branches of the second division of the trigeminal nerve (V2). This small space is difficult to conceptualize, yet it is clinically important for students to understand the relationship of the PPF contents to the orbit, cranial, oral, and nasal cavities. METHODS. To design a 3D interactive tutorial of the PPF and its related nerves using a reconstruction of scanned images from the maxilla, sphenoid, palatine, and zygomatic bones of a human skull. RESULTS. The scanned bony boundaries of the PPF were reassembled using Cinema 4D software, and branches of V2 were highlighted in their respective courses throughout the fossa using modeling tools within this program. The display was then converted to a 3D Adobe PDF to produce a PPF model with an interactive platform in which students can click on an individual nerve to highlight its course in and out of the fossa, adjusting the transparency of the bony boundaries to aid in this visualization. CONCLUSIONS. The PPF is difficult to comprehend due to its deep location within the face, and 3D supplemental instructional tools provide the opportunity to enhance the student’s understanding of this region. This tutorial provides a way in which students can manipulate the bony perimeters of the PPF to follow the course of the nerves throughout the various foramina and corresponding cavities. This approach will also be used to provide a complete tutorial of the three divisions of the trigeminal nerve.

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Virtual interactive presence and augmented reality (VIPAR) for remote anatomical instruction.

INTRODUCTION. We designed a virtual interactive presence and augmented reality (VIPAR) platform that allows a remote surgeon or anatomist to deliver real-time virtual assistance to a local surgeon or student, over a standard Internet connection. MATERIALS. The VIPAR system consisted of a “local” and a “remote” station, each situated over a surgical field and a blue
screen, respectively. Each station was equipped with a digital view piece, composed of 2 cameras for stereoscopic capture, and a high definition viewer displaying a virtual field. The virtual field was created by digitally compositing selected elements within the remote field into the local field. The view pieces were controlled by workstations mutually connected by the Internet, allowing virtual remote interaction in real time. Digital renderings derived from volumetric MRI were added to the virtual field to augment the learner’s reality. For demonstration, a cadaveric head and neck was used and structures identified/procedures performed under the VIPAR system. RESULTS. The VIPAR system allowed for real-time, virtual interaction between a local learner (resident) and remote surgeon and anatomist. Virtual interaction permitted remote instruction for the local surgeon/student, and MRI augmentation provided spatial guidance to both participants. CONCLUSION. Virtual interactive presence and augmented reality provides a novel platform with multiple applications in surgical training/anatomical learning and remote expert assistance by experienced surgeons and anatomists alike.
Abstracts – Poster Presentations
(listed by presenting author last name)

AGNEW, Amanda M.1,2 and Fangfang SUN3. 1Division of Anatomy, 2Department of Anthropology, 3Department of Statistics, The Ohio State University, Columbus, OH 43210, USA.
Bone quality in the elderly: the role of microfractures.

INTRODUCTION. Age-related fragility fractures are a growing health concern, especially as the proportion of older adults in the population increases. Rib fractures can affect morbidity and mortality in elderly individuals and the risk of their occurrence increases significantly with age. Clinical diagnoses of bone fragility often rely on relatively inaccurate measures of bone quantity, but fail to measure the contribution of poor bone quality. An inefficient remodeling process in aging individuals results in disrepair of microfractures, allowing their accumulation to reach harmful levels. While it is established that microfractures can contribute to catastrophic bone failure, it is unknown to what extent they exist in elderly human ribs and their role in determining bone quality. The objective of this research is to explore inter- and intra- individual variation in microfractures which accumulate in vivo in elderly ribs. METHODS. Left and right 6th ribs were removed from 10 elderly (>70 yrs) fresh cadavers. Two cm blocks from mid-shaft rib were stained en bloc in Basic Fuchsin Hydrochloride and transverse thin-sections were prepared from each. Histomorphometric analysis of microfractures was accomplished using a nested model applied to log-transformed data. RESULTS. ANOVA results reveal significant differences in microfracture accumulation between individuals, but not within (left vs right rib). CONCLUSIONS. These findings suggest that microfracture accumulation in the elderly has the potential to contribute to differential fragility. Knowledge of the specific mechanisms involved in deterioration of bone quality is vitally important to establish future methods to combat fragility fractures in the high-risk elderly population.

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Effects of concomitant administration of lithium and cadmium on the corpus striatum of rat brain-A histological study.

INTRODUCTION. Lithium is used in MDP patient because of its neuroprotective role on brain. Cadmium has proven degenerative effects on the brain. The aim of the present study was to determine the histological changes in the corpus striatum of adult rat brain after administration of lithium and cadmium simultaneously and to compare with the studies conducted earlier after lithium and cadmium administration separately. METHODS. Twelve adult albino rats of either sex were divided into control and experimental groups of animal each. The experimental group received injection of cadmium chloride, 2 mg/kg weight intraperitoneally on alternate days for 30 days. Intracardiac perfusion with 10% formalin and immediately after perfusion the rats were decapitated and the corpus striatum was removed. Half of the brain tissue was processed for paraffin blocks and the other half was processed for celloidion blocks. 5-7 µm thick sections were stained with thionin and hamatxolene and eosin. 150-200 µm thick sections were stained with Golgi technique. RESULTS. The tissues examined under light microscope showed degenerative changes. Neuronal shrinkage, clumping and atrophy of nerve fiber, appearance of concentric spaces around the nerve fibre bundles, spongification, shrunken neuron somata, stunted basal dendrites and the reduced dendritic arborization were appreciated in the mentioned staining methods. CONCLUSIONS. It is quite evident that exposure to lithium and cadmium have resulted in all round damage to the neurons. Degeneration of neurons and nerve fibres in the corpus striatum have been extensively reported following cadmium administration and despite the
reported neuroprotective effect of lithium its concomitants administration has not been able to prevent the neuronal damage caused by cadmium.

ALSTON, Eric1 and Brion BENNINGER1,2,3,4, Department of Oral Maxillofacial Surgery1, Department of Integrative Biosciences2, Department of Surgery3, Orthopaedic Surgery and Rehabilitation4, Oregon Health and Science University, Portland, OR 97239, USA. Clinical anatomy and relevance of the mandibular retromolar fossa.

INTRODUCTION. The objective of this study was to investigate the clinical anatomical relevance associated with the retromolar triangle (RT). The RT is formed from the inferior end of the anterior ramus as it bifurcates to terminate posterior to the third mandibular molar and/or the commencement of the alveolar process. The RT serves attachment for the distal temporalis tendon (TT) inserting on its medial and lateral borders, has the long buccal (LBN) nerve traversing and the lingual nerve (LN) along its medial border. Its area of mass is the primary area of support for denture base. Its fossa is the landmark for manual reduction of temporomandibular (TMJ) dislocations. METHODS. Literature search was conducted on texts, journals and websites regarding the RT anatomy and clinical associations. Dissection of the RT region of 30 cadaver sides was conducted. Medial and lateral borders from 150 human RT were measured. RESULTS. Literature search revealed minimal or absent descriptions of the RT and no single study was found addressing the RT and its clinical associations. Dissections revealed both the LBN (traverses H/L) and LN (medial border H/L) associated with the RT. Osseous measurements revealed right (M13.4 mm, L13.2 mm) and left (M12.2 mm, L13.2 mm). CONCLUSION. Clinically the TT is a mandible elevator from the RT, the LBN and LN can be injured during third molar extractions and implant surgery. The RT fossa/pad is a primary denture support area and serves as a landmark for TMJ reduction. Clinical relevance of the RT affects general dentistry and medicine, oral and maxillofacial surgery, periodontology and emergency medicine. Due to the important broad clinical relevance of the RT, this study suggests it have a higher profile in teaching of the oral region.

ANDERSON, Francine, Ken D’AMATO, Suporn SUKPRAPRUT, and Bradley ICARD. Edward Via College of Osteopathic Medicine – Virginia Campus, Blacksburg, VA 24060, USA. Prevalence of the absence of the palmaris longus among a regional adult population.

INTRODUCTION. The palmaris longus is a fusiform muscle originating from the medial epicondyle of the humerus at the common flexor origin. Although it contributes little toward normal hand function, the palmaris longus (tendon) is the most superficial tendon in the forearm and therefore serves as an anatomical landmark at the wrist. The palmaris longus is reported to be absent (unilaterally or bilaterally) in as much as 15% of the population. The tendon of the palmaris longus is the one most frequently harvested for reconstructive, plastic, and hand surgical procedures. Whether the palmaris longus is present has implications for those who may require (reconstructive) surgery. The variability in the prevalence of palmaris longus agenesis among various ethnic groups has been established. However, there are no documented studies on the prevalence of absence of the palmaris longus in the United States since the early 1900’s. METHODS. A descriptive study was designed to determine the absence of the palmaris longus in subjects from Southwest Virginia. Data will also be collected from (dissecting) cadavers known to have lived in the region. RESULTS. Preliminary data shows the palmaris longus to be absent in 28% of the sample. CONCLUSION. This study provides information about human anatomy, raising questions able the musculoskeletal system compared to years past. Our findings suggest the absence of the palmaris longus among an adult regional population is greater than previously reported studies in the United States. Yet, these finding are less than recent reported international studies. None the less, awareness of agenesis of the palmaris longus in a regional
population is a factor surgeons must consider when determining reconstructive surgical procedures.

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A description of gross anatomy curricula in chiropractic colleges.

INTRODUCTION. Anatomy has been an integral part of the pre-clinical curriculum in chiropractic education since early 1900’s. However, there has not been a comprehensive description of gross anatomy education in chiropractic curricula. METHODS. A 72 question electronic survey was sent to thirty-one chiropractic colleges internationally. Public sources of data were also reviewed. RESULTS. Forty-four percent of the electronic surveys were returned, and information was gathered from thirty-one institutions. Fifty-six percent taught anatomy to chiropractic students in addition to other programs of study. Ninety-four percent had one to nine full time anatomy faculty with a minimum of one faculty member with a clinical degree. Sixty-nine percent were involved in research and publishing in areas such as normal variants, anatomical anomalies, and educational base practices. All chiropractic colleges divide anatomy into two or more courses with lecture and laboratory, and sixty-eight percent had all the courses within the first year. Seventy-five percent utilized human cadavers in the laboratory. Fifty percent utilized “Atlas of Human Anatomy” by Frank H. Netter, M.D., and forty-five percent used “Grant’s Dissector” by Patrick W. Tank. Sixty-two percent utilized power point slides in lecture. Eighty-seven percent required an anatomy text written by Keith Moore et al. Sixty-nine percent issued one grade for the entire course (lecture plus laboratory). Seventy-five percent used letter/percentage grades, instead of pass/fail. CONCLUSIONS. Chiropractic institutions internationally have dedicated gross anatomy faculty, similar curricular design and similar delivery methods.

BENNINGER, Brion1,2,3,4, 1Department of Integrative Biosciences, 2Department of Oral Maxillofacial Surgery, 3Department of Surgery, 4Department of Orthopaedic Surgery and Rehabilitation, Oregon Health and Science University, Portland, OR 97239, USA.
Using cadaver teams to emphasize professional behavior through dissection, producing objectives and creating teaching videos during an anatomy course.

INTRODUCTION. The objective of this study was to develop an exercise that emphasizes professional behavior. Healthcare institution anatomy courses are accelerated and the entire body is taught in 12 weeks or less. To maximize skills that a trainee health care professional would benefit from, a learning segment should include teamwork, professionalism and collegialism. This can be obtained in the anatomy lab, often the initial course of the future clinician. This study illustrates a design to achieve these goals. METHOD. Literature search was conducted on texts, journals and websites regarding team-building exercises for first year trainee clinicians. Teams were assigned to cadavers and asked to develop an objective list, perform regional dissection, create, direct and produce a tutorial video of the dissection for exam preparation by all. RESULTS. Literature search revealed student cadaver dissection teams but no tutorial building exercises. Student cadaver teams successfully developed objective lists and created tutorial videos for fellow colleagues and enjoyed the experience. CONCLUSION. Health care institutions are emphasizing professionalism, accountability, ethics and team-based learning. Backgrounds of healthcare students entering training are often diverse; therefore, these traits should be introduced early in their training. Using the lab as a vehicle to acquire these traits is efficient. After dividing students into teams, they were able to develop objectives, dissect a region and create a filming tutorial which was shared with the other teams in the class and used in the course examination. This study suggests anatomy lab is an ideal setting for teaching professionalism, accountability, ethics and team-based learning by filming a teaching tutorial.
INTRODUCTION. The objective of this study was to investigate the incidence of bilateral absence of the sternohyoid muscle during routine dissection of the anterior neck. The sternohyoid (SH) muscle is the most anterior and superficial of the neck strap muscles lying over the thyroid gland and trachea. It attaches from the sternum to the hyoid bone. Clinical relevance (speech, mastication, respiration) is related to its dynamic action and its static position is intimate or associated with thyroidectomy, cricothyrotomy and tracheostomy procedures. The literature describes many variations and anomalies to the neck strap muscles. METHODS. Literature search was conducted on texts, journals, and websites regarding the incidence of bilateral absence of the SH muscle. During dissection a male cadaver had bilateral absence of the SH muscles. A retrospective review of records from 500 cadaver dissections during the past 10 years was conducted. RESULTS. Literature review revealed no known previous documentation of bilateral absence of the SH muscle. Unilateral absence was documented in 1890. No note of unilateral or bilateral absence of the SH muscle was recorded from 500 cadaver dissections during the past 10 years. CONCLUSION. As technology improves, it facilitates the clinical understanding of muscle actions related to physiology and pathology. The SH muscle, one of four classic infrahyoid muscles, continues to have its actions associated with daily functions and pathology as research progresses. Absence of the SH muscle is an extremely rare embryological event, perhaps indicating its importance. This study reveals an extremely rare bilateral absence of the SH muscle, one of the neck strap muscles, suggesting the importance and necessity of the SH muscles.

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Case study: gross anatomic dissection and CT scan of a 94 year old female achondroplastic dwarf.

INTRODUCTION. Achondroplasia is the most prevalent form of short-limbed dwarfism with over 200 possible types. Anatomic variations are well documented and include short proximal limbs, genu varum, hydrocephalus, and cardiovascular complications. METHODS. A 94 year old female achondroplastic dwarf was evaluated through gross dissection and computed tomography (CT). RESULTS. Medical history revealed dementia, osteoporosis, loss of vision bilaterally, hydrocephalus, and seizures. The age of this subject is rare, as this population has a shorter lifespan. Superficial observation revealed bilateral genu varum, while dissection uncovered a left total knee replacement, which was later evaluated by CT scan. Bone quality around the implant is poor. Intra-articular evidence of the varus deformity is present in the right knee with a lack of hyaline cartilage over the medial femoral condyle. An ACL tear and partial PCL tear was also noted in the right knee. The CT scan shows evidence of severe degenerative joint disease, including the non-weight bearing joints. A mal-union, mid-shaft femur fracture with significant superficial deformity was also discovered by CT scan. Neurovascular structures appear normal in their branching, however, the size of the vessels are visibly large compared to overall size of the subject. Both the upper and lower extremities have tortuous arterial malformations, primarily in the femoral, brachial, and radial arteries. CONCLUSIONS. There is very little anatomical research on achondroplastic dwarfism in the elderly population. The profound degenerative joint disease, large malformed vessels, and advanced age of this subject make this an interesting case study.
Validation of the virtual dissection table.

INTRODUCTION. In recent years digital media showing anatomical content are becoming commonplace in the curriculum. The purpose of this presentation to better understand the unique features and characteristics of the available innovative, 3D, digital anatomical learning resources and to conduct both formative and summative evaluations of one of the most promising of these tools—the Virtual Dissection Table (VDT). METHODS. We have 3 aims for this project: to develop an assessment rubric for comparing the unique features and characteristics of digital anatomy learning resources; to develop two modules for the VDT and formatively evaluate them with students and faculty in a variety of teaching/learning settings; and to assess student learning using the Virtual Dissection Table in selected health sciences curricula. CONCLUSIONS. We expect that findings will clearly show the strengths and limitations of the selected learning resources and provide feedback for refining the assessment rubric. The revised rubric will help faculty select the most appropriate digital anatomy resources for their students and educational setting. We also expect that we will be to determine 1) how well students achieve the module’s learning objectives, and 2) to determine whether the VDT is more or less effective with students from different disciplines (e.g. medicine, bioengineering, dentistry, and dental hygiene), with males or females, and with students of different educational levels, learning styles and visuo-spatial abilities.

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Evaluating temporomandibular joint anatomy with ultrasonography and cadaver dissection.

INTRODUCTION. The objective of this study was to identify and teach the anatomy of the temporomandibular joint (TMJ) using ultrasonography (USS) and cadaver dissection. The TMJ or craniomandibular joint is single synovial bicondyler joint with two halves. Each half is separated into upper and lower cavities by a fibrocartilaginous disc. TMJ is unique or atypical because it is covered by fibrocartilage rather than hyaline. TMJ opens and closes 1500-2000 times per day. Approximately 50% of adults will suffer at least one or more symptoms of TMJ dysfunction (TMD) and up to 25% will have severe TMD symptoms. TMJ spinal and cranial nerve innervation with close association to neck and facial structures allows TMD symptoms to be multiple and misleading. If USS can effectively image the TMJ, it could be used for prevention, diagnosis, and monitoring of TMD. METHODS. Literature search was conducted on texts, journals, and websites regarding TMJ USS. Dissection of thirty cadavers (60 sides) was performed to identify TMJ anatomy. USS was conducted on 300 live TMJ joints to assess morphology and structural identification. RESULTS. Literature search revealed few studies using USS with the TMJ. Dissection revealed soft tissue and bony landmark morphology of the TMJ joint aiding structure identification of USS imaging. USS revealed reproducible soft and bony structures of the TMJ from 300 sides. CONCLUSION. TMJ CT and MRI is expensive and time consuming. USS is safe, portable, inexpensive and reveals structures during static and dynamic TMJ activity. USS can be used to diagnose acute and chronic TMJ pathology. This study suggests USS can be used to image the TMJ, create a baseline or control of normal function and use it to compare when pathology begins to affect the TMJ.
INTRODUCTION. High anatomical variability of the superficial peroneal nerve (SPN) yields an unexpectedly high complication rate of nerve injury with procedures involving the lower limb. Present research attempted to better define the course and anatomic position of this nerve, particularly within the middle third of the lateral leg, as an aide with which to predict the course of the nerve allowing for faster identification and localization of the structure during specific surgeries. METHODS. 120 limbs from 60 cadavers, both prepared and fresh, were dissected and the path of the SPN analyzed. Photographs and measurements of each limb were taken and a detailed breakdown of the course of the nerve in the middle third of the lower limb was recorded. Specific branching patterns, overall length of the nerve, and patient demographics were obtained, including the points at which the SPN bifurcates into the intermediate and medial dorsal cutaneous sensory nerves. RESULTS. The course of the SPN within the middle third of the lower limb follows one of four general pathways. The SPN will either stay completely in the lateral compartment; pierce the anterior septum and continue in the anterior compartment; proceed along the anterior intramuscular septum; or branch into both the anterior and lateral compartments. CONCLUSIONS. Based upon our cadaveric study, there is significant variability of the superficial peroneal nerve in the lower limb. These variabilities can, however, be generalized and specific branching points can be identified. Such anatomical data will assist the surgeon when performing the limb-saving procedure of fasciotomy and accordingly, decrease the incidence of iatrogenic nerve damage when attempting such a decompression.

INTRODUCTION. Klippel-Trenaunay-Weber Syndrome (KTWS) is usually described as a sporadic form of osteohypertrophic angiodysplasia nevus and varicosities. It is described a case of KTWS with agenesis of deep venous system in left lower limb in a woman, despite other illnesses. METHODS. In SCMRJGH, a 20 year old female patient, who had been submitted to a partial saphenectomy in left leg by other medical team from another hospital. In SCMRJGH it was diagnosed KTWS, with many plain angiomas, including the left lower limb. Doppler and magnetic resonance imaging (MRI) were done to confirm diagnoses. RESULTS. Physical examination 5 years after the surgery shows hypertrophy of left lower limb, with venous ecstasy, and a new ulcer in left leg. Venous Doppler showed an anatomical variation of the left superficial and deep systems in left side. There is a varicose in accessory internal saphenous vein which drains to the left part of the internal saphenous vein, about 10 cm above the knee. There is a gastrocnemius perforator vein with abnormal pathway connecting external saphenous vein, popliteal vein to venous tibiofibular trunk. Results of right lower limb do not present abnormality. CONCLUSION. Venous shunts between superficial and deep venous systems and hypoplasia of deep venous veins confirming a clinical diagnosis of angiodysplasia of KTW Syndrome. Doppler and MRI results confirmed diagnosis. Nowadays, she has lower left limb bigger than the right, and phlebectomy without ulcer after treatment. Clinical follow-up without complications.
INTRODUCTION. The iatrogenic radial nerve palsy commonly occurred after the operative management of humeral fracture. In this study, we investigated the topographic anatomy of muscular branches of the radial nerve before going to be the posterior interosseous nerve dividing for the effective fracture manipulation or surgery. METHODS. Sixty one upper extremities from 39 Korean cadavers were dissected. The number, and the origin & inserting point of the muscular branches were observed and the distances of the origin & entering point of each muscular branch were measured, from the inter-epicondylar line or/and from the inferior margin of the deltoid tuberosity. RESULTS. Most of the branches to each head of the triceps arose from the radial nerve before running on the axillary groove. The branches to the lateral head arose more numerous and distally; the average distance from the inferior margin of deltoid tuberosity was 49.1mm proximally. In 41% of cases, the radial nerve had the branches to the brachialis and they arose at proximally 66.7mm from the inferior margin of deltoid tuberosity. Most of the branches to the brachioradialis arose from the radial nerve and at proximally 51.1mm from the inter-epicondylar line. In 3.7%, they arose from the deep radial nerve. Most of the branches to the extensor carpi radialis longus arose from the deep radial nerve and at proximally 41.7mm from the inter-epicondylar line. In 7.5%, they arose from the superficial radial nerve. Most of the branches to the extensor carpi radialis brevis arose from the deep radial nerve, while in 11.4%, they arose from the superficial radial nerve. CONCLUSIONS. We studied the muscular branches of the radial nerve, focused on their locations. We expect this study will help to plan the surgical application.

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Anatomy comic strips.

INTRODUCTION. Comics are powerful visual messages that convey immediate visceral understanding in ways that conventional texts cannot. In this study, authors created comic strips in order to teach anatomy more interestingly and instructively. METHODS. To achieve this, funny scenarios related to anatomy were collected and written. Based on these scenarios, four-frame comic strips were drawn on paper, and then painted on the computer. For relaxing readers, the authors intentionally created the main character, Dr. Anatophil, who is a comical anatomy professor. 550 episodes of these comic strips have been elaborated in Korean, and some are being translated into English. RESULTS. All comic strips can be viewed freely at the homepage (anatomy.co.kr). Because these were written and drawn by the experienced anatomists, responses were generally favorable. Now a day, the graduating students hesitate to specialize in anatomy because subject matter seems boring to them. The anatomy comic strips would be a new technique to attract the students’ interest, because the comics would inform them of the intriguing episodes and worthwhile activities of anatomists. CONCLUSIONS. The comic strips, aimed at helping students study anatomy, are expected to be improved further by authors and by other concerned anatomists.

COLLINS, James D., Ernestina H. SAXTON, Samuel S. AHN, Hugh GELABERT, and Alfred CARNES. David Geffen School of Medicine at UCLA, Los Angeles, CA, USA.
Obstruction of the thoracic duct(s) causes chronic lymphedema of the upper limb in patients presenting with symptons of thoracic outlet syndrome: MRI/MRA/MRV.

INTRODUCTION. Obstruction of the thoracic duct(s) impedes lymph drainage into the venous system causing chronic upper extremity lymphedema. Lymphatics have bicuspid valves like the
venous system. Obstruction of lymph drainage results in metaplastic fibrosis of the fascial planes of the upper limb. Nodular fibrosis of the superficial lymphatics and occlusion of the deep lymphatics that marginate the veins within the fascial planes, impedes venous drainage and arterial flow. The upper limb undergoes painful swelling, with swelling of the axilla and compression of the brachial plexus. Patients present with tingling/numbness and weakness of the affected arm; lightheadedness; blurred vision and floaters in the visual fields, and tinnitus with whooshing sounds in the ear on the affected side and increased hair growth and nail changes in the affected limb. METHODS. Bilateral MRI/MRA/MRV displays the sites of obstruction of lymphatics, draining veins of the neck and the subclavian and axillary arteries with binding nerve roots. Monitored multiplanar images with abduction external rotation and 2D Time of Flight MRA/MRV without contrast are acquired on a 1.5 Tesla GE Signa LX unit, 44 cm field of view, 512 x 256 matrix and saline water bags to enhance signal to noise ratio and Fast Spin Echo (FSE) to display lymphedema (JNMA 1999; 91:333-341). RESULTS. Two patients were selected; one with acquired obstruction of the thoracic lymph duct with lipoma extending into the left hemithorax, the other with developmental fibrosis of the right thoracic duct complicated by pulmonary emboli. Cannulation of the lymphatics could not be performed because of obstructed lymphatic flow. CONCLUSIONS. MRI/MRA/MRV is the only alternative to lymphangiogram in patients with obstruction to lymph flow.

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A study of podiatric student perceptions of USMLE-style items in a general anatomy course.

INTRODUCTION. The first-year NYCPM General Anatomy (GA) course was revamped to emphasize clinically-oriented anatomy. USMLE-style items correlated to Bloom’s taxonomy were used in lecture assessments. Students answered 324 multiple-choice items on quizzes/exams. An anonymous post-course survey was administered online to collect data about student perceptions of these assessments. METHODS. The survey contained Likert-style items. 71/97 (73%) students voluntarily responded. RESULTS. 89.9% of students either agreed or strongly agreed that the quizzes/exams contained a mixture of basic anatomy and clinically-oriented items (10.1% disagreed). 57.3% either agreed or strongly agreed that the quizzes/exams were fair, 33.8% disagreed, and 8.8% strongly disagreed. 73.5% either agreed or strongly agreed that the quizzes/exams contained items that correlated to lecture objectives, 19.1% disagreed, and 7.4% strongly disagreed. 85.5% either agreed or strongly agreed when queried if they believed they will do well on GA board items because of the items they were exposed to in the course, 11.6% disagreed, and 2.9% strongly disagreed. 85.5% either agreed or strongly agreed that “single-best-answer” items were easier than “extended list” items, 18.8% disagreed, and 1.4% strongly disagreed. 80.6% either agreed or strongly agreed that the items on the quizzes/exams were similar to those on the Part 1 USMLE, 4.9% disagreed, and 4.5% strongly disagreed. CONCLUSIONS. Students valued USMLE-style assessments. Although about half responded that the assessments were not fair, most believed they would do well on the GA section of their boards as a result of this exposure. These data suggest that USMLE-style items can be incorporated into a GA course in podiatric education.

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Descriptive anatomy of the interscalene triangle and costoclavicular space and their relationship to thoracic outlet syndrome.

INTRODUCTION: Thoracic outlet syndrome classically results from constrictions in one or more of three specific anatomical locations: the interscalene triangle, costoclavicular space and coracopectoral tunnel. Previous studies quantified the average width of the interscalene base.
MR and CT imaging studies suggest that, of the three potential locations for constriction, the costoclavicular space is the most susceptible to compression. This study aims to expand on a descriptive anatomy of the interscalene triangle and associated costoclavicular space.

METHODS: The interscalene angle, interscalene triangle base and costoclavicular space were measured on 120 sides of embalmed human cadavers. Linear distances and angles were measured using a caliper and protractor respectively. The data was analyzed by calculating the mean, range and standard deviation. RESULTS: The range for the interscalene base was 0 to 21.0 mm with a mean of 10.7 mm. For the interscalene angle the range was 4 to 22 degrees with a mean of 11.3 degrees. Measurements for the costoclavicular space ranged from 6 to 30.9 mm with a mean of 13.5 mm. CONCLUSION: No significant differences were observed between left and right interscalene triangles or costoclavicular spaces, furthermore, there were no differences between the genders concerning these two locations. Both range and mean of interscalene base measurement were comparable to the findings of previous studies that used diagnostic imaging to measure these spaces and reported only slightly less values.

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Bifurcation patterns of the superficial peroneal nerve: Implications in ankle arthroscopy.

INTRODUCTION: Over the last 15 years, ankle arthroscopy has become a major surgical procedure and the utilization of two anterior portals has become part of the gold standard in this surgical approach. Complications associated with this operative intervention include: joint infection, articular surface damage, and nerve injury. The most frequent complication remains confined to damage of the neurological structures. Most often, injury to the superficial peroneal nerve (SPN) accounts for a third to a half of these complications (3% to 8.5%). It is important to note that the superficial peroneal (fibular) nerve is likewise responsible for motor innervation to the fibularis longus and brevis in the lateral compartment of the leg, and for cutaneous sensation to the skin of the anterolateral leg including most of the dorsum of the foot. METHODS: Approximately 100 specimens taken from 60 cadavers, fresh and prepared, were dissected. The SPN was located and identified within the mid-third of the leg and followed distally up to and beyond its bifurcation. Measurements of fibular length and length of the SPN from the tip of the fibula were calculated. Bifurcation points were identified and measured in relationship to the lateral malleolus, ankle joint, and flexor retinaculum. RESULTS. Our study provides significant information about the bifurcation patterns of the superficial peroneal nerve. Such knowledge regarding the location and patterns the the nerve will assist in pre-surgical planning, allowing the surgeon to better estimate the safest placement of anterior portals for ankle arthroscopy. The gleaned anatomical data will be important not only for those performing arthroscopy but for those instances when an open procedure (anterolateral approach) of the ankle is required.

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The ‘oblique popliteal ligament’, a macro and microanalysis to determine if it is a ligament or a tendon.

INTRODUCTION. The objective of this study was to investigate the ‘oblique popliteal ligament’ (OPL) and challenge its alleged ligament status. The posterior aspect of the knee has become increasingly studied because of its clinical relevance. Surgeons, biomechanists, physical therapists, all health care providers dealing with the musculoskeletal system and anatomists need to have a definitive and precise understanding of the structures of the posteromedial knee. The currently named OPL is indigenous to the distal semimembranosus (SM); therefore, by definition is not a ligament inserting from bone to bone. This is clinically important because of the
proprioception of a tendon versus a ligament. METHODS. Literature search was conducted on texts, journals and websites regarding the formation of OPL. Dissection of 70 knees included observations, harvesting OPL samples and performing immunohistochemistry with antibody staining to the OPL. RESULTS. All but one text claimed the OPL receives fibers from SM. Macro dissection of 70 knees revealed the OPL coming from the distal SM tendon trifurcation (100%). Microanalysis of OPL from 16 knees demonstrated the expression of golgi tendon organs in 100% of the OPL samples suggesting tendon origin. DISCUSSION. Woodburne stated the OPL formed from the fibers of the distal SM tendon; however, no journals or texts have hypothesized that this ligament is indigenous to the SM tendon, thus, a tendon itself. Clinically it is important we know what type of tissue for purposes of maximizing rehabilitation and surgical techniques. CONCLUSION. This study suggests the OPL be considered the oblique popliteal tendon as a result of the macro and micro evidence revealed in this study.

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Comparing morphology and orientation between the common iliac artery and vein along the left and right pelvic sides in females explains swelling and sleep habits during pregnancy.

INTRODUCTION. The objective of this study is to investigate the morphology of the common iliac artery (CIA) and vein (CIV) comparing right and left sides in females versus males. Pregnant women favor lying on one side. The reason for this may be due to morphology and orientation between the CIA and CIV. Virtually all women during their pregnancy suffer from lower limb (LL) swelling. This study will provide an anatomical explanation for the propensity to lie consistently on one side and LL swelling and offer prevention measures. METHOD. Literature search was conducted on texts, journals and websites regarding the morphology and orientation of the Right and Left CIA and CIV. Measurements from 30 dissected cadavers was conducted on the Right and Left CIA and CIV. RESULTS. Literature search revealed no studies investigating the morphology and orientation between the Right and Left CIA and CIV. Cadaver results revealed a relatively direct anterior to posterior orientation between the Right CIA and CIV, but a relative oblique lateral to medial orientation between the Left CIA and CIV. DISCUSSION. Third trimester pregnant women tend to lie on their left side regardless previous sleep habits and suffer from LL swelling which manifests as toe, ankle and sacral edema. The arterial system is left sided, while the venous system is right sided. This leads to an interesting CIA and CIV orientation within the pelvis. As the uterus and fetus grow anterosuperiorty, they compress the CIA, which in turn collapses the CIV posteriorly on the right side more so than the left side due to different orientation. CONCLUSION. This study suggests an explanation why women lie on their left side when resting and sleeping during the third trimester due to the clinically relevant anatomy between the CIA and CIV.

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Design of an anatomy workshop for college graduates preparing for a career in medical device sales.

INTRODUCTION. The Zimmer Sales Academy is a unique training opportunity designed to prepare college graduates from diverse disciplines for a career in medical device sales. The Sales Academy is a 6 to 8 month program, depending on the business track, combining classroom and laboratory training with field observation. We describe the curriculum created for a 1-week anatomy workshop that is part of the Sales Academy and that provides a focused introduction
to anatomy related to orthopaedic surgery. METHODS. Day 1 begins with an introduction to clinical anatomy and body systems, followed by study of bones and ligaments of the limbs using a combined lecture/dry lab format. Day 2 focuses on the upper limb with lecture followed by study of preparations in the laboratory. Day 3 focuses on the lower limb using the Day 2 format. Day 4 is a review of all didactic and laboratory material. Case studies integrating anatomy and its application appear throughout the week. The program concludes on Day 5 with a practical exam on bones, medical images, and preparations. RESULTS. To date, 77 trainees have enrolled in three separate offerings of the workshop. The average score on the concluding practical exam is 91% (48% - 100%). Feedback from the trainees indicates a self-perceived higher level of confidence in their understanding of anatomy and ability to apply this knowledge in interactions with surgeons. The ultimate measure of success of the anatomy workshop will be its contribution to a strengthened clinical anatomy knowledge base that results in increased market share for Zimmer medical device sales. CONCLUSIONS. A specialized anatomy workshop for college graduates from diverse disciplines promotes their confidence as they prepare for a career in orthopaedic medical device sales.

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A ten-step chemical method to enhance dissection of the preserved foot.

INTRODUCTION. Few studies describe using chemicals to aid dissection of the preserved foot. We developed a novel ten-step method of foot dissection to better preserve anatomic structures. METHODS. Step 1: soften specimen with glycerine, methyl alcohol, phenol, and eugenol; then dissect superficial foot dorsum. Step 2: use the same chemicals plus eosin to perform deep foot dorsum dissection. Step 3: use the same chemicals in Step 1 to dissect superficial plantar foot and expose structures. Step 4: use the same chemicals in Step 2 to dissect first plantar muscle layer. Step 5: use the same chemicals in Step 2 to dissect second plantar muscle layer. Step 6: use the same chemicals in Step 5 to dissect third plantar muscle layer. Step 7: use the same chemicals in Step 6 to dissect fourth plantar muscle layer. Step 8: use glycerine, phenol, and peroxide to dissect foot dorsum ligaments. Step 9: use same chemicals in Step 8 to dissect plantar foot ligaments. Step 10: dissect remaining foot ligaments then use chemicals to decalcify bone. RESULTS. Step 1 softened tissue to ease dissection. Step 2 preserved structures on deeper dorsum dissection. The immersion process of Step 3 exposed all structures. Steps 4 through 7 included dissection with eosin injection to highlight plantar muscle layers 1 to 4, respectively. Step 8 included underwater dissection to demonstrate dorsal ligaments. Step 9 was similar to Step 8 except that plantar ligaments were dissected. Step 10 demonstrated deep ligaments and then chemical decalcification of bone. CONCLUSIONS. This method allowed visualization of structures relevant to podiatrists. Videotaping this method can allow students and surgeons to appreciate anatomic details of the foot, and thus, has value in medical education.

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Does the format of Powerpoint presentations affect students' behaviors toward textbook buying and reading, lecture attendance and academic curiosity?

INTRODUCTION. The objective of this study was to assess the format and influence of Powerpoint (PP) presentations in anatomy courses. PP was developed to assist presenters with visual aids and to deliver complicated concepts using key words—not comprehensive paragraphs. Today PP slides tend to be a word-for-word narration that becomes the syllabus for anatomy courses. Surveys have shown that students do not focus during the lecture and are less likely to attend the course. Worldwide, PP is the most commonly used program for presenting lectures. Globally,
are we encouraging students to only memorize PPs and thereby depriving them of academic expertise and depth of knowledge available from lecturers and texts? METHODS. A literature search was conducted on texts, journals and websites regarding the effect or influence of PP formats. A survey was conducted with medical and dental students assessing their behavior towards textbook buying, lecture attendance and exam preparation because of PP format. RESULTS. Literature search revealed no reference to textbook buying and lecture attendance based on PP format. PP survey revealed that students were not buying textbooks, attended lectures less frequently and read PP for exams due to format (word-for-word lectures). DISCUSSION. PP is an amazing tool to assist expert lecturers; however, paragraph word-for-word PP slides are replacing the course textbook, the traditional expert lecturer and class attendance. CONCLUSION. Data suggests that the current didactic portion of an anatomy course be taught online and the lab portion, use a human expert. The authors believe that there should be an expert lecturing from a PP, which provides a few key words and limited illustrations, allowing the expert to expound on current theories.

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Joint lab student teaching modules: clinical procedures demonstrated in the anatomy laboratory.

INTRODUCTION. A complete understanding of joint anatomy is critical for a physical therapist to better understand pathology, rehabilitation following surgical interventions and the performance of orthopedic special tests. Traditional dissection approaches in the anatomy laboratory have allowed only a cursory approach to examining and studying joint structure. METHODS. Design an active learning module that bridges traditional dissection in the anatomy lab with a clinical test and procedures class in a physical therapy curriculum. RESULTS. Students were given an optional active learning module that consisted of: 1) performing a comprehensive dissection of a self selected joint; 2) linking the joint dissection to an orthopedic special test learned in the clinical skills class or examining the dissection in relation to an orthopedic surgical procedure; 3) presenting the dissection to the anatomy class in a teaching module guided by objectives derived from the cognitive domain of Bloom’s taxonomy. CONCLUSIONS. Active learning joint anatomy teaching modules can be readily incorporated in the anatomy lab dissection course. The active learning modules afford students the opportunity to demonstrate the anatomy related to specific clinical tests and measures used by physical therapists during patient evaluation or the anatomy associated with a patient’s surgical procedure. The process engages students in actively bridging anatomical and clinical sciences through the creation and execution of a dissection teaching module.

FARKAS, A. Gabrielle¹, Brion BENNINGER², Anthony OLINGER¹, ¹Kansas City University of Medicine and Biosciences, Kansas City, MO 64106, USA, ²Oregon Health Sciences University, Portland, OR 97239, USA.
Prevalence of the subclavius posticus muscle and its relationship with thoracic outlet syndrome.

INTRODUCTION. The subclavius muscle originates from the first rib and inserts into the subclavian groove on the clavicle. The subclavius posticus muscle usually shares a common origin with the subclavius, but inserts on the superior margin of the scapula lateral to the suprascapular notch. Studies suggest that the subclavius posticus may play a role in neurovascular compression of the subclavian and axillary arteries as well as the brachial plexus, a condition known as thoracic outlet syndrome. This aberrant muscle sits like a strap over the neurovascular bundle as it travels through the thoracic outlet. The purpose of this study was to describe the frequency and morphology of the subclavius posticus muscle. METHODS. The lateral neck region of 102 embalmed human cadavers (50M, 52F) was dissected and searched for the presence of the subclavius posticus. Frequency and morphology data, based on the presence of a distinct
subclavius posticus muscle was collected. RESULTS. Of the 102 specimens, we identified one female specimen that had bilateral subclavius posticus muscles and two male specimens that had a subclavius posticus muscle on the right side of their bodies. CONCLUSIONS. Understanding the frequency and morphology of the subclavius posticus muscle may assist in evaluating, diagnosing and treating thoracic outlet syndrome. First rib resection and scalenectomy are often performed on patients before the actual cause of the symptoms are evaluated. Understanding that a small percentage of the population may have symptoms due to the presence of this muscle may help physicians diagnose the syndrome more effectively. Furthermore, the presence of this muscle in patients whose symptoms persist following surgical treatment may provide an explanation for their symptoms.

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Distal biceps brachii tendon and supinator muscle interactions at the elbow.

INTRODUCTION. The elbow is a complex convergence of a number of structures with different functions. The restoration of function following soft tissue injury and/or fracture may be compromised in more complex cases due to limited anatomical understanding of the interactions between structures. This study aims to quantify key relationships in this area. METHODS. Twenty-five embalmed elbows were dissected. The epitendon of the distal biceps brachii tendon was maintained and followed distally. The margins of the supinator muscle were identified, documented digitally and reflected. The attachments of the supinator muscle were then revealed by cutting down the mobile parts of the muscle. This was repeated for the distal biceps brachii tendon. The attachments were documented digitally and measured. RESULTS. The distal biceps brachii tendon is attached to an elongated area of the radius in a series of small tendinous components, ranging from four to eleven in number. Their attachment is not confined to the radial tuberosity, often continuing distal to this. The supinator muscle does not have a single attachment area to the radius; it is attached in a series of staggered, longitudinal bands. The most anterior of these (when supine) engulf the attachment of the distal biceps brachii tendon, cover part of the biceps bursa and often extend proximal to this to attach to the anterior joint capsule. CONCLUSIONS. The anterior area of the elbow features a complex interaction between the distal biceps brachii tendon and the supinator muscle. Attachments include involvement of the biceps bursa and anterior joint capsule, suggesting a more detailed functional relationship between the two. These may be of surgical importance.

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Functional anatomy of laryngoscopy for endotracheal intubation.

“Sniffing” position has been recommended for laryngoscopy for endotracheal intubation. “Sniffing” position means that the head is extended on the atlanto-occipital joint, and the neck is flexed on the thorax. Extension of the head aligns the oral cavity with the pharynx. Flexion of the neck aligns the pharynx with the larynx. The focus has been on the movements of the head and neck. The effect of the movements do not elucidate the specific movements within the airway. Two factors influence performance of laryngoscopy: position and force. The position that most affects laryngoscopy is flexion of the neck on the thorax. This affects the relationship of the trachea with the cricoid and thyroid cartilages. The force of laryngoscopy is anatomically forward on the tongue and epiglottis. This affects the relationship of the epiglottis to the thyroid cartilage and the epiglottis, hyoid bone, tongue, and mandible to each other and the thyroid cartilage. The force with the laryngoscope is at right angles to the axis of the laryngoscope
blade and also moves these structures forward. The vocal cords rotate from slightly off perpendicular to slightly off horizontal because of rotation of the thyroid cartilage. The objective of this study is to show the relationship of rotation the thyroid cartilage and cricoid cartilage to the trachea in laryngoscopy for endotracheal intubation and the effect on the trachea from flexion of the neck. Our hypothesis is that rotation of the thyroid cartilage and cricoid cartilage accounts for alignment of the pharyngeal and laryngeal axes with flexion of the neck on the thorax. Do the tracheal rings collapse anteriorly on each other with flexion of the neck?

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Development of interprofessional application modules prepares students for a work environment of integrated clinical care.

INTRODUCTION. In the modern health care environment, different professions provide patient care and rehabilitation. Physician Assistant (PA) and Physical Therapy (PT) students at our institution have reported previously that an integrated gross anatomy course provided them with an opportunity for a better understanding of the scope of each discipline. METHODS. In order to strengthen interprofessional communication, education, and a clinical understanding between PAs and PTs during their semester-long gross anatomy course regional interprofessional application modules were developed. RESULTS. PA and PT students at our institution participate in an integrated gross anatomy course with a focus on clinically-functional anatomy. During gross dissection lab, the students work in mixed groups, using the alternate dissection format, to complete a regional dissection. Those students not actively dissecting on that day completed assignments based on a clinical scenario, in a particular region. The assignments focus on how their respective disciplines will use the anatomy within a region to provide care for the patient described in the clinical scenario. Time is provided during lab for students of each profession to teach the clinical scenario to their colleagues. Interprofessional application modules from the region of the lower limb and head and neck are presented. CONCLUSIONS. PA and PT students who have an understanding of how each discipline approaches and contributes to a treatment strategy will be better able to provide integrated continuing care for patients. The development of interprofessional application modules, based on foundational basic science education (gross anatomy), provides directed study that serves to strengthen this approach to integrated clinical care.

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Using live chroma key video capture to produce a vertically and horizontally integrated clinical anatomy experience online.

INTRODUCTION. The LCME and the AAMC have made several strong appeals for schools to vertically and horizontally integrate basic medical sciences into senior years of medical training. With limited faculty, time and funding for such integrations it is a difficult goal to reach. Web, television and social networking sites have become powerful tools for connecting with the millennial generation. We set out with a goal of producing a publicly available website that provided world wide access to a set of clinical anatomy educational videos, geared to medical students, but appealing to all levels of training from high school through residency. METHODS. We built our own portable production studio using an Edirol© video switcher and Lite Ring for live chroma key video capture. Videos were captured using Pinnacle Studio® and edited using Adobe Premiere® and rendered with QuickTime Pro®. The “Anatomy Guy” website was laid out and hosted on an off-site location to ensure that the streaming and hosting did not rely on university IT resources. RESULTS. The website was launched August 16th, 2010, and by February
25th with no advertising, it has received over 22,000 visitors from 126 countries and 2168 cities around the world. The top 5 countries have been the USA, UK, India, Hungary, and Canada. Visitor loyalty is high with 51% of visitors returning multiple times. User comments are positive and indicate use from physicians, students, and patients alike. CONCLUSIONS. The local and global impact of the website continues to grow and shows promise by attracting broad clinical and institutional interest.

GOODMURPHY, Craig W., Stephanie T. TREXLER, Michele RETROUVEY, Jonathan W. STRAND, Jean-Marc RETROUVEY and Genevieve LEMIEUX. Eastern Virginia Medical School, Norfolk, VA., 23501, USA.
Orthodontic microimplants: A three pronged cadaver study of implant bony placement, vascular supply and anchoring strength.

INTRODUCTION. The use of dental microimplant screws in orthodontics has a relatively short history. They are used clinically to reposition teeth by providing a stable bony anchor point. Our research focused on identifying placement risk zones as well as determining placement strength based on screw length. METHODS. Seven unfixed cadavers were used and the heads were imaged four times using a GE Light Speed 64 slice scanner at .625mm slices: pre injection, after injection, after implant placement and after implant extraction. 3M Unitek® implants of 6mm, 8mm and 10mm were placed on the upper buccal, upper palatal and lower buccal regions by board certified orthodontist using manufacturer’s directions. The implant pull out strengths were measured using a Dillon Model GS tensiometer (500N) that was attached to each implant using 12 gauge Nicad and stainless steel wire. 23 to 26 measures for each length of screw was recorded RESULTS. All implants had pull out strengths above clinical levels with the 8 and 10mm significantly above that of the 6mm implants (p=0.03). 10mm implants would sometimes pierce bone to maxillary sinuses or nasal cavity creating an infection prone environment. Placement safety zones were determined using pull out fracture patterns and palatine artery and nerve landmarks. CONCLUSIONS. There is still much to be learned about proper placements of microimplants but it appears that 6mm or 8mm implants are both stable and less likely to pierce sinuses and damage tooth roots. To avoid palatine neurovascular damage a safety zone of placement is suggested when placements on the gingival side are required.

GUTH, J. Jared, and Amanda M. AGNEW. Division of Anatomy, The Ohio State University, Columbus, OH 43210, USA.
Comparative foot and ankle anthropometry from the US, Japan, and Australia.

INTRODUCTION. Anthropometric data from the foot and ankle are important for injury prediction, computer modeling, evaluating lower extremity pathologic abnormalities, and improvement of footwear design and shoe sizing. For these applications, it is important to account for population variation in foot and ankle architecture. The objectives of this study were to observe differences in data collection methods in prior research, quantify population-specific differences in foot and ankle anthropometry in comparable samples, and update previous anthropometric data. METHODS. Foot and ankle measurements were compared between samples from Australia, Japan, and the United States that used equivalent data collection techniques. Analysis of variance (ANOVA) was utilized to reveal population and sex-specific differences in measurements of foot length, foot breadth, calf circumference, and lateral malleolar height. RESULTS. Significant differences were found in foot and ankle anthropometry for all variables across all samples, even when subdivided by sex. Measurement values were also found to be significantly different between three separate samples from the United States after accounting for sex differences. CONCLUSIONS. The population and sex-specific differences in lower extremity anthropometry may be an important consideration for
future foot and ankle studies. Additional comparable anthropometric measurements should be recorded in future studies to provide a more robust basis for comparison between populations.

HALLIDAY, Nancy, Daniel O’DONOGHUE, Rhonda SPARKS, and Britta THOMPSON. University of Oklahoma College of Medicine, Oklahoma City, OK 73132, USA.
Use of clinically based active learning in medical gross anatomy.

INTRODUCTION. The University of Oklahoma College of Medicine competency-based curriculum strives to incorporate experience based learning beginning in the first year, involving investigation and evaluation of patient care, appraisal and assimilation of scientific evidence, and improvements in patient care. Clinically based active learning was implemented in the gross anatomy course to meet these objectives. METHODS. Assignments were designed to develop clinical problem-solving skills, enhance team learning, integrate scientific knowledge with clinical scenarios, and encourage critical evaluation of primary literature. RESULTS. Clinical cases were used in the Human Structure course to assist students in understanding the relevance of underlying scientific knowledge to principles of clinical practice. Teams of 4 students were assigned clinical vignettes for which they developed a 5-10 minute class presentation that included differential diagnoses, pertinent anatomy, treatment options, and review of the primary literature. In addition, the students gained experience in clinical problem solving and patient care through case tutorials with practicing physicians and interactions with standardized patients. CONCLUSIONS. Based on the quality of student presentations, course evaluations, and student focus group comments, the implementation of clinically based active learning met both faculty objectives and student satisfaction in integrating scientific knowledge with clinical practice.

HALLIDAY, Nancy, Daniel O’DONOGHUE, Rhonda SPARKS, and Britta THOMPSON. University of Oklahoma College of Medicine, Oklahoma City, OK 73132, USA.
Use of online formative evaluations as active learning in medical gross anatomy.

INTRODUCTION. Traditionally, exams are designed to measure student mastery of course content. There is little to no opportunity for students to evaluate their outcomes, and thus little further learning or investigation occurs after the exam. In addition, the high-stakes pressure of summative exams create an environment in which students may perform at a level that is not an accurate portrayal of actual mastery. Formative exams, in contrast can assist instructors in enhancing the effectiveness of traditional exams and promote enhanced student understanding. METHODS. Weekly formative online quizzes and practical exams were designed to encourage active review of weekly concepts and to develop competency-based self-assessment. RESULTS. Students in gross anatomy were required to pass a weekly formative online quiz. Students had 3 opportunities to achieve a pre-determined mastery level and were encouraged to work in groups while taking the quiz. In addition, students took a weekly formative lab practical exam. Each practical contained 25 structures to identify in order to earn a maximum of 20 points. CONCLUSIONS. Weekly formative quizzes were intended to encourage active review of missed concepts and reduce the stress associated with single high-stakes exams. Students were also given opportunity to self assess their competency in content areas that are typically problematic in the gross anatomy curriculum prior to taking the summative exam. These weekly formative assessments were designed to promote a more regular self-reflective learning process.
INTRODUCTION: Despite recent emerging evidence to support the articular origin of complex intraneural cysts, their origin remain controversial. The coexistence of intraneural and adventitial cysts has been described due to the proximate neurovascular bundle at the joint capsule. To clarify the pathogenesis, anatomically based imaging patterns can be identified. This study characterizes a common MRI finding describing the adventitial component originating from the superior tibiofibular joint (STFJ).

METHODS. MRIs of patients with fibular (peroneal) (n=24) and tibial (n=7) intraneural ganglion cysts were reviewed to determine coexisting cystic adventitial involvement. For comparative normal vascular anatomy, ten conventional knee MRIs without contrast in patients without intraneural ganglion cysts were examined.

RESULTS. Eleven patients with fibular and 2 patients with tibial intraneural ganglion cysts were identified as having a coexisting adventitial component. In all cases, the adventitial cyst extended from the anterior portion of the STFJ, within the capsular vessels, and along the anterior tibial vessels. An imaging pattern was identified and seen in all cases: the "vascular U" sign, consisting of cystic anterior tibial vessels running through the interosseous membrane between the proximal tibia and fibula. The constant U-shaped anatomy of the vessels was confirmed to be present in all 10 patients without intraneural ganglion cysts.

CONCLUSION. This study introduces a new imaging pattern that can improve the identification of adventitial cysts derived from the STFJ, the "vascular U" sign. Reflecting the vascular anatomy, this imaging pattern may have further implications in enhancing our understanding of the pathogenesis of isolated popliteal adventitial cysts.
pathology. Understanding the anatomy gives insight into the pathoanatomy which, in the future, may allow earlier diagnosis and improve treatment.

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Intramuscular innervation of supraspinatus: a 3D modeling study.

INTRODUCTION. The supraspinatus (SP) is the most commonly injured rotator cuff muscle. The architecture of SP has been studied using 3D modeling, however innervation studies are limited. The purpose of this study is to determine the pattern of intramuscular innervation of SP.

METHODS. The suprascapular nerve (SSN) was digitized sequentially in short segments throughout the muscle volume in five formalin embalmed cadaveric specimens without any evidence of rotator cuff pathology. The digitized data was modeled using Autodesk® Maya® 2011. The 3D models were used to document the intramuscular innervation pattern. RESULTS. The SSN enters SP at the suprascapular notch. The SSN continues as a single long branch along the bone of the supraspinous fossa to the spinoglenoid notch. The SSN has two branches that are given off as the nerve enters the muscle belly, a larger anterior branch and a smaller lateral branch. The anterior branch supplies the superficial portion of anterior two-thirds of the belly, and the lateral branch the lateral region. The main trunk of the anterior branch, as it veers medially, gives off a deep branch that innervates the deep fibre bundles at the base of the supraspinous fossa and a medial branch the innervates the superficial portion of the posterior one-third of the muscle belly. CONCLUSIONS. This pilot study suggests that SP is neuromuscularly partitioned into superficial and deep regions medially and one region laterally. Each region of SP is innervated by a discrete branch from SSN and therefore may be individually recruited during muscle contraction.

HOFFMAN, Leslie, and Mark SEIFERT. Department of Anatomy and Cell Biology, Indiana University School of Medicine, Indianapolis, IN 46202 USA.
The evolution of curricular change in U.S. medical schools: An anatomist’s primer.

INTRODUCTION. Anatomists play an integral role in the education of future physicians. As key contributors to medical curricula, they are subject, either directly or indirectly, to the external shifts and influences that bear on the training of future health practitioners. As such, it is important that they understand some of the historical roots of change and those elements of current change that may impact their role in the medical curriculum. METHODS. This study explored the evolution of medical education in the United States from the pre-Flexnerian era to the present, identifying key forces that prompted curricular change and which will likely influence future change in the early decades of the 21st century. RESULTS. Physician training prior to 1900 was largely apprenticeship-based or occurred in physician-owned medical colleges with little standardization of education or skill development. Abraham Flexner’s 1910 report fueled standardization of medical school admission criteria and firmly established the four-year medical curriculum that largely exists today. Recent changes in health care funding and delivery, information technology, medical instrumentation, and advances in educational theory and pedagogical methods have only increased the complexity of academic medicine and health centers and the call for new reforms. CONCLUSIONS. Curricular reform occurs in response to external and internal shifts and necessarily reverberates throughout a curriculum. As major stakeholders in the medical curriculum, contemporary anatomists must be aware of the roots and directions of change so that they can appropriately anticipate and adapt to those changes to educate the next generation of physicians.
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Abdominal ultrasonography in medical anatomy education.

INTRODUCTION. Because of the growing role of physician-operated ultrasound (US) in primary and emergency care there is an increasing need for US education at all levels of medical training. METHODS. Four 15-minute illustrated exercises were developed for US-naive students to accompany standard abdominal dissection: 1. the abdominal aorta and its branches; 2. left, and 3. right upper quadrant (RUQ); and 4. gallbladder (Gb) and biliary tree. RESULTS. In the RUQ exercise, the transducer (T) is placed transversely at the inferior costal margin in the midclavicular line and angulated from superior to inferior; diaphragm, liver, Gb, and kidney are identified, differing echogenicities noted, and relationships examined; and, upon sliding T left of midline and angling right in the horizontal plane, the right renal artery is seen originating from the aorta, passing posterior to the IVC. The hepatic venous confluence is scanned by placing T transversely at the medial border of the 8th costal cartilage, rotating counterclockwise 25° and angulating superiorly to 40° with the abdominal wall (AB); and, by rocking T, middle, right, and occasionally left hepatic veins are seen. The hepatorenal recess is examined in the midaxillary line in the 8-11th intercostal space by pointing T toward the posterior axillary fold, following the lower edge of the liver, and then moving superiorly along the course of the rib. Finally, the kidney and its components are studied by placing T longitudinally over ribs 6-9, midway between anterior axillary and midclavicular lines, at 110° to the anterior AB. CONCLUSIONS These exercises provide medical students a unique opportunity to study dynamic anatomic relationships in situ, visualizing them in multiple planes, and foster visual pattern recognition skills and comfort with the US modality.

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Challenging anatomists to an anthropological perspective: An example of the skeletal system.

INTRODUCTION. Using anatomical skeletal collections as a teaching tool for musculoskeletal anatomy provides a tangible learning experience for students. However, a frequently unaddressed and untapped potential of such collections is the capability to introduce and investigate questions of an anthropological nature. By implementing a type of problem-based learning (PBL), students can utilize their knowledge of musculoskeletal anatomy to begin to answer questions concerning the individual instead of only the skeletal element of interest.

METHODS. Approaching a skeletal collection anthropologically allows students to consider multi-system processes that would manifest skeletally; and how those processes can inform the anatomist or anthropologist about the life of the individual. Depending on the nature of the collection, further extrapolation could include population level questions. Instilling a sense of a “person,” their “lifetime” and the population they originated from into the learning process of students will only enhance their anatomical education creating more competent clinicians in their respective fields. Creating a biological profile for the individual skeletal remains includes estimation of age, sex, ancestry and stature. Including pathological conditions and/or stress markers can speak to events in the individual’s lifetime. CONCLUSIONS. Using this evidence in conjunction with anatomical understanding will lead students to uncover causative factors for the condition of the individual’s skeletal remains. Increasing awareness for anatomy educators about the possible PBL experiences incorporating anthropology is a crucial step in a more comprehensive understanding of the human body which ultimately provides a more holistic approach to health.
Henry Wheeler, a medical student caught up in his anatomical studies, was among the first townspeople of Northfield, Minnesota to fire back on Jesse and Frank James and their gang of outlaws during a failed robbery attempt. Wheeler also participated in the subsequent hunt by the posse for the gang that ultimately saw many of James-Younger gang returned to Northfield to face justice. His involvement in the robbery and its aftermath, and how these events affected his later studies and medical practice, is the subject of this presentation. This historical narrative of Henry Wheeler is a microcosm of medical practice on the North and South Dakota frontiers near the turn of the last century. Wheeler went on to medical practice in Grand Forks, North Dakota, and was named to be the first dean of a new medical college at the University of North Dakota. This man of action not only served as the president of the Dakota Medical Association, but also served as the mayor of the city of Grand Forks, all while flourishing in the community as a physician, citizen and sportsman.
management and must have continuing education to maintain certification. Practice on simulators is effective for learning skills necessary for intubation, but surrogates do not duplicate the feel of human tissue, and instructors have difficulty providing more realistic training of these life-saving skills. METHODS. OSU Anatomy collaborated with CFD to design a lab for 2-5 CFD crews at a time to practice laryngoscopy and airway management on unembalmed cadavers. RESULTS. 435 EMTs participated over 6 training days in 2009 - 2010. Each laboratory had 2 cadaver stations for hands-on instruction and practice of specific tasks: Station 1 - evaluate airway anatomy of the subject, practice positioning and performing bag valve mask resuscitation, review equipment for endotracheal tube (ET) intubation, practice laryngoscopy and ET placement; Station 2 - evaluate airway anatomy of the subject, review indications for surgical cricothyroidotomy, review and practice procedure for surgical cricothyroidotomy. Instructors gave formative assessment during practice sessions. CONCLUSION. Anatomy education outreach efforts were successful. CFD and paramedics were very pleased with the unique opportunity for paramedic training on unembalmed cadavers. Paramedics rated items on the Continuing Education Evaluation 4.73 to 4.98 on a scale of 5.0. Two comments written by paramedics summarize the experience best: “Can’t beat real anatomy” and “first time in years I was able to fully appreciate a surgical airway, and I left the lab feeling confident in being able to perform one.”

KEIM-JANSSEN, Sarah A., and Stephane P. VANDERMEULEN. Department of Genetics, Cell Biology and Anatomy and the Division of Physician Assistants, University of Nebraska Medical Center, Omaha, NE 68198, USA. Competence and confidence increases with clinical skills testing in the gross anatomy lab.

INTRODUCTION. The lightly embalmed cadaver is an ideal simulated patient where students obtain hands-on experiences related to the anatomical concepts presented in class. Research on hands-on approaches has also been shown to stimulate interest, develop skills and increase learning. The Lachman test, used to assess the integrity of the anterior cruciate ligament (ACL), is commonly performed by health care professionals, and is relatively easy to teach to first year students. For these reasons, we decided to integrate teaching the Lachman test into the anatomy lab. Our hypothesis is students receiving hands-on clinical skills in the anatomy lab will be more confident, competent and will become independent learners. METHODS. First year Medical, Physician Assistant and Physical Therapy students were randomly assigned into the intervention (Group A n=38) or control group with lecture only training (Group B n=36). Both groups received lecture training and Group A received a 20 minute hands-on training for the Lachman test. One week later both groups performed the Lachman test while being observed by a faculty member and completed a post test and survey. RESULTS. Students with hands-on training (Group A) performed significantly better (p=<0.01) than students with lecture only training (Group B) in completing the checklist, post test and correctly diagnosing an ACL tear. Students in Group A also reported being more confident after hands-on training vs. lecture only training. Both groups report that incorporating clinical skills aids learning and creates excitement for learning. CONCLUSIONS. Hands-on training with lightly embalmed cadavers promotes confidence and competence in performing the Lachman test and creates excitement and aids in learning anatomy.

KHAN, Ahmed N.1, Estomih P. MTUI1, and Petru L. MATUSZ2. 1Department of Cell Biology, Weill Cornell Medical College, New York, NY 10065, USA.2Department of Anatomy, University of Medicine and Pharmacy, Timisoara, ROMANIA. Semimembranosus complex.

INTRODUCTION. The study was conducted to demonstrate the role of semimembranosus with its eight tendinous insertions which act as a pivot and provides medial and posterior stability of the
knee. METHODS. Dissection was performed on 50 pairs of knees from 50 cadavers; 31 female, 19 male; ages 60-90 years. Tendons of the semimembranosus were followed to their insertions. Distal attachments were found to have eight different attachments to osseochondral tissues. RESULTS. Type 1 consisted of a round tendon attached to front of tibia. It was present in all specimens. Type 2 was a small band that attached on the tibia and was present in 70% of specimens. Type 3 descended inferomedially to the medial collateral ligament (81% occurrence) while Type 4 was a short, thin band that arose at a 45 degree angle from the Type 3 slip and was found in 17% of specimens. Type 5 was represented by the oblique popliteal ligament and appeared in all specimens as a very strong band. Type 6 formed as a thin fascial layer over the popliteus muscle beneath which passed the inferior lateral genicular artery. Type 7 was a small band that formed a thickening attached to the posterior capsule, reinforcing it. It appeared in 37% of specimens. Type 8 was a direct extension to the lateral edge of the lateral meniscus and appeared in 61% of specimens. CONCLUSIONS. Multiple insertional slips of the semimembranosus tendon contribute to the structural stability of the medial, posterior, and lateral aspects of the knee joint. In case of rupture of the medial collateral ligament, it is worthwhile to look into the possible tear of oblique popliteal ligament. In 24% of male cadavers Biceps femoris was remarkably hypertrophied indicating stress shared by the muscle in addition to the pulling of posterior horn.

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Investigation of fiber-type distribution within architecturally distinct regions of human supraspinatus.

INTRODUCTION. The architecture of supraspinatus (SP) is complex with architecturally distinct regions: anterior and posterior, each which is further subdivided into three distinct parts superficial, middle, and deep. To date, fiber-type studies of the entire muscle volume are limited. The purpose of this study is to investigate the fiber-type distribution throughout SP. METHODS. Samples of human SP muscle were excised from the three parts of the anterior and posterior regions of 5 formalin embalmed cadaveric specimens free of tendon pathology. Cryostat sections were prepared from frozen tissue. Type I and II fibers were labeled with antibodies against myosin heavy chains using immunohistochemical techniques. Pictures of labeled tissues were analyzed. Mean cross sectional area (CSA) of 50 fibers of each type were determined for each part of the muscle for each specimen. RESULTS. Mean percentage of fast fibers in the superficial part, 41.5%, were significantly larger (P>0.05) than the deep part, 35.9%. No significant differences were found between anterior and posterior regions. Type I fibers were consistently larger than type II within all parts and regions of the muscle. Type I fibers occupied a larger portion of the CSA of SP within all parts and regions. Mean percentage of CSA of type I fibers within the deep part, 80.6%, was greater than that of the superficial part, 72.6% for all specimens. CONCLUSION. Metabolic properties of distinct regions/parts of SP further support hypotheses of muscle function and tendon stresses generated from architectural investigation: (1) primary role of posterior region is to maintain tension on tendon; (2) force exerted on the articular side of the tendon by fiber bundles of the deep part is less likely than that of other parts.

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Anomalous fibulocalcaneus muscles associated with the ankle joint: Clinical implications.

INTRODUCTION. Anomalous fibulocalcaneus muscles have gained recent attention in the clinical literature. Novel variants of three fibulocalcaneus muscles were studied: 1) fibulocalcaneus internus, a posterior compartment muscle which travels posterior to the medial
malleolus; 2) fibularis quartus muscle, a lateral compartment muscle which travels posterior to the lateral malleolus; and 3) anterior fibulocalcaneus muscle, a novel anterior compartment muscle which passes anterior to the lateral malleolus. METHODS. Approximately 100 cadaveric limbs were dissected to identify, document, and note these muscles. The literature was reviewed to summarize their clinical implications. RESULTS. Approximately 20% of dissected limbs contained a fibularis quartus muscle, including a rare bilateral variant known as the peroneocalcaneocuboideus muscle. The fibulocalcaneus internus muscle was not present in our dissections. Three bilateral examples of a new muscle, the anterior fibulocalcaneus, were identified. CONCLUSIONS. Novel variants of these fibulocalcaneus muscles were identified and their clinical implications will be discussed. Fibularis quartus muscle variants can cause lateral ankle stenosis, ankle instability, fibular tenosynovitis, and subluxation of the fibular tendons. The fibulocalcaneus internus muscle has been implicated in posterior ankle pain/impingement and tarsal tunnel syndrome. The anterior fibulocalcaneus muscle was discovered in this study, and currently biometric and radiologic studies are underway to confirm the actions and prevalence of this muscle. Radiologists and clinicians should be aware of these muscles when embarking in diagnosis and imaging interpretation, especially when chronic ankle pain is involved.

LAMBERT, H. Wayne¹, Stavros ATSAS¹, Sean C. DODSON¹, Blake T. DANÉY¹, Heather J. BILLINGS¹ and Ferrell R. CAMPBE². ¹West Virginia University, Morgantown, WV 265096-9128, USA. ²University of Louisville, Louisville, KY 40202, USA.
The anterior fibulocalcaneus muscle: Confirmation of its presence in the anterior leg compartment.

INTRODUCTION. The discovery of the anterior fibulocalcaneus muscle was reported bilaterally by members of this research group in the journal of Clinical Anatomy (Lambert and Atsas, 2010). This muscle originates from the fibula, anterior intermuscular septum, and the investing fascia of the fibularis tertius. Its tendon passes anterior to the lateral malleolus and inserts onto the lateral aspect of the distal calcaneus, anterosuperior to the fibular (peroneal) trochlea. METHODS. Additional cadaveric leg dissections were performed to confirm the presence of this anomalous leg muscle. When present, these muscles were dissected, measured, and photographed. RESULTS. Two additional bilateral examples of the anterior fibulocalcaneus were identified. The innervation of these anomalous muscles was confirmed to be derived from the deep fibular nerve. Though the origin of these muscles showed variation, all six examples showed a common insertion into the calcaneus in close approximation to the fibular trochlea. CONCLUSIONS. The presence of the anterior fibulocalcaneus muscle was confirmed in this study. Like other muscles of the anterior leg compartment, this variant muscle is innervated by the deep fibular nerve. Currently, biometric and radiologic studies to confirm the actions and prevalence of this muscle are underway. Radiologists and clinicians should be aware of this muscle when embarking in diagnosis and imaging interpretation, especially when chronic ankle pain is localized anterior to the lateral malleolus. REFERENCE. Lambert HW, Atsas S. 2010. An anterior fibulocalcaneus muscle: An anomalous muscle discovered in the anterior compartment of the leg. Clinical Anatomy 23:911-914.

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Educational value of a social networking application, Twitter, for integrated dental anatomy education.

INTRODUCTION. Social networking applications have become a ubiquitous part of daily life, especially for the current generation of students. An opportunity to use the social networking application, Twitter, for use in education is explored in the current study. METHODS. In the yearlong, first-year, integrated dental anatomy curriculum at The Ohio State University, the instructors
tweeted” a multiple choice question pertaining to the course material after each lecture, followed by another tweet with the correct answer the following day. The Twitter link was made available to first and second-year dental students with an option to sign up for “push” notifications on smart phones if they so chose. The second-year students were invited to take a pre- and post-quiz at the end of each quarter to gauge the educational value of the “tweets”. They were invited to take a survey to measure their perception of the overall value of Twitter as an educational tool as well as to obtain opinion on the usability of a social networking application for educational purposes. RESULTS. A majority of the first-year dental students responded to the survey. Only ten percent of the second-year dental students participated in the pre- and post-quizzes. The survey results reveal that: 1) while students found the questions posted on Twitter useful, many did not like the Twitter application itself; 2) many students did not have Twitter accounts and had to create an account; and 3) many opted not to receive “push” notifications on their smart phones. CONCLUSIONS. Although social networking applications are used in abundance in students’ daily lives, Twitter, in particular was not perceived as a desirable educational interface. Detailed survey and pre-, post-quiz analysis will be presented.

LEITE, Túlio F. O.; Antônio C. P. de OLIVEIRA; Rossi M. da SILVA; Kyoshi GOKE; Williams da C. PINTO; Júlio G. SILVA and Carlos A. A. CHAGAS. Gama Filho University Rua Manoel Vitorino SN Piedade, Rio de Janeiro, R.J. Brazil and Souza Aguiar Municipal Hospital (SAMH), Praça da República, 111, Centro, Rio de Janeiro, R. J. Brazil. 1Medical Student of Gama Filho University, Rio de Janeiro, R. J. Brazil. 2Professor of Gama Filho University and Vascular Surgeon Staff, Chief of the Vascular Resident from Souza Aguiar Municipal Hospital (SAMH), Rio de Janeiro, R. J. Brazil. 3Head of the Vascular Surgery from SAMH, Rio de Janeiro, R.J. Brazil and Professor of Surgical Technique Valença Medicine Faculty, Valença, R. J. Brazil. 4Professor of Gama Filho University and Head of the General Surgery from Carlos Chagas Hospital, Rio de Janeiro, R. J. Brazil. 5Professor of Gama Filho University, Rio de Janeiro, R.J. Brazil. 6Professor of Rio de Janeiro Federal University and Professor of Augusto Mota University, Rio de Janeiro, R. J. Brazil. 7Staff of Angiology from Santa Casa da Misericórdia do Rio de Janeiro General Hospital (SCMRJGH), Head of the Angiology of Carmela Dutra Policlinic Hospital (CDPH), Professor of Gama Filho University, Professor of Angiology from Catholic Pontifícia University of Rio de Janeiro (PUCRJ), Rio de Janeiro, R. J. Brazil and Professor of Federal Fluminense University, Niterói, R. J. Brazil.

A rare variation of the aortic arc branches. Lusoria artery accompanied by a bicarotid trunk and non-recurrent laryngeal nerve in corpse. Discussion of clinical application in a case of dysphagia lusoria.

INTRODUCTION. The lusoria artery (LA) is a rare anatomical variation of aberrant right subclavian artery causes anatomical changes related to esophagus and vascular structures in the mediastinum. This anatomical relation is rarely reported in literature. METHODS. In SAMH, 51 years old a female patient, for seven years with progressive dysphagia was diagnosed with dysphagia lusoria and underwent corrective surgery for right carotid-subclavian artery bypass and LA occlusion by endovascular. Follow-up with no complications. Concomitantly during dissection in anatomy laboratory in a female corpse with no definite cause of death, age and ethnicity it was found this rare variation. After complete dissection, it was done a revision of the literature was done and it was studied its possible consequences in the mediastinal and neck structures in case of LA. RESULTS. The origin of the right subclavian artery is in the distal aortic arch as the last branch in both corpse and patient. LA trajectory is upwards to the right side, retroesophageal and then describing their usual path on both. Moreover, it was found in on corpse a bicarotid trunk which is not described in the literature associated to LA preceding the left subclavian artery. The right non-recurrent laryngeal nerve (NRLN) described as unusual path. The left recurrent laryngeal nerve described as usual path. CONCLUSION. This finding in corpse corroborates more confidence to surgeon during procedure. These reports becomes crucial to surgeons who intend to treat this disease, mainly on changes in trajectory and topographical
relations with other body structures. This study allows further investigation for clinical association with lusoria dysphagia.

MALLOY, Kyle and Brion BENNINGER. Department of Oral Maxillofacial Surgery, Department of Surgery, Department of Integrative Biosciences, Department of Orthopaedic Surgery and Rehabilitation, Oregon Health and Science University, Portland, OR 97239 USA. Maxillary sinus – is there a clinical link between its historical and surgical relevance?

INTRODUCTION. The objective of this study was to investigate the maxillary sinus (MS) regarding its historical and surgical relevance. Nathaniel Highmore is credited with the eponym “Highmore’s antrum” in 1650. The MS is pyramidal shaped, linked to multiple pathologies and the largest craniomaxillary sinus. Its roof is the floor of the orbit and consequently involved in orbital trauma. Its medial wall houses the ostium, draining the sinus, linking it to infectious conditions. The floor lies just above the roots of the maxillary molars. The floor is dynamic, remodels and is dependent on external forces of energy transferred via molars during mastication. Its 3D shape requires CT imaging for accurate fracture reduction. METHODS. Literature search was conducted on anatomical and specialty texts, journals and websites regarding history of the MS and its clinical evolution. Dissection of 60 embalmed cadavers and CT 3D reconstruction was conducted on 15 of the 60 cadavers to assess and measure its shape. RESULTS. Literature search revealed the first notation of the MS was from Galen; however, Highmore described a patient with chronic drainage from an extracted tooth in 1650. Anatomical texts do not mention Highmore; however, specialty texts and journals frequently associate his name with the MS. Dissections and CT scans revealed a pyramidal shaped chamber with variable bone thickness and translucency. DISCUSSION. MS dates back to Galen and drawings by Da Vinci. Highmore is credited with its description. A surgical subspecialty is highly devoted to the anatomy of the MS. Implant surgery by several specialties has increased the need for MS clinical anatomy detail. CONCLUSION. This study suggests Highmore antrum and MS be mentioned together due to its historical and surgical link.

Malloy, Kyle, Andrew WEEKS and Brion BENNINGER. Department of Oral Maxillofacial Surgery, Department of Surgery, Department of Integrative Biosciences, Department of Orthopaedic Surgery and Rehabilitation, Oregon Health and Science University, Portland, OR 97239 USA. Importance of frontal sinus anatomy regarding radiology, diagnosis and frontal sinus surgery.

INTRODUCTION. The objective of this study was to investigate the frontal sinus (FS) regarding surgery, radiology and anatomical detail. Frontal sinus (FS) surgery has developed over the last 25 years. Traditionally, surgical treatment for patients suffering devastating, high velocity facial trauma yielded inconsistent and mediocre esthetic outcomes. Within the last few years, CT guided surgery has resulted in superior outcomes for these difficult reconstructive cases. The FS continues to develop during infancy and matures with anterior and posterior plates. Its dimensions are the most diverse among the sinuses. METHODS. Literature search was conducted on specialty and anatomy texts, journals and websites regarding FS fracture surgery and anatomy. FS of 30 cadavers were dissected and measured, 12 were CT scanned. FS surgery was conducted on a male patient using CT guided reconstructive surgery. RESULTS. Search revealed CT reconstructive FS surgery and clinical anatomy described in specialty texts and journals but inadequately in anatomy texts. Dissections (30) revealed FS plate measurements (Anterior:R-4.33 L-4.13, Posterior:R-3.65 L-3.28 Space:R-8.02 L-8.58). DISCUSSION. CT guided reconstructive FS surgery has allowed open surgery to be highly successful. Surgeons success is related to the ability to assess the clinical anatomy damage (sinus obliteration, drainage and cranialization) and use CT imaging anatomy projected over the affected side to reduce the fracture. FS is the most variable sinus and understanding its anatomy and physiology is critical in the decision of
open surgery with CT guided reconstruction. CONCLUSION. This study suggests the importance of detailed FS anatomy with CT reconstruction to enable diagnosis and successful reduction of FS fractures.

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Specificity of segmentary distribution concerning the additional branches of the single renal artery. Study on 300 corrosion casts.

INTRODUCTION. The renal artery (RA) is divided in 2 branches: anterior (ABr) with 4 segmentary (S) arteries (superior S -SS, anterior superior S -ASS, anterior inferior S -AIS and the inferior S -IS), and posterior (PBr) (continued with the artery for posterior S -PS). The present study investigated the specificity of segmentary distribution concerning the additional branches of RA. METHODS. One analyzed a number of 300 renal corrosion casts with a single RA. The corrosion casts were realized by injection of the renal vasculo-ductal systems with plastic mass and corrosion of the parenchyma with hydrochloric acid. One revealed the additional branches (superior – SBr and inferior - IBr) and their specificity of segmentary distribution. RESULTS. The additional branches of RA, SBr and IBr were pointed out in 12.33%, respectively 2%. The presence of SBr was associated with: ABr (0.67%), ABr and PBr (10.67%) and ABr, PBr and IBr (1%). The presence of IBr (1%) was associated with ABr and PBr (1%) and with the presence of ABr, PBr and SBr (1%). Among the 44 de segments deserved by SBr: SS in 70.45%, AS in 4.55%, PS in 4.55%, AS in 6.81% and the superior anterior segment in 13.64%. IBr is distributed in 100% of the casts at a single segment, represented by IS. In 0.67% of the casts SBr is associated only with ABr; in the remaining cases with the presence of SBr one revealed the mandatory presence of ABr and PBr (and facultative presence of IBr). In 2% of the casts IBr is associated mandatory with the presence of ABr and PBr (and facultative of SBr). CONCLUSIONS. SBr is distributed in most of the cases to SS (70.45%) and to the neighbouring segments of SS in 29.55%. IBr is always (100%) distributed to IS (Supported by grant UEFISCDI 42097/2008).

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The variability of renal segmentation in case of single renal artery. Study on 300 corrosion casts.

INTRODUCTION. According to the Terminologia Anatomica (TA), the renal parenchyma has a number of five renal segments (RS): superior segment (SS), anterior superior segment (ASS), anterior inferior segment (AIS), inferior segment (IS) and posterior segment (PS). The present study investigated the variability of renal segmentation in the case of the kidney with a single renal artery. METHODS. One analyzed a number of 300 de renal corrosion casts with a single renal artery. The corrosion casts were realized by injection of the renal vasculo-ductal systems with plastic mass and corrosion of the parenchyma with hydrochloric acid. They were classified in morphological types (MT) according to the RS number. The occurrence of homologated RS as well as of supplementary ones was revealed. RESULTS. MT homologated by TA was revealed in 64% of the cases, and in 36% were pointed out 42 MT of renal segmentation. The number of RS varied between 4 and 8 (4RS in 4.33% with 4MT; 5RS in 70.67% with 8MT; 6RS in 21% with 8MT; 7RS in 3% with 2MT and 8RS in 1% with 1MT). The homologated RS were revealed with the frequency-following: SS 82.33%; ASS 91.33%; AIS 93.33%; IS 91.33% and PS 70.33%. 18.33% among the existing RS have a non-homologated aspect (performed by division in frontal plane or transversal of homologated RS). CONCLUSIONS. The renal segmentation presents a great anatomic variability. Based on this segmentation study, the partial resections resections can be achieved in secure anatomo-surgical conditions (Supported by grant UEFISCDI 42097/2008).
MOORE¹, Garrett D., Robin LENZ¹, Anthony C. DILANDRO², Fortunato BATTAGLIA², R. Shane TUBBS³, Marios LOUKAS⁴, Piotr B. KOZLOWSKI⁵, and Anthony V. D’ANTONI². ¹Podiatric Medical Student, ²Division of Pre-clinical Sciences, New York College of Podiatric Medicine, New York, NY 10035 USA; ³Pediatric Neurosurgery, Children’s Hospital, Birmingham, AL 35233, USA; ⁴Department of Anatomical Sciences, St. George’s University, Grenada; ⁵Touro College of Osteopathic Medicine, New York, NY 10027, USA.

Condylar emissary vein to extracranial venous anastomosis: an anatomical and histological case study.

INTRODUCTION: There is a paucity of literature on the histology of the condylar emissary vein and deep cervical vein. During dissection of a 77-year-old female, an unusually large vessel posterolateral to the cervical spine was demonstrated and initially thought to be a left supernumerary vertebral artery. METHODS: Blunt and sharp dissection revealed that the vessel coursed the length of the cervical spine and appeared to anastomose with the left vertebral artery at its V3 segment. A left condylar emissary vein from the ipsilateral condylar canal joined this vessel. The length of the unknown vessel, vertebral artery, and anastomotic branch was measured. Three 0.5 cm sections were removed from the unknown vessel; Four from the vertebral artery. Sections were also removed from the anastomotic branch and condylar emissary vein. The diameter of each section was measured with microcalipers. Sections were stained with H&E and Verhoeff’s elastic stain. RESULTS: The length of the unknown vessel was 19.5 cm, 18.5 cm for the vertebral artery, and 1.5 cm for the anastomotic branch. The diameter of the unknown vessel 1 cm from the perceived origin was 1 mm, 5 mm at C5-6, and 4 mm at C2-3. The diameter of the anastomotic branch was 1.5 mm and 4 mm for the emissary vein. Histologic analysis revealed that the unknown vessel was not an artery but a vein (deep cervical vein) and received the condylar emissary vein and an anastomosis from the vertebral venous plexus.

CONCLUSION: This report should further our understanding of the histology and variation of the condylar emissary vein and related structures. As the condylar emissary vein can spread infection between the cranium and cervical spine, awareness of its relationships and microscopic architecture has important clinical relevance.

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A possible relationship between reliability of thoracic outlet syndrome diagnostic testing and the position of the axillary artery. Part III: The relationship between the axillary artery and the roots of the median nerve.

INTRODUCTION. Publications describe anomalous spatial relationships between the axillary artery and brachial plexus whereby the axillary artery can be compressed by the median nerve roots when the upper extremity is hyper-abducted. Previous work quantified anomalous positioning of the axillary artery anterior to the median nerve roots. Previous work also described an increase in pressure in the axillary artery when the upper limb was hyper-abducted and the median nerve roots compressed the artery. The purpose of this study is to describe and quantify the lengths of the median nerve roots. METHODS. A total of 312 preserved cadaveric axillae (148F/ 164M) were dissected to examine the brachial plexus in the axilla. The lengths of the roots of the median nerve were measured from their origin at the cords to their convergence at the median nerve. RESULTS. The average length of median nerve roots was 21.1mm. 35.8% of the median nerve roots measured were longer than the population average, while 64.2% were shorter. Interestingly, the right medial (16.4mm) and right lateral (17.6mm) median nerve roots were significantly shorter than the left medial (26.3mm) and left lateral (24.8mm) median nerve roots. There was no length difference between genders concerning the median nerve roots. CONCLUSIONS. The symptoms observed during the provocative test could be the result of
compression between the median nerve roots and the axillary artery. Some provocative diagnostic tests for thoracic outlet syndrome rely on evaluating pulse during hyperabduction. The majority (64.2%) of median nerve roots are short enough to compress the axillary artery and affect the pressure inside that vessel thereby altering reliability of evaluating pulse distal to the axillary artery.

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Clinical anatomy of the Vazirani-Akinosi method for pain relief with and without an associated concussion.

INTRODUCTION. The objective of this study was to investigate the clinical anatomy of the Vazirani-Akinosi technique(VAT) for mandibular nerve blocks and its clinical purposes. Vizirani and Akinosi described closed mouth mandibular nerve anesthesia in 1960 and 1977 respectively. VAT is used to anesthetize the mandibular trunk for mandible fractures, trismus, etc. Landmarks for needle insertion are anterior border of ramus and mucogingival junction of maxillary second molar. Dental schools teach the VAT but rarely is it used. Patients with head injuries and mandibular trauma are contraindicated for opiates require pain relief (VAT) while their head injury is evaluated. Nearby structures include maxillary, inferior alveolar and medial pterygoid arteries, inferior alveolar, long buccal and accessory nerves, temporalis tendon and pterygoid muscles. METHODS. Literature search was conducted on texts, journals, and websites regarding clinical anatomy associated with VAT. Ultrasonography (USS) was used for needle guidance and structure identification. Dissection (30sides) and analysis of involved structures was recorded

RESULTS. Literature search revealed no description of the VAT in clinical anatomy texts for closed jaw pathology. Journals and specialty texts describe VAT (inadequate anatomy) and it’s taught during injection courses at dental schools. USS was successful in identifying the needle and surrounding structures. Variability of nerves, arteries, veins and muscles in harms way were recorded. DISCUSSION. The VAT allows a clinician to treat a patient with pain who is unable to open their mouth. VAT is highly successful with minimal side effects. CONCLUSION. This study reveals the anatomy associated with the VAT providing confidence and aiding a clinician’s decision.

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Characterizing the structural anatomy of the supraspinatus muscle of the rotator cuff complex.

INTRODUCTION. Rotator cuff (RC) muscle injuries are the most common cause of shoulder pain and dysfunction in industrialized countries. To date, the natural history of supraspinatus (SS) pathology is not well understood and the mechanisms responsible for the changes in muscle structure and function are unknown. The objective of this research project was to characterize parameters of the SS muscle and its tendinous junction via cadaveric dissection. METHODS. Following dissection of 17 embalmed cadavers, the size, length, location and size of humeral and scapular attachments were recorded. Muscle fiber direction was also determined relative to the long axis of the tendon and divided into 4 quadrants RESULTS. Mean (±SD) fiber angle was highly variable (anterior medical:16±7; anterior lateral:17±9; posterior medical: 21±12; posterior lateral: 23±11), with the angle of attachment of posterior fibers being significantly larger in orientation. Mean muscle length from the medial border of the scapula to the humerus was 102±15 mm, and mean (±SD) muscle volume was 27±11 ml. Mean (±SD) size of bony attachment
of the muscle to the spine of the scapula was 67±7 mm and medical border of the fossa was 54±10 mm. A surprisingly large percentage (47% ±1%) of the muscle was “free floating” across the joint space. Finally, examination of the humeral attachment illustrated that the SS tendon (36% ±1%) contribution was similar to that of the infraspinatus tendon. CONCLUSIONS. Results provide a detailed description of the anatomical orientation and attachments of the SS muscle-tendon complex, clarify the results of previous investigations, and provide surgeons with clinically relevant data that can be used to refine surgical techniques used in the treatment of RC pathologies.

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Clinical anatomy of the Gow-Gates local anesthesia technique.

INTRODUCTION. The objective of this study was to investigate the anatomy of the Gow-Gates (GG) technique for mandibular nerve block (MNB). GG is a MNB conducted intraorally. Dental schools teach the technique but students seldom practice this technique during or after their training. The technique commonly used for mandibular molar tooth is the inferior alveolar block (IAB). There is a 20% incidence of accessory nerves innervating the mandibular molars. The IAB has the greatest failure rate. GG is thought to be technique sensitive compared to traditional and closed-mouth blocks. Currently GG is used when IA blocks fail. METHODS. Literature search was conducted on texts, journals, and websites regarding MNB failure and the anatomy of GG technique. Ultrasonography (USS) guided GG technique was performed on volunteers to view anatomical structures. Dissection of 60 infratemporal fossa was conducted to reveal potential anatomy in harm’s way. RESULTS. Literature search revealed inadequate GG description regarding detailed associated anatomy. USS revealed anatomy structures during GG technique. Dissections revealed the following structures as possible hazards: maxillary, IA, middle meningeal, lateral and medial pterygoid arteries, auriculotemporal and accessory nerves, lateral and medial pterygoid muscles. DISCUSSION. The IAB has a 15-20% failure rate and is associated with a high incidence of accessory nerves which can complicate achieving anesthesia. GG block can take twice as long as the IAB to achieve full anesthesia. This is due to nerve size; however, it is a more comprehensive block. CONCLUSION. Although the GG technique is relatively safe anatomically and associated with fewer failures, its drawback is a more delayed anesthesia probably due to its mass.

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Piriformis syndrome: A commonly misunderstood syndrome.

INTRODUCTION. Piriformis syndrome (PS) has an 83 year history of ill definition with proposed diverse etiology resulting in misunderstanding and underreporting in the literature. The definition of PS has evolved to include sciatic pain resulting from the entrapment of the sciatic nerve by piriformis as it exits the pelvic cavity. This broad definition supports an array of etiologies due to the complicated and variable nature of the anatomical relationship between piriformis, sciatic nerve, and surrounding tissue. Technological advancements, such as MRI, have allowed for further evaluation in the pathological process and have renewed interest in PS. METHODS. A thorough review of literature was performed to extract all available data on PS using the PubMed, CINAHL, Embase, and Medline databases to February 2011. RESULTS. The nature of the broad definition serves to facilitate the inclusion of many case reports which does not enhance
our understanding of PS. Despite this, the literature has identified two potential principal etiologies. It is thought that with normal anatomy, the sciatic nerve becomes entrapped as it passes inferior to the hypertrophied piriformis muscle. An anomalous relationship between the piriformis muscle and sciatic nerve, found commonly in the population, may also contribute to the formation of PS. However this mechanism is still elusive due to conflicting evidence.

CONCLUSIONS. The literature is suggestive of two discrete mechanisms of sciatic nerve entrapment that may result from complex deep gluteal anatomy. Future research should be directed toward the understanding of the relationship between the sciatic nerve, piriformis muscle, and greater sciatic foramen to provide a clearer definition and clinical picture of this misunderstood syndrome.

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INTRODUCTION. More than 90% of medical students have experienced stress during their training (Shiakh et al., 2004). High stress level in this student population has been associated with poor academic performance, and physical and psychological health issues (Calicchia & Graham, 2006; O’Rourke, 2010). Many surveys have been developed to study stress levels in the medical curriculum including the Perceived Medical School Stress (PMSS) scale, burn-out assessment and general stress assessment. However, coping mechanisms have not received as much attention. PURPOSE. To develop a survey to assess the main causes of stress and coping mechanisms used to manage the stressors by first and second year medical students at the University of Toronto. METHODS. An anonymous online Likert-scale questionnaire will be developed. Current first (N=250) and second year (N=224) medical students at the University of Toronto will be surveyed using the questionnaire that will be deployed online using LimeSurvey. RESULTS. The survey evaluated the stressors and coping mechanisms of the pre-clerkship students. The survey was divided into six sections: (1) demographics, (2) type of difficulty, (3) coping strategies, (4) reasons for support utilization, (5) reason for lack of support utilization, and (6) lifestyle. CONCLUSIONS. This survey was able to identify the stressors and coping mechanisms used by first and second year medical students. Preliminary data indicates that first and second year students have differences in stressors that they experience but both groups seek support from friends and family most often. The questionnaire is easy to administer and informs faculty of student experience.

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Parametric b-spline representation of the fiber bundle architectural pattern of extensor carpi radialis longus and brevis.

INTRODUCTION. Biomechanical models of skeletal muscles have used linear segment(s) or template fiber bundle geometry derived from mean architectural parameters, eg. fiber bundle length (FBL) and pennation angle (PA), to represent internal muscle architecture (Delp et al., 2000; Blemker et al., 2004). By using mean values for each of the architectural parameters of the muscle, rather than those of individual fibers, the complexity of the muscle architecture may be underestimated. PURPOSE. To develop a parameterized b-spline fiber bundle model that can be used to reconstruct in situ fiber bundle architecture and to compare the 3D fiber bundle arrangement of the b-spline model with the linear muscle model. METHODS. Previously digitized fiber bundle data were used to create a b-spline representation of each fiber bundle. For the
parameterized b-spline model, using a custom computer program allowed partitions (i.e. architecturally distinct patterns of fiber bundle arrangement) to be identified within the muscle volume. The linear muscle model used the mean FBL and PA (Ravichandiran et al., 2009) to create a set of idealized parallel fiber bundles within the muscle volume. The 3D rendering of the two models were compared to in situ muscle architecture. RESULTS. The architecture of ECRL, with parallel fiber bundle arrangement, was realistically modeled using both of the models. In contrast, the ECRB with a more complex pennate architecture was represented more accurately with the parameterized b-spline model than the linear muscle model. CONCLUSION. Muscles with complex architecture are more realistically modeled using a parameterized b-spline model due to the sensitivity of the model to fiber bundle curvature and pennate arrangement.

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Clinical anatomical terminology: a collaborative approach to clarity.

INTRODUCTION: The AACA has convened a committee on anatomical terminology to address issues that prevent clarity of discussion among students, faculty and clinicians; specifically, usage of multiple terms to describe the same anatomical structures and concepts. Terminologia Anatomica terms are often supplanted by language representing clinical vernacular or colloquial parlance that may cloud understanding of the structures to which they refer. Recognizing that practical usage is as important as conventional taxonomy, the committee seeks to unite understanding of these divergences by providing opportunities for comparison of terms and contrast of specifics regarding various forms of usage. METHODS: First, an open access wikified website (ATI) has been developed (Paul Gobee, LUMC) on which multiple terms for a single structure are listed, with Google links to related images and text resources. Clinical terms will be collected, vetted, and added to ATI and AnatomicalTerminology (Tom Gest) by an AACA-managed body of anatomists and clinicians. Second, opportunities for clarifying discussions are available through brief reports combining both clinical and anatomical viewpoints in a single review of a particular anatomical structure or concept. These reviews, written in a common format to promote consistency and publication, will enrich the understanding of clinicians, anatomists and students. RESULTS: We provide guidelines for participation, an introduction to the website, and an example of an annotated review. Students and faculty from both academic and clinical settings are encouraged to contribute to both efforts. CONCLUSIONS: Enhanced communication among professionals from many disciplines will serve to clarify anatomical terminology used in classroom and clinical settings.

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Neuromuscular partitioning of infraspinatus: a three-dimensional modelling study.

INTRODUCTION. Neuromuscular partitions within a muscle have distinct architecture and innervation, allowing for task-dependant recruitment of different parts within a muscle. Infraspinatus (IS) is a functionally important rotator cuff muscle in which neuromuscular compartmentalization is poorly defined. The architectural component has been examined in three studies with limited sampling (Gill et al., 2007; Langenderfer et al., 2006; and Ward et al., 2006), whereas no studies could be found that extensively tracked intramuscular innervation. The purpose of this study is to determine the pattern of intramuscular innervation of IS. METHODS. The suprascapular nerve (SSN) was traced to the spinoglenoid notch where it entered the infraspinous fossa. The nerve and its branches were exposed in short segments and sequentially
digitized (Microscribe G2 digitizer) until they were no longer visible under a dissection microscope. Data from the digitized nerve and muscle volume were reconstructed into a 3D model using MAYA®. The nerve distribution patterns were analyzed and compared between specimens. RESULTS. The SSN enters the IS on its deep surface against the infraspinous fossa and gives off a lateral branch which innervates the deep lateral part of the muscle belly. The SSN continues medially and bifurcates into two main branches, superior and inferior. The superior branch supplies the superior two thirds of the muscle belly to the medial edge of the IS, while the inferior branch innervates the inferior third. The density of innervation by the lateral and inferior branches is greater than the superior branch. CONCLUSIONS. These results provide a detailed mapping of the intramuscular innervation of IS, providing evidence of neuromuscular partitioning within the muscle belly.

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Spatial relations of the hyoglossus with the muscles in the suprahyoid region.

INTRODUCTION. Many muscles attach to the hyoid bone, and they overlap each other. This gross anatomical study investigated the extrinsic muscles of the tongue, the superior hyoid muscles and the pharyngeal constrictors to clarify their spatial interrelationships. METHODS. After the removal of the mandible, the muscles in the suprahyoid region were dissected under a binocular microscope in 10 Japanese cadavers. RESULTS. The hyoglossus arose by two flat bundles that overlap one another at different angles. The anterior bundle from the body of the hyoid bone entered into the tongue superficial to the posterior one from the greater cornu, and the lingual artery passing deep to them was found between the origins. Another small bundle was frequently found deep to the anterior bundle. The geniohyoid was inserted lateral and medial to the origin of the anterior bundle. The styloglossus was inserted deep and superficial to the hyoglossus and between its two bundles. The middle pharyngeal constrictor, which fanned out from the greater cornu to the median raphe, attached medial to the origin of the posterior bundle, but its upper fibers occasionally lateral. Some fibers of the styloglossus and the constrictor frequently merged into the hyoglossus. The hypoglossal nerve running superficial to the hyoglossus supplied the styloglossus and the hyoglossus from their lateral side, branched out to the geniohyoid, and entered into the space between the lower small and upper main bundles of the genioglossus. CONCLUSIONS. The hyoglossus, the styloglossus, the geniohyoid and the middle pharyngeal constrictor are separable into some parts, respectively, and they overlap alternately. Their interrelations seem to be important to understand the tongue movement for its functional diagnosis.

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Varied anatomy of the thumb A1 pulley system: Implications for successful trigger thumb release.

INTRODUCTION. Surgical treatment of adult and congenital trigger thumb requires resection of the first annular (A1) pulley. Complications of this procedure include radial digital nerve injury, infection, stiffness, weakness, continued triggering, and bowstringing. There is currently a lack of consensus concerning the anatomy of the thumb pulley system. It is plausible that anatomical differences contribute to an incomplete release and to a higher likelihood of nerve damage in trigger thumb release as compared to trigger finger release. METHODS. Hand specimens from 60 adult cadavers(120 specimens) were procured and a detailed analysis was carried out concerning the anatomy of the pulleys, bones, and tendons associated with the proximal thumb. The flexor pollicis longus tendon sheath, the A1, A2, and oblique pulleys, as well as the radial digital nerve were dissected and various measurements obtained and standardized. RESULTS. Data is somewhat consistent with literature values for widths of 6mm, 4mm, and 6mm for A1, oblique, and A2 pulleys respectively. There appears, however, to be an additional band
between the A1 and oblique pulley with an average width of 6 mm. Studies are still underway as to determine whether this is a separate structure or a continuation of the A1 pulley. In our dissections, the exact course of the radial digital nerve has been identified as it crosses the path of the A1 pulley close to the site of surgical release. CONCLUSIONS. This extensive cadaveric study provides definitive data regarding the structure of the thumb A1 pulley and its association with the radial digital nerve. The results provide better surgical insight, which may improve surgical results related to adult and congenital trigger thumb release.

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Clinical anatomy and incidence from six continents of cleft lip and palate.

INTRODUCTION. Objective of this study is to investigate the clinical anatomy and worldwide incidence of cleft lip (CL) and palate (CP). CL and CP are attributed to genetic and environmental factors causing interference of cellular migration of the first pharyngeal arch. The combination of CL and CP has a higher incidence versus single lip or palate involvement. CL anatomy consists of vermillion border, philtrum (ridge, groove), columella, orbicularis oris, ala (base, rim), nostril sill, Cupid’s bow (apex, base of arch, tubercle, mucocutaneous ridge), prolabium vermillion and premaxilla. CP anatomy consists of incisive foramen, primary palate, secondary palate, medial pterygoid plate, pterygoid hamulus, pterygoid bone, tensor and levator veli palatini, palatopharyngeus and velopharyngeal. CP has an incidence of associated anomalies between 10-50% and up to 8% of CP’s occur as a recognized syndrome. METHOD. Literature search was conducted on texts, journals, and websites regarding the clinical anatomy and incidence of CL and CP. Dissection of 30 cadavers was conducted to assess oral anatomy. RESULTS. Literature search revealed incidence rates from CL-0.033, CP-0.038, CL+CP-0.063. Specialty text and journals revealed surgical anatomy and embryology of CL and CP. Dissections revealed the oral cavity anatomy related to CL and CP. DISCUSSION. CL and CP is a defect with multifactorial causation affecting people worldwide whose incidence is relatively universal. The defects demand detailed knowledge of developmental and macroscopic oral anatomy in order to provide the highest care. CONCLUSION. The worldwide incidence and the social and medical implications of CL and CP suggest that healthcare professionals be exposed to a detailed standard of clinical anatomy regarding CL and CP.

SHOJA, Mohammadali M., Marios LOUKAS, Hossein NAMDAR, Amir Hossein MOHAMMAD-ALIAN, Jalal ETEMADI, and R. Shane TUBBS. Low frequency of supernumerary renal arteries in patients with coronary artery disease.

INTRODUCTION. As coronary artery disease (CAD) is currently the most common cause of mortality worldwide, identification of predisposing or protective factors for CAD is of paramount importance. The present study aimed at assessing the potential association between CAD and renal vascular anatomy. METHODS. In a prospective design, 81 consecutive patients with symptomatic coronary artery disease who underwent conventional coronary angiography in a single center were recruited. Abdominal angiography was performed in all patients. Statistical analysis was done using Fisher’s Exact and Cramer’s V tests. The observed frequency of supernumerary renal arteries per kidney was compared to that of same-race, healthy individuals (n = 50). RESULTS. The mean age of patients was 58.7 years with 52 men and 29 women. A variable pattern of CAD (1-vessel, 2-vessel, 3-vessel, etc.) was present in all patients. Twelve patients (13.6%) had a supernumerary renal artery; three bilateral and nine unilateral. In total, 15 (9.3%) out of 162 kidneys had a supernumerary renal artery. Compared to the cohort of healthy individuals, the frequency of supernumerary renal arteries per kidney was significantly lower among CAD patients (P < 0.01). No statistically significant relationships were noted between
CAD patterns and the presence of a supernumerary renal artery (P > 0.1). No association was found between the history of hypertension and the presence of a supernumerary renal artery (P > 0.1). CONCLUSIONS. The present study indicated a low prevalence of supernumerary renal arteries among CAD patients. However, the pattern of CAD was not affected by the presence of a supernumerary renal artery. It is known that supernumerary renal arteries demonstrate remarkable ethnic variation. As far as we are aware, this is the first study to show an association between CAD and renal vascular gross anatomy. Although it remains speculative, the observed association between CAD and a low prevalence of supernumerary renal arteries may potentially reflect some common genes inherent to the susceptibility for CAD and renal vasculogenesis during fetal development. Such genetic associations remain to be identified.

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Posterior intercostal artery tortuosity and collateral branch points: a cadaveric study.

INTRODUCTION. Publications report observing tortuosity in the posterior intercostal arteries of elderly patients. Studies also describe the size and course of the collateral intercostal arteries. This information is clinically significant when performing thoracentesis and video-assisted thorascopic surgery. To the best of our knowledge, no studies have examined arterial tortuosity or described collateral artery origins relative to boney landmarks. The purpose of this study is to quantify posterior intercostal artery tortuosity in elderly individuals and describe the origins of the collateral intercostal arteries biometrically. METHODS. Three-hundred sixty intercostal spaces (3rd – 8th) of 30 male and female embalmed cadavers were dissected from the vertebral body to the mid-axillary line to observe the posterior intercostal artery and its collateral branch. The age of all cadavers was ≥ 60 years. The origins of the collateral intercostal arteries relative to the rib angle were measured. RESULTS. Mild to moderate tortuosity (arterial curves covering 25-50% of the intercostal space) was observed in at least one posterior intercostal artery in the majority of cadavers. The origins of the collateral intercostal arteries were variable relative to the rib angle: proximal, distal as well as multiple origin points were observed. CONCLUSIONS. Tortuosity is common in the third through eighth posterior intercostal arteries distal to the rib angle. The origin of the third through eighth collateral intercostal arteries is variable. Therefore pre-procedure angiography of the posterior and collateral intercostal arteries is advised when performing non-emergent thoracentesis and video-assisted thorascopic surgery, particularly in patients >60 years of age.

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Identifying the clinically relevant structures of the posterolateral-knee-unit using ultrasonography and cadaver dissection.

INTRODUCTION. The objective of this study was to investigate the clinical anatomy of the posterolateral-knee-unit (PLKU) using ultrasonography (USS), cadavers and healthy volunteers. Recently, increased clinical and research attention has been directed at the PLKU regarding its role in knee stability. MRI scan has been the medium of choice to view the PLKU structures. However, MRI has limitations due to artifacts occurring at the knee joint. USS has been shown to identify the structures that can be difficult to appreciate on MRI. PLKU structures are the biceps femoris, lateral head gastrocnemius muscle, fabellolateral and lateral collateral ligaments, popliteus muscle, arcuate and popliteofibular ligaments. METHODS. Literature search was conducted on texts, journals, and websites regarding anatomy and USS imaging of the PLKU. USS was performed on the PLKU of 50 healthy volunteers and 30 cadaver knees followed by deep
dissection. RESULTS. Literature search did not reveal any anatomy texts describing the PLKU as a collective group. However, specialty texts and journals describe the PLKU and its associated anatomy. USS revealed PLKU structures can be identified on healthy volunteers (50/50-100%) and cadavers (30/30-100%). Cadaver imaging had less resolution than live imaging. Dissection revealed the depth and orientation of the PLKU structures identified on USS. DISCUSSION. PLKU is a dynamic region receiving formal attention and establishing itself as an important stabilizer. Interpreting structures from USS of the PLKU requires thorough orientation of the anatomy, which can be achieved comparing USS with dissection. CONCLUSION. This study suggests comparing USS from cadavers with their dissection better prepares a trainee to interpret dynamic USS of the PLKU.

TELISKY, R. Ashley and Anthony OLINGER. Kansas City University of Medicine and Biosciences, Kansas City, MO 64106 USA. Unique variation of the axillary arch muscle discovered during dissection could explain neurologic symptoms in the living patient.

INTRODUCTION. Since its discovery in 1795, the axillary arch muscle (of Langer), an anomalous muscle with many variations located in the axilla, has been well documented in both living and cadaveric specimens with an incidence ranging from 0.25% - 37.5%. The presence of this anomaly has clinical implications including neurovascular impingement and interference during surgical procedures. METHODS. During a routine dissection of a 61 year old male cadaver, a unique version of the axillary arch muscle was discovered and documented. An interview with the relatives of the patient was performed to evaluate whether or not this anomaly expressed itself in the individual. RESULTS. The superior part of the axillary arch muscle was very similar to descriptions reported in previous studies. However, the inferior part of the axillary arch muscle, which was separated from the superior part by a tendinous band, was made up of fibers that curled laterally to insert onto the tendon of the latissimus dorsi immediately proximal to its insertion on the humerus. The interview with the patient’s relatives revealed symptoms associated with neurovascular compression on the side associated with this muscular variation. CONCLUSIONS. Our findings suggest that the deceased experienced symptoms due to the presence of a unique variation in the axillary arch muscle. The inferior portion of the muscle could have caused developmental or compensatory changes in the anatomy of the axilla, increased the pressure on neighboring neurovasculature, or decreased the area surrounding the neurovasculature, increasing the probability of experiencing symptoms. This anomaly should be considered in the differential diagnosis of neurovascular impingement and prior to surgical procedures involving the axilla.

TUNALI, Selcuk2,3, Mehmet A. UYSAL1, Guven METE4, Arzu AVCİ5, and Osman A. BORA1. 1Clinical of Orthopedics and Traumatology, Izmir Atatürk Education and Research Hospital, Izmir, Turkey. 2Department of Anatomy, Hacettepe University Faculty of Medicine, Ankara, Turkey. 3Department of Anatomy, Biochemistry and Physiology, University of Hawaii School of Medicine, Honolulu, HI. 4Clinic of Orthopedics and Traumatology, Ardahan Government Hospital, Ardahan, Turkey. 5Laboratory of Clinical Pathology, Izmir Atatürk Education and Research Hospital, Izmir, TURKEY. Multimodal imaging and investigation of vascular beds in amputated fingers.

INTRODUCTION. We investigated the vascular beds in total finger amputates with conventional angiography, 3-dimensional volume rendering and plastination methods, after introducing color latex-radio contrast mixture. Our objectives were: to determine the nature of the damage in the amputate; to provide durable amputate specimens and additional diagnostic data; to guide the microsurgical treatment. METHODS. Twenty-three total finger amputates that were not eligible for replantation were divided into three groups according the type of the injury as local...
crush, extended crush and avulsion. All amputates underwent conventional angiography, dissection and histological examination. After this step, eleven amputates were randomly selected for multislice computerized tomography imaging and 3-dimensional reconstruction, and four amputates for plastination. The damage and/or intactness of the vascular beds were evaluated via dissection and histological examination. Hand surgeons and interventional radiologists evaluated the specimens in a double-blind manner. Statistical analysis was performed. RESULTS. The kappa coefficient for the arterial flow was calculated as 0.862 in conventional angiography (p=0.001). There was an excellent consistency between our findings and that of the hand surgeon: accuracy: 95.7%, sensitivity: 100.0%, specificity: 80.0%, positive predictive value: 94.7% and negative predictive value: 80.0%. The kappa coefficient for the arterial flow was calculated as 0.744 in 3-dimensional volume rendering technique (p=0.001). Our findings were consistent again with that of the hand surgeon: accuracy: 90.9%, sensitivity: 88.9%, specificity: 100.0%, positive predictive value: 100.0% and negative predictive value: 100.0%. CONCLUSIONS. Multislice computerized tomography is advantageous as it is very fast and enables 3-dimensional reconstruction. However, 3-dimensional images must be evaluated along with the axial cross-sections; otherwise, the sensitivity and specificity would be less than that of the conventional angiography. Plastination may be used for determining the nature of the damage in amputates, and it provides durable specimens for the use in post-graduate education. In this study, the flow patency diagnoses of the hand surgeons and interventional radiologists were consistent in conventional angiography. Intravascular introduction of non-toxic radio contrast agents both to the amputate and stump during the replantation may provide additional imaging techniques, and may be useful during the follow up of the prognosis of the vascular bed after replantation.

WAGGENER, Joshua and Brion BENNINGER. 1Department of Surgery, 2Department of Orthopaedic Surgery and Rehabilitation, 3Department of Integrative Biosciences, 4Department of Oral Maxillofacial Surgery, Oregon Health & Science University, Portland, OR 97239 USA. An alternative pericardiocentesis approach: subxiphoid-right sternoclavicular joint during blind and ultrasound-guided techniques.

INTRODUCTION. The objective of this study was to develop an anatomy based alternative approach for pericardiocentesis (PC). First PC was reported in 1841 and in 1979 echocardiograph (ECHO) revolutionized the approach. Initially, PC was an emergency life-saving blind technique with serious side effects (SE). PC has evolved into acute and elective ultrasound-guided (USS-G) technique. Two classic approaches, subxiphoid and direct transthoracic exist. Unfortunately, ultrasound (USS) or ECHO is not always available. This study investigated an alternative approach, the subxiphoid-right sternoclavicular joint (SRSJ) to diminish serious side effects during blind or USS-G techniques. METHODS. A literature search was conducted on anatomy and specialty texts, journals and websites to analyze PC approaches. Anatomy associated with the SRSJ approach was analyzed with USS (30), ECHO (30), magnetic resonance imaging (MRI) (30) and cadaveric dissections (16). RESULTS. Literature search revealed inadequate or no anatomical description of PC in clinical anatomy textbooks; however, the technique was described in specialty texts, journals and websites. Two approaches were consistently described. No previous study was found on the alternative SRSJ approach. USS, ECHO, MRI, and dissections all (100%) revealed the pericardial space can be obtained from the SRSJ approach. The first structure beyond the pericardial space (PS) was the right auricle. DISCUSSION. PC is performed commonly as an elective procedure. The most serious SE is puncturing the left ventricle especially when pathologically enlarged. CONCLUSION. This study suggests an alternative approach for blind and USS-G PC gaining access to the PS while possibly decreasing serious SE’s.
WANAT III, Thomas and Brion BENNINGER. 1,2,3,4, 1Department of Oral Maxillofacial Surgery, 2Department of Surgery, 3Department of Integrative Biosciences, 4Department of Orthopaedic Surgery & Rehabilitation, Oregon Health & Science University, Portland, OR 97239 USA.

Integrating head and neck anatomy with a live modified cranial nerve examination as an exiting requirement.

INTRODUCTION. The objective of this study was to investigate teaching of cranial nerves to students by addressing the didactic, cadaver dissection, radiology and clinical examination of the cranial nerves which must be passed in order to complete head and neck anatomy. Currently, cranial nerves are taught didactically and dissected in the lab during anatomy courses. Few courses will include radiological mediums highlighting the cranial nerves. The clinical examination of cranial nerves is taught later in the students’ curriculum. This study integrates the basic and clinical sciences of the cranial nerves for future healthcare professionals. METHODS. Literature search was conducted on texts, journals and websites regarding cranial nerve examinations conducted during head and neck anatomy courses. Students were asked survey questions based on the integration of cranial nerve examination with head and neck anatomy: ie, 1) was anatomy more interesting? 2) was cranial nerve examination training useful? RESULTS. Literature search revealed no studies on the integration and examination of cranial nerves during a head and neck anatomy course. Survey revealed that students found anatomy more interesting and were pleased they learned and conducted a cranial nerve examination during their anatomy course. DISCUSSION. Cranial nerve examination is generally taught and examined later in the students’ curriculum after the completion of anatomy. Students complained that there was too long of a gap between anatomy and the clinical examination of the cranial nerves. This study facilitated the integration of cranial nerves by lectures, lab dissection, videos and live examinations. CONCLUSION. This study suggests that cranial nerve examination could be taught during anatomy.

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Branching patterns of the common peroneal nerve: Literature review and cadaveric study.

INTRODUCTION. The common peroneal nerve (CPN) descends laterally along the popliteal fossa to the fibular head, passes through the peroneal tunnel, and divides into the deep peroneal, superficial peroneal, and recurrent genicular nerves. Damage to the CPN is common and can result in significant sensory loss and foot drop. Operative treatment is often recommended; however, outcomes of these interventions are inconsistent and unsatisfactory due to variability in the anatomy of the CPN and its branches at the level of the joint line and around the peroneal tunnel. In this study, we complemented a thorough review of the literature on the anatomy of the CPN with a rigorous cadaveric research protocol. METHODS. 120 cadaveric specimens were dissected. The following variables were evaluated for each specimen: patient demographics (age, gender, height, weight, ethnicity); length and width of the fibular head; fibular length; thickness, length, and width of the tendon making up the peroneal tunnel; and distances of CPN branch points from the joint line and tip of the fibula. RESULTS. A unique cross section and grid analysis of the common peroneal nerve branches has been constructed. Data gleaned from our study provides a unique perspective of the CPN branching patterns and the nerve branch points identified with respect to the joint line and tip of the fibula. CONCLUSIONS. The large sample size and rigorous measurement of parameters in this study are a contribution to and consolidation of the literature concerning the anatomy of the CPN and the peroneal tunnel. These findings have implied benefits regarding anatomic education, successful completion of surgical procedures, trigger point injections, regional anesthesia, and physical therapy regimens.
INTRODUCTION. Venous blood from the Gastrointestinal (GI) tract drains into the Hepatic Portal Vein and into the liver. The foregut is drained by various veins, and the spleen is drained by the Splenic Vein into the Hepatic Portal Vein. The midgut is drained by the Superior Mesenteric Vein, and the hindgut is drained by the Inferior Mesenteric Vein, both eventually draining into the Liver. Consistently, the Superior Mesenteric Vein and the Splenic Vein combine to form the Hepatic Portal Vein. The Inferior Mesenteric Vein is typically described as being variable but most commonly draining into the Splenic vein. The purpose of this study was to determine the frequency of the variations of the draining pattern of the Inferior Mesenteric Vein - which has not been previously described. METHODS. 90 observations of the drainage pattern of the Inferior Mesenteric Vein were provided by 5 different medical school classes during the course of dissection in Gross Anatomy. RESULTS. The observations describe the Inferior Mesenteric vein draining into the Splenic Vein in 38.9% (35 of 90) of individuals, into the Superior Mesenteric Vein in 37.8% (34/90), and into the junction of the Superior Mesenteric and Splenic Veins in 22.2% (20/90). In one case, the Inferior Mesenteric Vein draining directly into the Hepatic Portal Vein (1 out of 90). In another observation, a pair of Inferior Mesenteric Veins are observed both draining into the Splenic Vein (1 out of 90). CONCLUSION. Awareness of variations in this pattern of veins is useful information for anatomists and physicians.

INTRODUCTION. 3rd and 4th-year medical students can register for an elective rotation as a Teaching Assistant (TA) in first year medical Gross Anatomy, as an excellent review method. A common assumption is only medical students preparing for specific specialties find it valuable to be a TA in Gross Anatomy. METHODS. 125 former TAs over the last 11 yrs were correlated with their subsequent residency. The distribution/frequency of these TAs was compared to the overall residency placement of the class. RESULTS. With few exceptions, the distribution/frequency of residencies of the TAs was not different than that of all medical students. For example, residency placement was similar for Anesthesiology (5%), Emergency Med (8%), Internal Med (19%), and Ob/Gyn (6%). In addition, frequency of TAs was higher than the overall students in Orthopedic surgery (14 vs 4%, P<0.05, N=17), Radiology (11 vs 5%,P<0.0001, N=14), and Surgery (13 vs 8%, P<0.0001, N=17). To examine other factors, correlations were made with exam score performance from when they had taken the Gross Anatomy course. Scores were separated into quartiles. Analysis suggests that TAs performed extremely well in the course (mean scores by quartile: 94 %, N=41; 87%, N=70; 79%, N=26, and 71%, N=6, respectively - highest to lowest). Exam data also show that the highest scores in Gross Anatomy matched to residency specialties in Otolaryngology, Ophthalmology, Surgery, Orthopedic surgery, Internal Med, Emergency Med, Pediatrics, Urology (mean scores of 91% and similar), with significant differences in Ob/Gyn, Family Med, deferment, and Anesthesiology (mean scores of 81.9% and similar, P<0.05, N = 30). CONCLUSIONS. With few exceptions, medical students preparing for all specialties consider being a TA valuable preparation.
INTRODUCTION. Fifty first year Touro University COM (CA) students witnessed heart surgery (coronary bypass and/or valve surgery) and completed entry and exit surveys. METHODS. Questions covered anatomy and surgery (20 questions) and related material (13 additional questions.) All entry quizzes were taken immediately after thoracic anatomy lectures and labs. Exit surveys were completed at the end of each operation. RESULTS. The main reason given for wanting to see heart surgery was “possible career choice.” Only 4 of the 50 students had seen cardiac surgery before. All students (100%) rated the experience as excellent. Ninety-eight percent considered that observing heart surgery made the learning of anatomy “very much” more relevant, and 76% indicated that their knowledge of thoracic anatomy had improved “a lot,” compared with 24% stating “a little” and 1 student “not at all.” Anatomical question scores averaged 61% in the entry quiz, increasing to 66% in the exit quiz. Surgical knowledge, however, showed a marked improvement from 42% on entry to 85% on exit. Eighty-eight percent of students recorded their interest in heart disease had increased “a lot,” compared with 20% stating “a little” and 1 student “not at all.” Anatomical question scores averaged 61% in the entry quiz, increasing to 66% in the exit quiz. Surgical knowledge, however, showed a marked improvement from 42% on entry to 85% on exit. Eighty-eight percent of students recorded their interest in heart disease had increased “a lot,” compared with 24% stating “a little” and 1 student “not at all.” Anatomical question scores averaged 61% in the entry quiz, increasing to 66% in the exit quiz. Surgical knowledge, however, showed a marked improvement from 42% on entry to 85% on exit. 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YOUNG, Matt\textsuperscript{2} and Brion BENNINGER\textsuperscript{1,2,3,4}. \textsuperscript{1}Department of Oral Maxillofacial Surgery, \textsuperscript{2}Department of Integrative Biosciences, \textsuperscript{3}Department of Surgery, \textsuperscript{4}Department of Orthopaedic Surgery and Rehabilitation, Oregon Health and Science University, Portland, OR 97239, USA. Can the long buccal nerve be identified intraorally using ultrasonography: its evolution into clinical relevance?

INTRODUCTION. The objective of this study was to assess whether the long buccal nerve (LBN) can be identified using ultrasonography (USS) intraorally and determine the pathway of the LBN using MRI, CT and cadaver dissection. Implant surgery has led to increased incidence of injury to the LBN. LBN innervates both the mucosa and dermis of the cheek making it extraordinary. Anatomy of the LBN pathway regarding the retromolar triangle (RMT) may reveal why injury has increased. METHODS. Literature search was conducted on texts, journals and websites for the pathway of the LBN regarding the RMT. Dissection of 30 cadavers (60 sides) assessed the LBN pathway. USS of 150 sides was performed and analyzed on healthy volunteers. MRI and CT scans were analyzed to identify relationships between the LBN and the RMT. RESULTS. Literature search revealed no reported relationships between the LBN and the RMT. Dissections revealed two common patterns of the LBN; anterior inferior/low takeoff (36%), posterior superior/high takeoff (64%). Intraoral USS revealed the LBN can be identified. LBN was not easily identified on MRI and CT, however the landmarks of the RMT were identified. DISCUSSION. Implant surgery is the current practice for extracted molars. Previous treatment was to use crowning procedures. LBN path regarding the anterior ramus and the RMT is inadequately described and depicted. Dissections and USS and revealed a pattern of the LBN, which could be divided into two classifications: LBN1-high and LBN2-low. This is the first study to suggest intraoral USS to identify the LBN. CONCLUSION. This study suggests the LBN has two common morphological patterns associated with the RMT and can be identified with intraoral USS prior to surgery.