

AMERICAN ASSOCIATION OF CLINICAL ANATOMISTS



**The object of this Association shall be to advance the science and art of
Clinical Anatomy, to encourage research and publication in the field
and to maintain high standards in the teaching of Anatomy**

AMERICAN ASSOCIATION OF CLINICAL ANATOMISTS



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CLINICAL ANATOMY

**Official Journal of the
American Association of Clinical Anatomists and the
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THURSDAY JUNE 11, 1998

ANNUAL BANQUET

Presentation of Honored Member Award

to

John E. Skandalakis, M.D., Ph.D., F.A.C.S.

**Spindletop Hall
Lexington, Kentucky**

6:30 pm Cash Bar

7:00 Dinner and Entertainment

8:00-9:30 Annual Banquet,

Presentation of Honored Member Award to:

John E. Skandlakis, M.D. Ph.D. F.A.C.S.

The \$150 registration fee paid by members includes the cost of the Scientific Program and the Banquet. The spouse or guest of the registrant is welcome to attend the banquet, \$30.00,

Honored Member 1998

John Skandalakis, M.D. Ph.D., F.A.C.S.

Surgeon * Anatomist * Embryologist * Scholar * Educator

For his distinguished career and legacy epitomizing clinically-applied anatomy,
and in appreciation of his role as a Founder of the AACA.



Previously Honored Members:

W. Henry Hollinshead, 1984
Chester B. McVay, 1985
Donald James Gray, 1986
Russell T. Woodburne, 1987
Oliver Beahrs, 1988
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Ralph Ger, 1991
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Robert A. Chase 1996
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SPONSORS/COMMERCIAL EXHIBITORS

Generous donations and/or commercial exhibitor fees paid by the following companies and organisations have substantially reduced the Association's expenses in presenting this meeting. You are encouraged to visit the exhibits available for viewing in the Patterson Ballroom D. Please refer to your registration packet for an up-to-date listing, including sponsors who have registered after the date of this printing.

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(A Waverly Company)**

Tuesday, June 9, 1998

PRELIMINARY EVENTS

All Tuesday events at the Hyatt Regency Hotel: Check events board to confirm meeting rooms

- 8:00 a.m. **Journal Committee – Chicago Room**
(for Committee members)
- 9:00- 5:00 p.m. **Executive Council Meeting - Atlanta room**
(for AACA Officers and Councilors.
- 1:00 p.m. **Young Anatomist Event: “Anatomy As A Living Discipline:
Developing A Successful Career In Anatomy”**
Regency Ballroom East
- 3:00 p.m. **Set up - Commercial Exhibits – Patterson Ballroom D**
Posters - Patterson Ballroom F & G
- 5:00 p.m. **Young Anatomist Event, Socializer**
(for Event Attendees, Mentors and new members (<5 yrs)
- 5:30 p.m. **Registration and Check-in.**
Foyer by Regency Ballroom, Lobby Level
- 6:00-8:00 p.m. **Welcome Reception - (cash bar)**
(for all meeting attendees and their accompanying persons)
Regency Ballroom West

Wednesday, June 10, 1998

Scientific Program*

**This activity has been planned and implemented in accordance with the Essentials and Standards of the Accreditation Council for Continuing Medical Education through the joint sponsorship of the University of Kentucky College of Medicine and the American Association of Clinical Anatomists. The University of Kentucky College of Medicine is accredited by the AACME to provide continuing medical education for physicians.*

The University of Kentucky Office of Continuing Medical Education designates this educational activity for a maximum of eleven and one half (11.5) hours in Category 1 credit toward the AMA Physician's Recognition Award. Each physician should claim only those hours of credit actually spent in the educational activity.

All Events at the Hyatt Regency Hotel

Scientific Platform Sessions - Patterson Ballroom B & C

**Continental Breakfast - Commercial Exhibits
Patterson Ballroom D**

Posters - Patterson Ballroom F & G

**7:00- 8:00 am Editorial Board Breakfast Meeting --
for Editors and Associate Editors -- of *CLINICAL ANATOMY*
hosted by John Wiley & Sons, Inc.**

**8:00 Registration and
Continental Breakfast -Commercial Exhibits
Patterson Ballroom D
Posters - Patterson Ballroom F & G**

**8:30 Opening Ceremonies/Remarks: Art Dalley Ph.D., President
AACA, James W. Holsinger, JR., M.D., Ph.D., Chancellor, UK
Chandler Medical Center, Don M. Gash, Ph.D., Chair,
Department of Anatomy and Neurobiology**

**Announcements: Brian MacPherson Ph.D. and David
PeckPh.D.. Local Hosts**

Wednesday, June 10, 1998

Platform Session I: Abdomen

Moderator: Todd Olson, Ph.D.

- 9:00 Use of the rectus abdominis muscle to produce a continent stoma: a feasibility study. BARDOEL*, Janou, Wayne K. STADELMAN*, John H BARKER, Gordon R. TOBIN . Division of Plastic and Reconstructive Surgery, University of Louisville, Louisville, KY., (Sponsored by R. D. ACLAND)
- 9:15 Advanced laparoscopy of the retroperitoneum and spleen: new anatomic perspectives. PARK*, Adrian. Department of Surgery, University of Kentucky, Lexington, KY (sponsored by J. Holsinger).
- 9:30 Video demonstration of the lymphatics and the autonomic nerves of the pancreas head. SATO*, Tatsuo, Hirokazu SAKAMOTO*, Sadao TAKAHASHI*, Sadaaki HEIMA*, Yoko TSUBOI*, and Keiichi AKITA*. Department of Anatomy, School of Medicine, Tokyo Medical and Dental University, Tokyo, Japan.
- 9:45 Left and right renal veins : comparative study and clinical significance. SATYAPAL, Kapil S. Department of Anatomy, University of Durban-Westville, Durban, South Africa.
- 10:00 Hepatic surgery and hepatic surgical anatomy: historical partners in progress. SKANDALAKIS, John. Centers for Surgical Anatomy and Technique, Emory University, School of Medicine, Atlanta, GA.
- 10:15 Investigation of the inferior epigastric vessels for application in reconstructive surgery. Part I: anatomy. VOPPICHLER*, Michelle D., Bernhard F. MORIGGL. Institute of Anatomy, University of Innsbruck, Austria.
- 10:30 ***Refreshment Break***
Commercial Exhibits
Patterson Ballroom D
Posters - Patterson Ballroom F & G

Wednesday, June 10, 1998

POSTER SESSION I: All posters listed below will be on display throughout Wednesday, 7:30 am – 4:30 pm Adjournment. Authors should staff their posters during poster display periods

Lateromedial and dorsoventral loops between the nerves innervating the intrinsic muscles of the foot with special reference to the innervation of the adductor hallucis. AKITA*, Keiichi, Hirokazu SAKAMOTO*, and Tatsuo SATO. Department of Anatomy, School of Medicine, Tokyo Medical and Dental University, Tokyo, Japan.

Physical therapy human anatomy at the University of Maryland. ANDERSON, Paul A. Department of Physical Therapy, University of Maryland (UMB), School Medicine, Baltimore, MD.

Annual symposium on cranial nerves: Having fun with neuroanatomy. CULBERSON*, James. L. Department of Anatomy, West Virginia University Health Sciences Center, Morgantown, WV (sponsored by D.O. GRANEY).

A historic perspective on reconstructive modeling of anatomical forms. DISCHER, William. Human Developmental Anatomy Center at the National Museum of Health and Medicine of the Armed Forces Institute of Pathology, Washington D.C. (sponsored by A Noe).

Plastination, preservation of biological specimens for the 21st century. HENRY, Robert W., Department of Animal Science, College of Veterinary Medicine, University of Tennessee, Knoxville, TN.

Liver and spleen injuries in simulated accident tests using human unembalmed cadavers. HINES, Margaret H., Sorin M. FLOREA*. Department of Cell Biology, Neurobiology and Anatomy, Ohio State University, Columbus, OH.

Revascularization after traumatic ear amputation. HÜBNER, K. U., R. Burger, K. ÖHLER, and T. SCHÖLLER, Institute for Anatomy, Department of Plastic and Reconstructive Surgery, University of Innsbruck, Innsbruck, Austria.

Wednesday, June 10, 1998

POSTER SESSION I: (Continued)

The anatomical texts of the Harvey-Servetus Collection. HOLSINGER, James W., JR., Janet STITH*, and James D. BIRCHFIELD*. Department of Anatomy and Neurobiology and the Medical Center Library, Chandler Medical Center, University of Kentucky, Lexington, KY.

Nerve blocks: (A collaborative teaching approach. JENKINS, David B. and Curtis HIGH*. Sections of Anatomy and Oral and Maxillofacial Surgery (OMS), Southern Illinois University School of Dental Medicine, Alton, IL.

The distribution of TMJ disc perforations in an aging human population. JERGENSON, Margaret A. and John M. BARTON*. Department of Oral Biology, Creighton University School of Dentistry, Omaha, NE.

Computer administration of a "written" examination in medical gross anatomy: a pilot study. JOHNSON, James H., Hugo R. SEIBEL*, Dean X. PARMELEE*, Brenda L. SEAGO*, and Chris L. STEPHENS*, Virginia Commonwealth University School of Medicine, Richmond, VA

Nomenclature of the internal carotid artery: anatomical and clinical considerations. KELLER*, Jeffrey T., Ned E. WEINER*, Michael R. CHICOINE*, and Harry VAN LOVEREN*. Department of Neurosurgery, University of Cincinnati, College of Medicine, Cincinnati, OH (sponsored by Richard L. Drake)

Analysis of the attachment of the lateral pterygoid muscle in the temporomandibular joint using 3D digitizing morphometrics. KIELY, Michael, Adam WILDING*, Nathaniel TUCK*, Jason SCHLIESSER*, Pritesh PATEL*, Joel WEISBERG*, Robert BECK* and Ram GUDAVALLI*. Department of Anatomy, The National College of Chiropractic, Lombard, IL.

Cytoarchitecture of the motor cortex in long term diabetic mice. KLUEBER, Kathleen M. and Paul D. BENSON*. Department of Anatomical Sciences and Neurobiology, University of Louisville School of Medicine, Louisville, KY.

Kinking and Coiling, case reports of the dissecting course. KREYER*, Ruth, Sepp POISEL, and Wolfgang DORINGER*. Institute for Anatomy, University of Innsbruck and Department of Radiology, Feldkirch, Austria (sponsored by S. Poisel).

Wednesday, June 10, 1998

POSTER SESSION I: (Continued)

Introduction of Magnetic Resonance Images into the Neuroanatomy Laboratory. LAMPERTI, Albert and Marvin SODICOFF*. Department of Anatomy & Cell Biology, Temple University School of Medicine, Philadelphia, PA.

Anatomical study of the anterior communicating artery. LEBONA, Gregory T., and Benson OKOLI*, Departments of Human Anatomy and Neurosurgery, Medical University of Southern Africa, Medunsa, South Africa.

Donor program survey: preliminary results. LILES*, Kristin L. and Lawrence M. ROSS. Department of Anatomy, Michigan State University, East Lansing, MI.

Applying texture maps for rendering three-dimensional anatomical reconstructions. LOZANOFF, Scott, David MOODY*, and Beth K. LOZANOFF*. Departments of Anatomy and of Surgery, University of Hawaii School of Medicine, Honolulu, HI, and Division of Computing and Network Services, University of Alberta, Edmonton, AB.

Anomalies and variations of the extrinsic ocular muscles. LUDINGHAUSEN, M. v. and M. MIURA* First Department of Anatomy, University of Wurzburg, Wurzburg, Germany

Multiple congenital defects in a stillborn fetus from a mother known to consume large volumes of alcohol during pregnancy. NAGY, Frank, Jane N. SCOTT*, Dan NOLAN*, and Kim WARREN*. Department of Anatomy, Department of Obstetrics and Gynecology, and Clinical Research Center, Wright State University School of Medicine, Miami Valley Hospital and Grandview Hospital, Dayton, OH.

Using QuickTime VR in computer-assisted instruction of gross anatomy: Yorick the VR Skull. NIEDER*, Gary L., and Jane N. SCOTT*. Department of Anatomy, Wright State University School of Medicine, Dayton, OH (sponsored by Frank NAGY).

Wednesday, June 10, 1998

11:15 Presidential Presentation: Magnetic resonance microscopic anatomy of the human embryo, Bradley R. Smith, Ph.D., Center for In Vivo Microradiology, Duke University Medical Center

**12:00 Lunch (on your own)
Rupp Arena Food Court, Victoria Square, etc.**

**Commercial Exhibits -Patterson Ballroom D
Posters – Patterson Ballroom F & G**

Platform Session II: Thorax

Moderator: Anne M. R. Agur, M.Sc.

1:15 Endothelin antagonism but not nitric oxide-administration attenuates pulmonary hypertension in a rat model. Molecular and morphological aspects. AHARINEJAD, Seyedhossein, and Wilhelm FIRBAS. First Dept. of Anatomy, University of Vienna, Vienna, Austria.

1:30 Mechanisms of rib injury caused by surgical rib spreaders. HUBBELL, David S., Julian J. DWORNIK, and Lary A. ROBINSON*. University of South Florida College of Medicine, Departments of Anatomy and Surgery, Tampa, Fl.

1:45 The inframammary fold: a histological appraisal. MUNTAN*, Charles D., Michael J. SUNDINE*, Richard D. RINK*, Division of Plastic and Reconstructive Surgery, University of Louisville, Louisville, KY. (sponsored by R.D.ACLAND).

2:00 Surface anatomy concepts form basis of minimally invasive cardiac surgery. ROBINSON, Clive M*.,and Joao MOTA*., University of Kentucky Medical Center, Section of Cardiothoracic Surgery, Lexington, KY (sponsored by J. HOLSINGER).

2:15 The surface projection of intercostal nerves on the skin of the abdominal wall for harvest of musculocutaneous flaps. KYALYAN*, Gohar P., Anahit L. ZARGARYAN*. Department of Normal Anatomy; Yerevan State Medical University, Yerevan, Republic of Armenia (sponsored by D. O. GRANNEY).

Wednesday, June 10, 1998

2:30

Refreshment Break
Commercial Exhibits -Patterson Ballroom D
Posters – Patterson Ballroom F & G

Platform Session III: Spine

Moderator: Thomas H. Quinn, Ph.D.

- 3:15** Radiodiagnosis of cervical spine diseases based on radio-anatomical details of the atlas. WEIGLEIN, Andreas H. and Heinz SCHMIDBERGER*. Anatomical Institute and Department of Radiology*, Karl-Franzens-University Graz, Austria.
- 3:30** Transverse, oblique, and wedge fracture patterns: variations on the bending theme. PORTA, David J.^{1,2}, Stephen J. FRICK², Tyler A. KRESS³, and Peter M. FULLER². ¹ Department of Biology , Bellarmine College, Louisville, KY. ² Department of Anatomical Sciences and Neurobiology, University of Louisville School of Medicine, Louisville, KY. ³ Engineering Institute for Trauma and Injury Prevention, University of Tennessee, Knoxville, TN.
- 3:45** Some complexities of vertebral cancellous bone as revealed by the combination of Fourier and multivariate morphometric analyses. OXNARD*, Charles, and Alanah BUCK*. Department of Anatomy and Human Biology, University of Western Australia, Nedlands, WA. Australia. (sponsored by D. O. GRANNEY).
- 4:00** Racial differences of internal thoracic artery morphometry: significance in coronary artery bypass grafting. LACHMAN*, Nirusha, Ebrahim A. VANKER* and Kapil S. SATYAPAL. Department of Human Biology, Technikon Natal and Department of Anatomy, University of Durban-Westville, Durban, South Africa.

4:15 pm

Adjournment

Thursday, June 11, 1998

**7:30 a.m. Registration and Continental Breakfast
Commercial Exhibits - Patterson Ballroom D**

Posters - Patterson Ballroom F & G

Platform Session IV: Lower Limb

Moderator: Lawrence Ross, M.D, Ph.D.

- 8:30** The human soleus muscle: A dynamic 3D model. AGUR, Anne, Kevin BALL*, Victor NG*, Roger LEEKAM*, Eugene FIUME* and Nancy MCKEE*, Departments of Anatomy and Cell Biology, Surgery, Medical Imaging and Computer Science, University of Toronto, Toronto, ON.
- 8:45** Arterial blood supply of the femoral trochanters in connection with their osteolysis after total hip replacement. FEIGL Georg*, Reinhard JESSERSCHEK* and Roman RADL*, Anatomical Institute, Karl-Franzens-University Graz and Department of Orthopedics , LKH- Graz, Austria, (sponsored by Andreas H. Weiglein).
- 9:00** The bifurcation of the dorsal metatarsal arteries in relation to transmetatarsal amputations of the toes. GER, Ralph, and Todd. R. OLSON. Department of Anatomy, Albert Einstein College of Medicine, NY and Department of Surgery, Nassau County Medical Center, East Meadow, NY.
- 9:15** Anatomic study on the (extrapelvic) inferior gluteal artery (IGA) and sciatic nerve (SN): basics for and first experience with ultrasound evaluation. MORIGGL, Bernhard F., Erich R. A. BRENNER, and Florian N. STADLER, Peter KOVACS. Institute of Anatomy, University of Innsbruck, Innsbruck, Austria.
- 9:30** The importance of the vascularization of the femur for the transplantation of vascularized femoral diaphyseal allografts. HENNERBICHLER Alfred, Martin H. KIRSCHNER*, Ralph BURGER, Gunther O. HOFMANN*, and Othmar GABER. Institute of Anatomy, University of Innsbruck, Innsbruck, Austria and Department of Surgery, Klinikum Grosshadern, Ludwig-Maximilians-University Munich, Munich, Germany and Trauma Center Murnau, Murnau/Staffelsee, Germany.

Thursday, June 11, 1998

9:45

Refreshment Break
Commercial Exhibits - Patterson Ballroom D
Posters - Patterson Ballroom F & G

POSTER SESSION II: All posters listed below will be on display throughout Thursday, 7:30 am – 4:30 pm Adjournment. Authors should staff their posters during poster display periods

Lack of neuroprotection by NBQX in thioacetamide-induced fulminant hepatic encephalopathy in the rat. NORTON, Neil S., James R. McCONNELL*, Manuchair EBADI*, and Jorge F. RODRIGUEZ-SIERRA*. Department of Oral Biology, Creighton University School of Dentistry, and Departments of Radiology, Pharmacology, and Anatomy, University of Nebraska Medical Center, Omaha, NE.

Comparative effectiveness of a computer-based laboratory exercise versus a microscope-based laboratory exercise in helping students learn to identify developing blood cells found in bone marrow. OXBERRY, Brett A. and Marvin SODICOFF*. Department of Anatomy and Cell Biology, Temple University School of Medicine, Philadelphia, PA.

Resolving discrepancies in image research: The importance of direct observation in the illustration of the human soleus muscle. OXORN, Valerie*, AGUR, Anne, and Nancy MCKEE*, Departments of Anatomy and Cell Biology, Surgery, and Biomedical Communications, University of Toronto, Toronto, ON.

Lumbar anterolateral spinal arteries and other "accessory" longitudinal arteries of the spinal cord. PARKE, Wesley W., Harry E. SETTLES, Paul C. BUNGER, and Suleman SAID*. Department of Anatomy and Structural Biology, University of South Dakota School of Medicine, Vermillion, SD.

The subclavian steal syndrome: an appraisal. PEDALINO*, Ron, Essy WHITERU*, Mohd, MOINUDDIN*, and Mak KHAN. State University of New York, Departments of Medicine & Anatomy; HSCB, Brooklyn, NY; Baptist Memorial Hospital, University of Tennessee, Memphis, TN.

Thursday, June 11, 1998

POSTER SESSION II: (Continued)

Clinical case discussions in anatomy: Who are the best facilitators? PERCAC, Sanja. Department of Anatomy, University of Zagreb School of Medicine, Zagreb, Croatia.

The use of touch screen in anatomy computer-assisted instruction programs. PHAM*¹ Gia Liem and Dzung H. VU ². ¹Eurokios, Paris, France, ²School of Anatomy, University of New South Wales, Sydney, Australia

The fine points of spiral fractures. PORTA, David J.^{1,2}, Stephen J. FRICK², Tyler A. KRESS³, and Peter M. FULLER². ¹Department of Biology, Bellarmine College, Louisville, KY. ²Department of Anatomical Sciences and Neurobiology, University of Louisville School of Medicine, Louisville, KY. ³Engineering Institute for Trauma and Injury Prevention, University of Tennessee, Knoxville, TN.

Age-related changes of the collagen and elastic fibers of the corpora cavernosa in men. RODRIGUES, C. J., M.C. SHIH*, and A. J. RODRIGUES, JR. Department of Surgery, Faculty of Medicine, University of Sao Paulo, Sao Paulo, SP, Brazil.

Purpose to histomophometric evaluation of pulmonary hipertension. RODRIGUES, C. J., U. TANNURI*, A. C. TANNURI*, L. T FIGUEIRA*,. and A. J. RODRIGUES, JR. Department of Surgery, Faculty of Medicine, University of Sao Paulo, Sao Paulo, SP, Brazil.

Anatomical study of venous architecture at the space of Bogros by pre-peritoneal approach. RODRIGUES, A.J. Jr., C.J. RODRIGUES, , R. TERRA*, and C. POPLER*, Department of Surgery, Faculty of Medicine, University of Sao Paulo. Sao Paulo, SP, Brazil.

Migraine complicated by brachial plexopathy as displayed by MRI and MRA. SAXTON*, Ernestina H., James D. COLLINS, Anthony DISHER* and Theodore Q. MILLER*. UCLA School of Medicine, Departments of Radiological Sciences and Neurology, Los Angeles, CA.

Thursday, June 11, 1998

POSTER SESSION II: (Continued)

Evolution of gross anatomy into human structure: a new design for old content.

SCOTT, Jane N*. , Frank NAGY, and Gary L. NIEDER. Department of Anatomy, Wright State University, School of Medicine, Dayton, OH (sponsored by F. NAGY).

An anatomical study of the muscles innervated by the masseteric nerve.

SHIMOKAWA, Takashi*, Keiichi AKITA*, Kunimichi SOMA*, and Tatsuo SATO. First Department of Orthodontics, Department of Anatomy, Tokyo Medical and Dental University, Tokyo, Japan.

Variation of infrarenal aortic diameter. A necropsy study. SILVA* E. S., A. J.

RODRIGUES, JR, C. J. RODRIGUES ,E. M. C. TOLOSA*, and A. ZANOTO*. Department of Surgery, Faculty of Medicine, University of Sao Paulo, Sao Paulo, SP, Brazil.

Anatomical basis of partial resection of the head of the pancreas. TAKAHASHI*,

Sadao, Keiichi AKITA*, and Tatsuo SATO, Department of Anatomy, School of Medicine, Tokyo Medical and Dental University, Tokyo, Japan.

Female rhabdosphincter – morphology, innervation, blood supply and clinical

relevance. TOEROEK*, Robert, Sepp POISEL, Reinhard WISSER*, and Karl COLLESELLI*. University of Innsbruck, Institute of Anatomy and Department of Urology, Innsbruck, Austria (sponsored by S. POISEL).

Development of 3D virtual anatomy image resources for use in multimedia

education programs distributed by the World Wide Web. TRELEASE, Robert B., JR. Department of Pathology and Laboratory Medicine, UCLA School of Medicine, Los Angeles, CA.

Ultrasonographic imaging of the coracoclavicular ligament. VU, Thao P.*1,

Manh H. VU*2, Dzung H. VU¹. School of Anatomy, University of New South Wales, Sydney, Australia 2. Citi Centre X-Ray and Ultrasound, Peterborough, Ontario, Canada. .

Thursday, June 11, 1998

POSTER SESSION II: (Continued)

Identification of an anomalous accessory flexor digiti minimi profundus muscle. WAHBA*, Mark Y., Gurdev D. SINGH, and Scott LOZANOFF. Department of Anatomy and Cell Biology, College of Medicine, University of Saskatchewan, Saskatoon, SK, Department of Dental Surgery, School of Dentistry, University of Dundee, Scotland, UK, and Departments of Anatomy and Surgery, University of Hawaii School of Medicine, Honolulu, HI.

Narrative: a teaching tool for reflection in the gross anatomy laboratory. ZARDETTO-SMITH, Andrea M. and Gail M. Jensen*, Department of Physical Therapy, Creighton University School of Pharmacy and Allied Health, Omaha, NE.

Platform Session V: Head and Neck and Upper Limb

Moderator: David Peck, Ph.D.

10:30 Left or right access for successful central venous catheterization.- the anatomical answer – a preliminary study. BOON*, Johannes M., Penelope A. RICHARDS*, Johannes BAUMBACH*^o, Leoni SCHOLTZ*_. Department of Anatomy University of Pretoria, Pretoria, South Africa. ^oAerotek CSIR (Counsel for Scientific and Industrial Research). _Dr L Scholtz & Partners Diagnostic Radiologists (sponsored by J. H. MEIRING).

10:45 Comparisons of current forehead lift techniques used in aesthetic surgery: a cadaver study. COOPER, Margaret H., Paul S. NASSIF*, Mimi S. KOKOSKA*, and J. Regan THOMAS*. Departments of Anatomy-Neurobiology and Otolaryngology and Head and Neck Surgery, Saint Louis University School of Medicine, St. Louis, MO.

11:00 Obstetric brachial palsy or brachial plexus palsy as displayed by MRI. COLLINS, James D., Theodore Q. MILLER*, and Ernestina H. SAXTON, UCLA School of Medicine, Los Angeles, CA.

11:15 The arterial supply of the inferior angle of the scapula: a microdissection study. BAS*, Heidi, Valentin.I. SHAROBARO*, Michael.B. SUNDINE*,

John H. BARKER, Gordon. R. TOBIN Division of Plastic and Reconstructive Surgery, University of Louisville, Louisville, KY (sponsored by R. D. ACLAND)

Thursday, June 11, 1998

11:30 The clinical importance and variance of the coracoclavicular ligament – a detailed anatomical and biomechanical study. HARRIS*¹, Richard I., Dzung H. VU¹, Andrew L. WALLACE*², Jerome A. GOLDBERG*², David H. SONNABEND*², and William R. WALSH*² ¹ School of Anatomy & ²Orthopedic Research Laboratories, University of New South Wales, Sydney, NSW, Australia.

11:45 Morphology and morphometry of the styloid process of the radius. PIETRASIK, K.(1), Beata LAKOMIEC*(2), Marek MOLSKI*(3), and Bogdan CISZEK(1), (1) Department of Anatomy, University Medical School of Warsaw; (2) Department of MRI Analysis, Brodno Hospital, Warsaw; (3) Department of Plastic Surgery, Medical Center of Postgraduate Education, Orłowski Hospital, Warsaw, Poland.

12:00 **Lunch (on your own)**

Rupp Arena Food Court, Victoria Square, etc.

**Commercial Exhibits -Patterson Ballroom D
Posters – Patterson Ballroom F & G**

1:30 **Annual AACA Business Meeting**
(for AACA members, including new members)
Patterson Ballroom B & C

Educational Affairs Symposium
Moderator: Scott Lozanoff

3:00 The anatomy of web programming. GUTTMANN, Geoffrey, Lyndsey FERGUSON, and Mike CUNNINGHAM. Department of Anatomy and Cell Biology, College of Medicine, University of Saskatchewan, Saskatoon, Canada.

- 3:15 Utilizing the web for instructional materials: considerations for design and application. MacPHERSON, Brian R. Anatomy and Neurobiology, University of Kentucky, Lexington, KY.

Thursday, June 11, 1998

- 3:30 Development of web-based material for gross anatomy. HILBELINK, Don R. Department of Anatomy, University of South Florida, Tampa, FL.
- 3:45 Discussion
- 4:00 **Special Interest Group: Directors of Willd-Body Programs**
(All interested registrants invited to attend)
Moderators: Marita Nelson and Dan Graney
- 5:00 Adjournment

Evening Events

- 6:00 Bus Service from Hyatt Regency to Spindletop Hall
- 6:15 **Arrival at Spindletop Hall for Cash Bar Reception**
(self-guided tours of Spindletop Hall)
- 7:00 **Annual AACA Banquet
and
Presentation of Honored Member Award
to John E. Skandalakis, M.D., Ph.D., F.A.C.S.**
- 9:30 **Evening Adjournment, (Bus transport to Hyatt Regency)**

Friday, June 12, 1998

7:30-8:30 Educational Affairs Committee Meeting - Henry Clay Room
(for Committee and interested members)

8:00-9:00 Registration and Continental Breakfast
Commercial Exhibits - Patterson Ballroom D

Platform Session VIa: Educational Papers

Moderator: Daniel O. Graney, Ph.D.

- 9:00 Multimedia CD-ROMs. A teaching and learning tool for Advanced Clinical Anatomy and Imaging. ABRAHAMS, Peter, Girton College, Cambridge, and Cambridge Overseas Medical Training Programme, Kigezi International School of Medicine, Cambridge UK.
- 9:15 Making video images of the hyoid bone and its associated muscles. ACLAND, Robert and Heidi BAS*. Division of Plastic and Reconstructive Surgery, University of Louisville, Louisville, KY.
- 9:30 A report on self-assessment for evaluation of our institute as required by the Austrian rectors conference following the Peer-Review-System: experiences and problems. BRENNER, Erich A., Bernhard F. MORIGGL. Institute of Anatomy, University of Innsbruck, Austria.
- 9:45 The Interactive Skeleton: A 21st century anatomy resource. HARRIS, Justin *, Peter ABRAHAMS, Sandy C. MARKS Jr., and Peter C, AMADIO Primal Pictures Ltd, UK *, Kigezi International School of Medicine; Girton College, Cambridge University, UK, University of Massachusetts, Worcester, MA., Mayo Clinic; Mayo Medical School, Rochester, MN.
- 10:00 Problem based anatomy for the surgical resident. MATTINGLY*, Mark, Richard E. DEAN, and Rexford CARROW. Department of Surgery, Michigan State University, College of Human Medicine, East Lansing, MI.
- 10:15 A web-based dissection tutorial for the perineum. MacPHERSON, Brian R., David PECK, Kathryn M. WONG-RUTLEDGE*, Derek EGGERS*, Scott McDONALD* & Matt HAZZARD. Anatomy and Neurobiology and

University Arts and Photography, University of Kentucky Medical Center, Lexington, KY *.

Friday, June 12, 1998

10:30

Refreshment Break
Commercial Exhibits - Patterson Ballroom - D

Platform Session VI: Educational Papers (Continued)

Moderator: Robert Acland, M.D.

10:45

Anatomy and anatomists in an information age. MARKS, S. C., JR.¹ and F.C.T. VOON^{1&2}. ¹Department of Cell Biology, University of Massachusetts, Worcester, MA, ²Department of Anatomy, National University of Singapore, Singapore.

11:00

Market forces in business (commerce, education and medicine) and the implications for medical education. VOON, F.C.T. and S. C. MARKS, JR. Department of Anatomy, National University of Singapore, Singapore and Department of Cell Biology University of Massachusetts Medical School, Worcester, MA.

11:15

3-D Anatomy of the cerebral sulci and ventricles. RIBAS*, G. C. and A. J. RODRIGUES, JR., Department of Surgery, Faculty of Medicine, University of Sao Paulo. Sao Paulo, SP, Brazil.

11:30

Surgical Anatomy of the inguinal region. -- a 3-D vision. RODRIGUES, A. J. JR., C. J. RODRIGUES, and G. C. RIBAS*. Department of Surgery, Faculty of Medicine, University of Sao Paulo, Sao Paulo, SP, Brazil.

11:45

Brazilian experience in Clinical Anatomy teaching. RODRIGUES, C. J. and A. J. RODRIGUES JR. Department of Surgery, Faculty of Medicine, University of Sao Paulo, Sao Paulo, SP, Brazil.

12:00

Adjournment of 15th Annual Meeting of the AACA

1:00

Meeting of Executive Council

Saturday, June 13, 1998



ANNOUNCEMENT

POSTGRADUATE COURSE

**Back Pain:
A Multi-Disciplinary
Overview of Etiology
Diagnosis, Therapy And Prevention**

**Saturday, June 13, 1998
Hyatt Regency Hotel
Lexington, Kentucky**

**Jointly Sponsored by:
University of Kentucky College of Medicine
Department of Anatomy and Neurobiology
and the
American Association of Clinical Anatomists**

**Detailed announcement enclosed with registration form.
Separate registration fee**

This activity has been planned and implemented in accordance with the Essentials and Standards of the Accreditation Council for Continuing Medical Education through the joint sponsorship of the University of Kentucky College of Medicine and the American Association of Clinical Anatomists. The University of Kentucky College of Medicine is accredited by the AACME to provide continuing medical education for physicians.

The University of Kentucky Office of Continuing Medical Education designates this educational activity for a maximum of eleven and one half (6) hours in Category 1 credit toward the AMA Physician's Recognition Award. Each physician should claim only those hours of credit actually spent in the educational activity.

ABRAHAM, Peter. Girton College, Cambridge, and Cambridge Overseas Medical Training Programme, Kigezi International School of Medicine, Cambridge UK. Multimedia CD-ROMs. A teaching and learning tool for Advanced Clinical Anatomy and Imaging.

The recent advent of student-affordable CD-ROMs has led to an exciting educational development where both teacher and student have open access to all imaging modalities, procedural videos and a composite database for understanding of radiological anatomy and the anatomical basis of common practical procedures, (see new curriculum for AACA). Teaching directly from Laptop via a video projector factual information is shown on PowerPoint presentation, whilst all the radiological images, including video MRA and Ultrasound are shown directly from CD-ROM. The beauty of this system is that all images used during each lecture are handed out as a single lecture 'file' on floppy disc. This allows students to review the visual material at home or in the Medical School Computer Centre. This presentation will illustrate from Laptop not only the teaching advantages but also how easy it is to set a completely different examination each term from the same CD-ROM database of over 700 interactively labeled Images of all modalities.

ACLAND, Robert, and Heidi BAS*. Division of Plastic and Reconstructive Surgery, University of Louisville, Louisville, KY. Making video images of the hyoid bone and its associated muscles

Understanding the hyoid bone, and the structures that hold it in place and move it, is a good starting point for understanding the functional anatomy of two important structures: the tongue and the larynx. The hyoid bone and its associated muscles hold the tongue up from below; and they hold the thyroid cartilage (and thus the larynx) in place from above. It is hard to provide an image of the hyoid bone that makes it easy for students to understand these important structural and functional roles. A clear view of the bone is obscured by its much larger neighbor, the mandible, and by the numerous muscles which are attached to it. These muscles, too, are difficult to present in ways that make it easy to understand their roles. Print atlases provide two dimensional images of projections that show the hyoid muscles, but these are hard to interpret in three-dimensional terms.

Dissection can reveal much, but in the process of dissection the structures are demolished as they are revealed. In making the Video Atlas of Human Anatomy we took the opportunity to provide images of the hyoid bone that provide a clear, three-dimensional understanding of the hyoid bone and its attached muscles. The images combine established projection approaches, the use of fresh tissue and rotation of the specimen about vertical and horizontal axes to give a clear

perception of three-dimensional structure. In addition to showing some of these images we will show the simple technology that is used in making them.

Supported by grants from the Jewish Hospital Foundation, the Alliant Community Trust Fund, and the United States Surgical Corporation.

AGUR, Anne, Kevin BALL*, Victor NG*, Roger LEEKAM*, Eugene FIUME* and Nancy MCKEE*. Departments of Anatomy and Cell Biology, Surgery, Medical Imaging and Computer Science, University of Toronto, Toronto, Canada. The human soleus muscle: A dynamic 3D model.

Purpose: To develop a technique to reconstruct human skeletal muscle architecture from in situ into a manipulatable 3D model.

Methods: The human soleus muscle has three parts: posterior, marginal and anterior. Cadaveric soleus muscles, located in situ, were serially dissected: at each level 50-100 fiber bundles, were pinned; specimens were photographed using three spatially calibrated cameras. The images were transferred to CD-ROM and the locations of the pins were digitized. Using photogrammetric techniques, the digitized coordinates of a given muscle were used to generate 3D coordinates representing the orientation of each of the dissected fiber bundles. Plots of the muscle as a whole and of its component parts were created to observe and verify the architecture. Using the 3D coordinates, fiber bundle length, direction and angle of pennation were determined throughout the muscle. The 3D coordinates were fitted into a B-spline solids model, which will parameterize an enclosed volume as well as its boundary surface using 3D vector functions. Once the B-spline solids model of the soleus has been fitted with its external surface and internal volume arrangements, one can generate manipulatable 3D models of the muscle to visualize its complex architecture.

Results: Using this model, the complexity of fiber architecture of the soleus muscle can be reconstructed and viewed as manipulatable, *dynamic* 3D images. Architectural data can be obtained from any region of the muscle.

Significance: The detailed mapping of muscle architecture and the analysis of force generation will facilitate a better understanding of muscle performance in normal and pathologic states.

(Sponsors: AO/ASIF-Foundation of Switzerland, and Department of Surgery, University of Toronto.)

AHARINEJAD, Seyedhossein, and Wilhelm FIRBAS. First Dept. of Anatomy, University of Vienna, Vienna, Austria. Endothelin antagonism but not nitric oxide-administration attenuates pulmonary hypertension in a rat model. Molecular and morphological aspects.

We have shown that spontaneously hypertensive rats (SHR) develop pulmonary hypertension associated with increased muscularity (sphincters) in the walls of

their pulmonary veins. These pulmonary venous sphincters (PVS) are not innervated but contract after endothelin-1 (ET-1). Since ET-1 is a mitogenic agent, we asked whether bosentan, an ET-A and B receptor antagonist, or L-arg, a nitric oxide (NO) donor, could affect pulmonary hypertension and PVS in SHR. SHR were treated with bosentan, L-arg or saline for 4 weeks. We measured the mean pulmonary arterial pressure (PAP) and mean systemic pressure (MSP) with telemetry on-line. The number of venous sphincters and smooth muscle cells inside them and percentage of sphincter contraction (PSC) were evaluated using light microscopy, TEM, and SEM of casts. Gene expression of pulmonary eNOS, iNOS and ET-1 was measured in all groups and in normotensive rats (NR) by quantitative rt-PCR. The PAP, MSP, eNOS, iNOS and ET gene expression levels were significantly higher in SHR vs. NR and were reduced after bosentan. L-arg decreased MSP moderately but significantly PAP. Bosentan attenuated both the hyperplasia and hypertrophy of smooth muscle cells in PVS. This effect was not observed after L-arg. SEM showed that the tone of PVS (percentage of contraction of sphincters in casts) was not reduced either by bosentan or L-arg. We conclude that: ET-1 is involved in the pathophysiology of pulmonary hypertension in SHR; bosentan seems to antagonize this effect of ET-1; increased NOS gene expression levels in SHR might be reactive to increased ET-1 gene expression in SHR and is reduced after ET receptor antagonism. Chronic ET-receptor antagonism but not L-arg treatment is effective in attenuating pulmonary hypertension and reversing the pulmonary vascular remodeling in SHR.

(Supported by the grant No. 1464 from the Medical Foundation of Vienna's Major to S.A.)

AKITA*, Keiichi, Hirokazu SAKAMOTO*, and Tatsuo SATO, Department of Anatomy, School of Medicine, Tokyo Medical and Dental University, Tokyo, Japan. Lateromedial and Dorsoventral loops between the nerves innervating the intrinsic muscles of the foot with special reference to the innervation of the adductor hallucis.

The branching patterns of nerves innervating the intrinsic muscles of the foot were analyzed to confirm the muscle layer structure which has been reported based on embryological and comparative anatomical studies. However, there is little detailed information of the innervation compared with the anatomical data of muscle variations. Sixteen sides of the feet of eight Japanese cadavers were used in this study. We found that the lateral and medial plantar nerves formed a loop dorsal to the oblique head of the adductor hallucis in three specimens, and interestingly the medial plantar and the deep peroneal nerve formed a loop medial to the head in two specimens. The oblique head was frequently innervated by combinations of the branches from these three nerves. We

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consider that the adductor hallucis occupies a very critical position in the muscle layer structure of the intrinsic muscles of the foot; a schematic model of the possible origins of this muscle is proposed.

ANDERSON, Paul A. Department of Physical Therapy, University of Maryland (UMB), School Medicine, Baltimore, MD. Physical Therapy Human Anatomy at the University of Maryland.

Human Anatomy is the first course taught in the UMB physical therapy curriculum. The course is a dissection based functional anatomy which is completed in twelve weeks of summer school. The Head, Abdomen, and Perineum regions are survey units while the Back and Extremity units are studied in detail. The joints of the body are studied from prosections. The students are expected to know the anatomical structures which are called behavioral objectives in our program. The back and extremity regions are competency based units. The students must pass osteology and muscle/nerve exams with 90% success before they can take the unit tests. The unit examination consists of a written objective test and a practical test on the cadaver. Surface anatomy is taught concurrently and tested on the unit examination day. The student receives one point for every correct answer with the maximum points totaling 1000. The student dissections are graded Honors, Pass and NonPass with the point value reflecting the quality of the dissection. The course is divided into 50 hours of lecture and 200 hours of laboratory.

BARDOEL*, Janou, Wayne K. STADELMAN*, John H BARKER, Gordon R. TOBIN . Division of Plastic and Reconstructive Surgery, University of Louisville, Louisville, KY (sponsored by R.D.ACLAND). Use of the rectus abdominis muscle to produce a continent stoma: a feasibility study.

Introduction: A continent stoma would greatly benefit patients who have to live with an ileostomy or a colostomy. Previous attempts to create a continent stoma using dynamic muscle flaps have failed primarily because of denervation atrophy of the neo-sphincter.

Purpose: In this study we : (1) revisited the neuro-vascular anatomy of the Rectus Abdominis Muscle (RAM); (2) determined the anatomic feasibility of making a neo-sphincter from the most caudal segment of the RAM without damaging its nerve or blood supply Methods: A detailed micro-dissection was performed on 16 RAMs in 10 fresh human cadavers. The point at which the inferior epigastric vessels and each segmental intercostal nerve entered the deep surface of the muscle was determined, measurements being made from the pubic symphysis. The number of nerves entering the muscle distal to the most caudal tendinous intersection was determined. After recording these details the RAM was detached at its insertion. The part of the muscle distal to the lowest

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intersection was split longitudinally. The lateral half of the split muscle was wrapped around a 3-cm diameter stent to create a neo-stoma. The amount of muscle that overlapped after one turn round the stent was measured.

Results: The most caudal intercostal nerve entered the RAM 9.4 ± 2.3 cm cranial to the pubic symphysis and 0.2 ± 0.4 cm medial to the lateral edge of the RAM. The vascular hilus was 10.8 ± 2.4 cm cranial to the pubic symphysis and 3.1 ± 0.8 cm medial to the lateral edge of the RAM. The most caudal intersection was 15.8 ± 2.2 cm from the pubic symphysis. The muscle segment caudal to this intersection was innervated by two intercostal nerves in 19%, three nerves in 50% and four nerves in 31% of the muscles. Following the creation of the neo-sphincter, there was full overlap in 89% of the RAMs with an average overlap of 0.4 ± 1.4 cm.

Conclusion: A neo-stoma can be created using the most caudal part of the RAM without damaging the intercostal nerves or the vascular pedicle. Maintaining the innervation of the neo-sphincter will avoid denervation atrophy, which has been a major cause of failure in previous studies. Supported by the Foundation "Die Drie Lichten" in the Netherlands

BAS*, Heidi, Valentin.I. SHAROBARO*, Michael.B. SUNDINE*, John H. BARKER, and Gordon. R. TOBIN. Division of Plastic and Reconstructive Surgery, University of Louisville, Louisville, KY. (sponsored by R. D. ACLAND)

The arterial supply of the inferior angle of the scapula: a microdissection study

Purpose: The inferior angle of the scapula has the potential to be made into an unusually thin vascularized bone graft, that could be used in repairing complex facial defects. The purpose of this study was to determine which of two arteries provides the principal blood supply to the part of the scapula that lies within 5cm of the inferior angle.

Materials and Methods: In pilot studies two arteries were seen to converge on the inferior angle of the scapula: (1) the Descending Osseous branch of the Circumflex Scapular Artery (DB,CSA), (2) the Transverse Branch of the Thoracodorsal Artery(TB,TDA). In 25 Microfil® injected unembalmed specimens (13 cadavers) these two arteries and their parent vessels were dissected out from the origin of the Subscapular Artery to their periosteal branches, using standard microsurgical techniques.. The presence, length, and internal diameter of each vessel was recorded and the numbers of periosteal branches over 0.2mm in diameter supplying the caudal 5cm of the scapula were counted.

Results: The DB,CSA supplied the area of interest in 100% of cases, the TB,TDA in 76%. The diameter of the DB,CSA at its origin from the CSA was $1.1\text{mm} \pm 0.1$; the diameter of the TB,TDA at its origin from the TDA was $0.6\text{mm} \pm 0.1$. The DB,CSA supplied 14 ± 1 periosteal branches over 0.2mm in diameter to the region of interest; the TB,TDA supplied 5 ± 1 such branches. The length of the

CSA and its descending osseous branch was $12.1\text{cm} \pm 3$; the length of the TDA and its transverse branch was $16.2\text{cm} \pm 4$.

Conclusion: The descending branch of the Circumflex Scapular Artery is more dependable than the transverse branch of the Thoracodorsal Artery in supplying the most caudal part of the scapula. Its diameter is greater, and it gives more periosteal branches. The DB,CSA should therefore be considered as the principal vessel supplying this part of the scapula. This paper also demonstrates the surgical technique of raising this potentially elegant vascularized bone graft, which has not yet been used clinically.

BOON*, Johannes M., Penelope A. RICHARDS*, Johannes BAUMBACH*^o, Leoni SCHOLTZ*_. Department of Anatomy University of Pretoria, Pretoria, South Africa. ^oAerotek CSIR (Counsel for Scientific and Industrial Research). _Dr L Scholtz & partners diagnostic radiologists. (sponsored by J. H. MEIRING).

Left or right access for successful central venous catheterization.- the anatomical answer – a preliminary study.

Central venous catheterization is associated with a significantly high rate of misplacement, of the catheter tip, during right sided infraclavicular central venous catheterizations: 15% (right) compared to 2% (left). Of catheter tip placements which were considered unsatisfactory most lay in the ipsilateral internal jugular vein. The question was asked whether the angles formed by the subclavian vein with both the internal jugular vein and the brachiocephalic vein differs between the left and right sides. The sharper the angle between the subclavian and brachiocephalic veins (a) and the wider the angle between the subclavian and internal jugular veins (b), the easier will a catheter pass into the ipsilateral internal jugular vein. Five patients with no known intrathoracic pathology consented to be included in the preliminary study. Magnetic resonance (MR) coronal venous flow studies were done, imaging the three veins on both sides at an MR unit in Pretoria. These images were scanned into a computer in PCX format, symmetrically enlarged and the angles (a and b) measured by a professional mechanical engineer. The angle formed by the subclavian vein and internal jugular vein (b) was not significantly different between the left and right sides. However, the angle formed by the subclavian vein and the brachiocephalic vein (a) was significantly sharper on the right ($p < 0.005$). We conclude that this difference may be one of the major contributing factors to the higher misplacement rate, into the internal jugular vein, in right sided central catheterizations.

BRENNER, Erich A., and Bernhard F. MORIGGL. Institute of Anatomy, University of Innsbruck, Innsbruck, Austria. A report on self-assessment for evaluation of our institute as required by the Austrian rectors conference following the Peer-Review-System: experiences and problems.

This contribution deals with fundamental problems as they occur during the set up of an autobiographic report on evaluation of an Austrian University institute. We demonstrate and discuss these problems in view of our own experiences within research, teaching and administration. In particular the following questions are dealt with: should such a report either be limited to a minimum or offer a comprehensive document? To what an extent should legal provisions be included and who could possibly support the institute in providing them? How effective can research data be collected, presented and above all be rated? In which way should one establish data on number of students as well as drop out rates? Do we judge high or low drop out rates favorably? What are essential informations regarding administration and what is an appropriate way of documentation? How time consuming are "pure" administrative tasks and can they be marked off from those necessary for teaching and research? In which way can we – retrospectively - prepare a mission statement that meets the following demands: not being in contradiction to legal duties (without including them) and being no justification for the past. We conclude by presenting a possible attempt at solution.

COLLINS, James D., Theodore Q. MILLER*, and Ernestina H. SAXTON, UCLA School of Medicine, Los Angeles, CA. Obstetric brachial palsy or brachial plexus palsy as displayed by MRI.

Traction to the brachial plexus at delivery has been listed as the cause of obstetrical palsy or brachial plexus palsy . Fractures of the clavicle and humerus, and dislocations of the shoulder may also be sustained at delivery. If by 3 1/2 to 4 months, shoulder function and /or biceps function has not returned, a CT myelogram is requested. Rarely CT may give false negative and false positive results. Surgery may still be indicated. MRI demonstrates fascial planes, soft tissues and neurovascular anatomy and can eliminate false negative and false positives results. We have modified the technique of bilateral brachial plexus MRI and MRA to accommodate the newborn and infant patients. The patient is sedated and gently placed into the head coil and the field of view is selected to accommodate the thorax and upper extremities. Imaging was conducted on the 1.5 Tesla G. E. Signa, 5.5 software, 4,0 mm thickness with saline water bags along side the thorax to enhance signal to noise ratio. T1 weighted and selective Fast Spin Echo (FSE) imaging sequences were acquired. Coronal, transverse, transverse oblique, sagittal, 2D Time Of Flight Magnetic angiography (MRA) sequences are obtained. Image analysis demonstrated the

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low signal intensities of the dural sacs and displacement of the right C5, C6 and C7 nerve roots. Bilateral imaging of the brachial plexus allows the radiologist to distinguish between avulsion and stretching of nerve roots. The purpose of this presentation is to demonstrate the modified technique of Bilateral MRI of the brachial plexus in the evaluation of obstetric brachial plexus palsy.

COOPER, Margaret H., Paul S. NASSIF*, Mimi S. KOKOSKA*, and J. Regan THOMAS*. Departments of Anatomy-Neurobiology and Otolaryngology and Head and Neck Surgery, Saint Louis University School of Medicine, St. Louis, MO. Comparisons of current forehead lift techniques used in aesthetic surgery: a cadaver study.

eyebrow and forehead elevation and tension were compared in three different forehead lift surgical procedures. This comparison is important in determining the optimal method of elevation in an aesthetically accepted range for forehead lifts. The three techniques were: 1) subperiosteal elevation to the supraorbital rim, 2) subperiosteal elevation with release of the periosteum at the supraorbital rim and 3) subgaleal elevation to the supraorbital rim. 12 heads were used in the study with each side of the forehead used as a separate side; therefore 24 sides were compared. The heads were embalmed with an ethylene glycol formula which helps to maintain natural tissue flexibility. This is imperative for such a study in cadavers. Preoperative distances from predetermined points were made. Coronal and midline incisions were performed and the forehead flaps were elevated using one of the three techniques. The corrugator supercilii and procerus muscles were cut. The same distances were measured post dissection. A digital force gauge was used to measure the tension of the forehead flaps at 0.5 and 1.0 cm advancements followed by a secondary procedure using 5 pounds of constant posterior traction. Measurements were again obtained from the predetermined points. This study provides information of comparative flap in the forehead flap utilized in the traditional coronal forehead lift (subgaleal elevation) versus the endoscopic forehead lift (subperiosteal elevation).

CULBERSON*, James. L. Department of Anatomy, West Virginia University Health Sciences Center, Morgantown, WV (sponsored by D.O. GRANNEY). Annual symposium on cranial nerves: Having fun with neuroanatomy.

Expansion of health science fields has led to increasing numbers of students studying structural sciences, including Neuroanatomy. Neuro is a specialized subject area of particular interest to a limited number of health care professionals, usually postgraduate students. Among undergraduates, physical therapists have substantial interest in and use for basic neurology information. Undergraduates with modest preparation in science now enroll in courses like

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neuroanatomy where the content and pace can be overwhelming, even for academically talented students. While teaching introductory functional neuroanatomy (for 23 years), I wondered if these very bright students (and I!) might benefit from some diversion from routine instructional methods. I introduced an annual student-run instructional symposium. Small groups (3-4) of students select a cranial nerve (or related nerves) and prepare a 15-20 minute presentation which by assignment must be instructional and may be entertaining (in that order). Student work generated in this little project immediately exceeded my wildest expectations and has continued to be outstanding over about ten years. The symposium has achieved sufficient fame that it annually attracts faculty, staff and upper-class students who attend to revise their knowledge of the cranial nerves. Students usually do achieve the most important objective, i.e. selecting and teaching the important features of the cranial nerve from the viewpoint of a physical therapist. It is interesting and important to recognize that these features often differ from those emphasized by a neurology-biased anatomist. Beyond the content, the entertainment elements of this experience have exposed a depth of talent and creativity that we seldom recognize in science students. The exercise has produced impressive videos, original poetry, songs (lyrics and music) and recently, a proliferation of game shows. This presentation will share some student material in the interest of stimulating other course planners to look for ways to increase student participation and enthusiasm for their own learning.

DISCHER, William. Human Developmental Anatomy Center at the National Museum of Health and Medicine of the Armed Forces Institute of Pathology, Washington D.C. (sponsored by A Noe). A Historic Perspective on Reconstructive Modeling of Anatomical Forms.

3-D modeling and medical imaging are most often seen as a boon of the computer age. What is less known is that over 100 years ago scientists and artisans were working to devise ways to represent minute anatomical structures on a large and accurate scale. These 3-D models revealed the unseen. The Carnegie Collection of Embryology's plaster models are but one example, albeit a prime example, of pre-computer imaging of an unseen part of the anatomical world in three dimensions. This report shows just how much the computer brings to 3-D imaging and just how much was already in place before hand

FEIGL Georg*, Reinhard JESSERSCHKE* and Roman RADL*. Anatomical Institute, Karl-Franzens-University Graz and Department of Orthopedics, LKH-Graz, Austria (sponsored by Andreas H. Weiglein). Arterial blood supply of the femoral trochanters in connection with their osteolysis after total hip replacement

Osteolysis after total hip replacement occurs often, even in cases of a stable total hip prosthesis and with no polyethylene abrasion. Therefore, the blood supply of this special anatomical region was investigated with regard to the surgical procedure. Fifteen cadavers were investigated without paying attention to age, sex and side of the cadavers. All were fixed by Thiel's method and the arteries were injected via the extern iliac artery with Thiel's DGM 85 mass, consisting of dextrin, latex, and lead tetroxid for precise and easy identification of the arteries. The dissection followed the three main blood vessels, the medial and lateral circumflex femoral arteries and the first perforant artery, dissecting the branches to the rete trochantericum and also the branches entering the femur.

In all cases we found one to three branches originating from the ascending branch of the medial circumflex artery, leaving this vessel at the posterior-inferior aspect of the neck of the femur. These branches entered the femur on the posterior aspect of the intertrochanterical crista or on the top of the crista itself. No direct branches from the medial circumflex femoral artery to the lesser trochanter were found. However, some small branches coming from the arteries supplying the quadratus femoris muscle were dissected.

Because of the small amount of investigated cadavers, this is only an interim report. However, we are convinced, that by knowing the blood supply of this region, the orthopedic surgeons will be able both to prevent most of the patients from osteolysis after total hip replacement and to reduce the length and also the costs of the postoperative therapy.

GER, Ralph, and Todd. R. OLSON. Department of Anatomy, Albert Einstein College of Medicine, NY and Department of Surgery, Nassau County Medical Center, East Meadow, NY. The bifurcation of the dorsal metatarsal arteries in relation to transmetatarsal amputations of the toes.

Transmetatarsal amputations are very common procedures that take place particularly in patients with diabetes mellitus and peripheral vascular disease. A common complication of these operations is the onset of gangrene of an adjoining toe which is usually ascribed to the underlying disease. It is suggested that another explanation that may be responsible for some of these sequela may be based on the level of the bifurcation of the dorsal metatarsal arteries and the operative technique. The former is either not specifically described or has different levels in different texts. The operation in most texts advise racket shaped incisions, with no mention of the width of the racket. The combination of an incision diverging widely from the handle of the racket is in danger of severing the metatarsal artery, it's bifurcation or the digital artery to the adjacent toe. A patient with a good blood supply may be able to salvage the situation through the plantar vessels, but in a patient whose vascular supply is parlous, which is the case in many amputations, the adjacent digit is at

considerable risk. Clinical, radiological and anatomic evidence will be presented to support this contention and a safer operative technique will be suggested.

GUTTMANN, Geoffrey, Lyndsey FERGUSON, and Mike CUNNINGHAM. Department of Anatomy and Cell Biology, College of Medicine, University of Saskatchewan, Saskatoon, Canada. The Anatomy of Web Programming.

The World Wide Web (WWW) has become an everyday part of our personal and professional lives. What makes the WWW function? Do I need to be a computer programmer to be on the WWW? What material should I put on the WWW? A brief overview of web programming concepts will be presented. The topics will be hypertext markup language (HTML), virtual reality modeling language (VRML), java, object-oriented programming (OOP) and QuickTime and QuickTime Virtual Reality (QTVR). Websites (also known as URLs) describing these topics in more detail and a list of suggested introductory books will be provided. Anatomical applications of web programming will be illustrated using the University of Saskatchewan Computer Aided Learning (CAL) Environment program, known as USCALE, and other websites. USCALE will also illustrate appropriate material for the WWW and web instruction.

HARRIS, Justin *, Peter ABRAHAMMS, Sandy C. MARKS JR., and Peter C, AMADIO Primal Pictures Ltd, UK *, Kigezi International School of Medicine; Girton College, Cambridge University, UK, University of Massachusetts, Worcester, MA, Mayo Clinic; Mayo Medical School, Rochester, MN. The Interactive Skeleton: A 21st century anatomy resource

There is a worldwide scarcity of skeleton specimens for anatomical study. Primal Pictures, in collaboration with a group of anatomists and medical educators in the USA and UK, has created a 3-D digital alternative on a CD-ROM. This presentation will explore the genesis of the project, its technical development and outline how it is currently being used in medical schools across the world.

Using advanced computer graphics techniques combined with its own software, Primal Pictures took raw Computerized Tomography (CT) scan data and transformed it into a three-dimensional computer graphic. The CT slice Data was recorded at 1/2 mm intervals. The resulting 3-D computer model records a remarkable level of detail of skeletal anatomy, in addition to highlighted anatomical landmarks and areas of muscle attachment. It was the first such product available on a PC.

With grant assistance from the Employment Department in the UK, Primal Pictures has integrated the 3D model with the educational requirements of the anatomy curricula in the UK and USA. Facilities such as self-testing, exam

questions & answers, and sound clips comprising clinical points provide valuable additional data for students and teachers.

HARRIS*¹, Richard I., Dzung H. VU¹, Andrew L. WALLACE*², Jerome A. GOLDBERG*², David H. SONNABEND*², and William R. WALSH*² ¹ School of Anatomy & ²Orthopedic Research Laboratories, University of New South Wales, Sydney, Australia. The clinical importance and variance of the coracoclavicular ligament – a detailed anatomical and biomechanical study

The coracoclavicular ligament (CCL), comprised of the conoid and trapezoid components serve as the main suspensory ligaments of the shoulder girdle and provide the major vertical restraint to the acromioclavicular joint (ACJ). Detailed knowledge of its anatomy is important for successful reapproximation of the CCL for stabilization of acute, complete ACJ dislocations and distal clavicle resection for symptomatic relief in arthritic ACJs. Very few authors have adequately described the CCL anatomy and discrepancies exist in the literature and textbooks. The biomechanical properties of the CCL and its two components have never been previously investigated. This study provides a detailed anatomical and biomechanical description of the CCL. The geometric dimensions of twenty-four CCLs from fresh cadaveric shoulders were quantitatively determined. The shape and location of attachment areas on the coracoid and clavicle were also examined qualitatively. The intact CCL, isolated conoid and isolated trapezoid ligaments were tested to tensile failure on an MTS materials testing apparatus. Both ligaments were wider and thicker at their clavicular attachments. The distance from the lateral trapezoid ligament to the distal clavicle averaged 15.3 mm. The coracoid insertions of the conoid ligaments displayed high variance; 33% being confluent with the lateral fibers of the transverse scapular ligament, 8% presenting an additional lateral fascicle. The isolated trapezoid ligaments displayed higher ultimate strengths, but lower stiffness values than the conoid ligaments. From our results, a safety margin of 15 mm is suggested for distal clavicle resection in incomplete ACJ injuries to preserve the intact CCL. Traditional 20-25 mm surgical resection is not recommended. The unprecedented anatomical variants of the conoid ligament noted revealed three distinct and previously undescribed groups of the CCL. Biomechanical results indicate superior strength of the trapezoid ligament and highlight its importance as a tensile load bearing element. These findings provides more anatomical substrate for operative management of shoulder girdle injuries.

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HENNERBICHLER Alfred, Martin H. KIRSCHNER*, Ralph BURGER, Gunther O. HOFMANN*, and Othmar GABER. Institute of Anatomy, University of Innsbruck, Innsbruck, Austria and Department of Surgery, Klinikum Grosshadern, Ludwig-Maximilians-University Munich, Munich, Germany and Trauma Center Murnau, Murnau/Staffelsee, Germany. The importance of the vascularization of the femur for the transplantation of vascularized femoral diaphyseal allografts.

For reconstruction of large defects of the femur due to posttraumatic osteomyelitis and tumors of the bone, respectively, 3 allogenic, vascularized femoral shafts have been transplanted. One major problem concerning the survival of these grafts regards the blood supply of the femur, the selection of the correct vascular pedicle for the section of the bone required and the topographic preparation of these vessels. Therefore, the arterial angioarchitecture of 30 human femora was investigated in order to identify the important arteries of the femur and examine their topography and area of periosteal blood supply. In addition, the course of the arteries to the bone as well as the distribution of the nutrient arteries could be determined. The analysis revealed that the periosteum of the femur has defined nutritive areas but the arteries supplying these areas (femoral artery, deep femoral artery, lateral femoral circumflex artery and direct periosteal branches of the femoral artery) originate in variable distance from a defined landmark, the inguinal ligament, and in varying branching. According to these results there has to be an adjusted harvest of the supplying vessels in the back-table-preparation. Considering these anatomic facts a sufficient perfusion and vitality of the graft can be guaranteed in order not to jeopardize the total result of the transplantation by resecting particular vessels of the graft.

HENRY, Robert W. Department of Animal Science, College of Veterinary Medicine, University of Tennessee, Knoxville, TN. Plastination, preservation of biological specimens for the 21st century.

Preservation of biological specimens for teaching anatomy or pathology via the plastination process has been used to a limited degree for 20 years. A few specimens are available commercially and only a few institutions routinely use the process. Plastinated specimens are clean, dry and free from irritating formaldehyde vapors. They are esthetically pleasing to students and offer a quick method to review anatomy. With the plastination process, the prepared specimen is first dehydrated, preferably in cold acetone. Then the acetone is exchanged via vacuum for a curable polymer (silicone, polyester or epoxy). Silicone specimens provide an excellent means for preservation and presentation of various difficult to understand regional anatomy to medical students. Wet and often under used museum specimens can be transformed into user friendly teaching/learning aids. Transparent epoxy body slices are excellent adjuncts for

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studying sectional anatomy and for correlation with ultrasonographic, CT or MRI scans. Polyester slices are not transparent and classically have been used for brain slices. However, recently they have been used for preparation of body slices and are excellent aids for also studying sectional anatomy. Use of the plastination method has waned. The most often stated reason is the expense of the process and of the polymers. We have found that the polymers are one of the least expensive components. In the average specimen, only 0.4 kg of polymer is used per kilogram of finished specimen. At current prices, polymer cost is only \$14 to \$19 per kilogram specimen and new, improved, and less expensive polymers are being formulated. The polymer cost for the epoxy and polyester specimens is twice that since the polymer is also used as the presenting medium for the specimen. The majority of the cost of plastinating is the time spent in specimen preparation and equipment. Plastination is a unique process which should be considered for preserving biological specimens for the 21st century.

HILBELINK, Don R. Department of Anatomy, University of South Florida, Tampa, FL. Development of web-based material for gross anatomy

As of the fall semester of 1997, every medical student matriculating in the College of Medicine, University of South Florida, is required to purchase a lap-top computer configured to meet the College's standards. Development of computer-based instructional material for incorporation into all medical courses is now expected, and indeed mandated, by our Dean's office. Little or no personal, financial resources or technical support was provided to assist faculty in the development of course materials. Initial computerization of the gross anatomy course, focused on placing house keeping features such as: course schedule, learning objectives, examination and grading policies, traditional handouts, etc., on a course-specific web page. In an attempt to tie together the traditional dissection laboratory with the computer components of the course, a relatively comprehensive list of structures that needed to be identified was established. The core of this list consisted of all of the structures identified in the assigned dissection manual. The list was organized by regions and systems in the most recent release of Microsoft Excel. A library of unlabeled images in digital format was obtained from the publishers of our assigned atlas. The atlas image library along with images of radiographic material have been placed in our intranet computer server and html linked to the structure list. Intranet compatible software for the administration and grading of examinations as well as student performance tracking, is currently being developed.

HINES, Margaret H., and Sorin M. FLOREA*. Department of Cell Biology, Neurobiology and Anatomy, Ohio State University, Columbus, OH. Liver and spleen injuries in simulated accident tests using human unembalmed cadavers.

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This research proposed to examine trauma of the liver and spleen by analyzing of simulated accidents and cadaver testing, and to develop methodology for increasing the biofidelity of dummies used in trauma research. Several studies were conducted, approaching this topic in different ways. A retrospective study using the National Trauma Registry investigated the spleen and liver injuries in relation to occupant's location, restraints used, and the direction of impact. A second study compared the injuries sustained when same body liver and spleen were subjected to identical graded levels of impact energy. Further, cadavers, as surrogate for living vehicle occupants, were subjected to right or left side pneumatic impact. These studies were designed to produce trauma comparable to that observed in automobile accidents, where injury ranged from none to fatal. The Assessment of Injury Scale (AIS) was used for determining the severity of injury. The results of these studies are important to: 1) Researchers in medical trauma and safety engineering in studying possible effects of non-fatal injuries typical of motor vehicle accidents in more detail than would be possible in a clinical environment and 2) Government officials in developing policies that promote safety and reduce costs caused by transportation accidents.

HOLSINGER, James W., JR., Janet STITH*, and James D. BIRCHFIELD*. Department of Anatomy and Neurobiology and the Medical Center Library, Chandler Medical Center, University of Kentucky, Lexington, KY. The anatomical texts of the Harvey-Servetus Collection.

The collection was developed by Dr. Emmet Field Horine, a Kentucky physician book collector and bibliographer of national note. His collecting interests included medical literature, especially cardiology, prior to 1800. He began his collection of the works of William Harvey prior to 1920 and by 1929 his collection had been exhibited at Louisville's Speed Museum. This collection is of the highest quality including not only Harvey's own work, but books about Harvey and his age. Horine included the work of his predecessors and teachers, his contemporary critics and the history of his discoveries, and his successors. Michael Servetus was one of Harvey's most colorful forerunners and this portion of the collection, although small, emphasizes material on John Calvin, Servetus' executioner. The following works will be on display: De Motu Cordis, anatomical exercises concerning the motion of the heart and blood. Latin edition of 1645, published by Adriaan van de Spiegel of Amsterdam and the English translation of 1673 printed in London for R. Lowndes and M. Gilliflower. De Circulatione Sanguinis: Latin edition of 1660, bound together with De Motu Cordis. De Generatione Animalium, anatomical exercises concerning the generation of living creatures, 1651 Latin edition printed in Amsterdam by Apud L. Elzevirium. Servetus's Christianismi restitutio, a Latin manuscript ca. 1710, in which Servetus incidentally described his discovery of the pulmonary

circulation of the blood. Calvin's Institutes of the Christian Religion, Latin edition of 1654.

HUBBELL, David S., Julian J. DWORNIK, and Lary A. ROBINSON*. University of South Florida College of Medicine, Departments of Anatomy and Surgery, Tampa, FL. Mechanisms of rib injury caused by surgical rib spreaders.

Introduction: The postero-lateral rib-spreading incision is the most used access for lung surgery. Often a rib is fractured inadvertently, which leads to increased post-thoracotomy pain. Object: 1) To demonstrate where the fractures happen most often, and hence where the major stresses to the postero-lateral thorax occur during thoracotomy. 2) To compare the skeletal damage incurred by spreading ribs to: (a) 6 cm, and to (b) 10 cm.

Materials and Methods: 36 standard postero-lateral thoracotomy incisions were made in embalmed cadavers. After the tissues external to the ribs had been divided, each incision was spread at the mid-axillary line to (a) 6 cm then to (b) 10 cm, inspecting at each width. Results: At 6 cm: No rib fractures. At 10 cm: 22 of 36 incisions (61%) had a fractured rib. 15/22 (68%) fractures were oblique, non-displaced, non-palpable, and in the anatomical neck of an adjoining rib, and in an area difficult to inspect during an actual thoracotomy. Conclusions: 1) This study shows that the cadaver can be used to demonstrate sites of skeletal stress and of fractures, although not entirely simulating O.R. conditions. 2) Spreading the ribs to only 6 cm as might be done in a limited or mini-thoracotomy (with or without video-assist) caused no rib fractures.

HÜBNER, K. U., R. Burger, K. ÖHLER, T. SCHÖLLER. Institute for Anatomy, Department of Plastic and Reconstructive Surgery, University of Innsbruck, Innsbruck, Austria. Revascularization after traumatic ear amputation.

Because of its position and prominence the ear is frequently affected by facial trauma. There for, it is important in reconstruction to consider both cosmesis as well as hearing function. Micro-surgical ear-reimplantation has seldom been successful because of the small-sized vessels and the appearance of venous congestion. When injury permits, reimplantation should always be attempted, because the aesthetic results are incomparably better than the conventional repair. If revascularization appears to be ineffective the conventional method of Miadick or Baude should be used.

We present a case discussing the preoperative planning, surgical and post-operative management of the procedure. Anatomical studies of the repair are also presented.

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JENKINS, David B. and Curtis HIGH*. Sections of Anatomy and Oral and Maxillofacial Surgery (OMS), Southern Illinois University School of Dental Medicine, Alton, IL. Nerve blocks: (A collaborative teaching approach.

Our students are introduced to clinical procedures involving; dental injections during the second semester of the second year, a year after they have participated in gross anatomy. Several years ago collaborative teaching involving an anatomist and an oral and maxillofacial surgeon was initiated to further emphasize the applied clinical anatomy. Laboratory exercises at that time were limited to supraperiosteal injections and the inferior alveolar nerve block. This year, to enhance this collaboration and better prepare the student for their first clinical injections, lecture and laboratory components have been expanded to include additional intraoral/extraoral blocks. Following detailed, integrated anatomical and clinical lectures, one and one half hour laboratory sessions with four students provide an opportunity for the anatomist and clinician to demonstrate the pertinent clinical anatomy and injection procedures. Students then load dental syringes and practice injections on the cadavers. Inferior alveolar nerve blocks are performed on a cadaver which is dissected to allow visualization of the syringe needle in relation to the inferior alveolar, lingual and buccal nerves within the pterygomandibular space. This is a modified version of a technique reported previously (Clin. Anat. 8:231-234,1995). Other dissections have been developed to enable visualization of the needle during anterior superior alveolar and V2 blocks and Akinosi and Gow-Gates injections. Following these sessions students are scheduled in the OMS clinic to observe and perform injections on patients. Feedback has been very positive. The same specimens are utilized for sessions with our Advanced Education in General Dentistry residents.

JERGENSON, Margaret A. and John M. BARTON*. Department of Oral Biology, Creighton University School of Dentistry, Omaha, NE. The distribution of TMJ disc perforations in an aging human population.

Perforations of the human TMJ disc are seen commonly in joint dissections. The purpose of this study was to determine the frequency with which they occur, where they occur and what influence age, gender and the presence or absence of dentition may exert. Unilateral and bilateral occurrences were also related to these factors. The cadaver subjects ranged in age from 30 to 99 years. Condyles with the disc in situ were removed from 241 cadavers (482 sides) and the discs separated from the condyles by sharp dissection for examination. Overall, 28% of the discs had perforations. The most common site was the lateral aspect of the intermediate zone followed by the central aspect of that zone. Perforations occurred more often in females (38%) than males (20%). Edentulous individuals had more perforations than the dentulous. Frequency of perforations increased

significantly after age 65. Age, gender, and dentition, or lack thereof, had no significant effect on the unilateral or bilateral occurrences.

JOHNSON, James H., Hugo R. SEIBEL*, Dean X. PARMELEE*, Brenda L. SEAGO*, and Chris L. STEPHENS*, Virginia Commonwealth University School of Medicine, Richmond, VA. Computer administration of a "written" examination in medical gross anatomy: a pilot study.

In order to provide students with exposure to a computerized testing experience similar to that which they will encounter in sitting for the USMLE, as well as to eliminate making and securing paper copies of exams, one exam was administered to first year medical students during the gross anatomy course. Standard faculty-authored multiple choice questions (type A or type K, some involving "case" problems) were presented in random order to each student using an exam program developed in Macromedia Authorware. The program allowed the student to skip questions initially, to "mark" those for review later in the test, and to return to any question and/or to change the chosen answer at any time prior to electronically "submitting" the answers and exiting the program. Time and unanswered questions remaining could be displayed at any time, and the student's score was displayed on the screen immediately following submission. "Output" was compatible with programs normally used for tracking grades and for test item analysis. Testing in 4 groups of 42-45 students was dictated by the numbers of PC's available in the computer laboratory. No significant differences were observed in performance of students in the different groups, nor between users of Windows or Macintosh platforms. Programming enhancements to address students' desire to expedite review of items later in the test by underlining or highlighting parts of the text and by marking out answers they had eliminated are being considered. Faculty had to adjust to earlier question deadlines and to coordinating proofreading with computer center personnel.

KELLER*, Jeffrey T., Ned E. WEINER*, Michael R. CHICOINE*, and Harry VAN LOVEREN*. Department of Neurosurgery, University of Cincinnati, College of Medicine, Cincinnati, OH (sponsored by Richard L. Drake)

Nomenclature of the internal carotid artery: anatomical and clinical considerations

The internal carotid artery (ICA) originates in the neck and begins its ascent to the cranial vault in a direct manner. Its course changes dramatically as it reaches the skull base. After entering the carotid canal, the ICA has an unusually tortuous course. Descriptions of various portions or segments of the ICA are presented in the literature. Fischer (1938) designated five numerical segments, C1-C5; C1 marked the distal ICA while C5 was proximal to the cavernous ICA. Although this was an angiographic study that neither examined nor addressed

anatomical issues, Fischer's classification was adopted by clinicians. In a microanatomical study, we examined the course of the ICA and identified seven distinct segments, C1-C7, numbered in the direction of blood flow. Furthermore, the relationship of the ICA to surrounding osseous, ligamentous, and dural elements changes significantly as it courses in the skull base. Microanatomical and histological examination of the ICA and surrounding region lead us to identify three areas of transition: (1) cervicopetrous, (2) petrocavernous; and (3) cavernous - supraclinoid. This study addresses the concept of ICA segments and identifies transitions of the ICA within the skull base. These issues are discussed in terms of their clinical application.

KIELY, Michael, Adam WILDING*, Nathaniel TUCK*, Jason SCHLIESSER*, Pritesh PATEL*, Joel WEISBERG*, Robert BECK* and Ram GUDAVALLI*. Department of Anatomy, The National College of Chiropractic, Lombard, IL. Analysis of the attachment of the lateral pterygoid muscle in the temporomandibular joint using 3D digitizing morphometrics.

Although previous studies have shown that the superior head of the lateral pterygoid muscle (SLP) attaches to the articular disc/capsule of the temporomandibular joint (TMJ), quantification of this relationship has been lacking. Using a three dimensional digitizing system (OPTOTRAK 5020), the insertion of the SLP to the anteromedial-inferior aspect of the disc/capsule interface in the TMJ was studied. A series of 3D coordinate points were digitized directly on 27 cadaver specimens. Two measurements were made: 1) anterosuperior margin of the disc from its lateral to medial-most extent and 2) length of this margin providing attachment for the SLP. From these data the mean % of attachment of SLP to the margin was calculated. Comparison of these results was made with those previously reported using 2D morphometrics. The data were collected by three observers after a reliability study was conducted. The mean length of the disc margin was 34.77 mm with a range of 26.25 - 41.50mm. The mean length of SLP attachment to this margin was 12.51mm (range: 4.52 - 17.92mm). The average % of attachment of SLP to the disc margin was 36.37% ranging from 13.69 - 51.95%. Comparison of these data with those determined previously using 2D digitizing showed no significant difference (n = 8; P>0.10). Numerically, however, the mean amount of SLP attachment to the disc margin was found to be 5.28% greater using the 3D technique with the larger sample size (n = 27). Since the 3D procedure utilizes one additional parameter and measurements are taken directly on the specimen instead of from photographs, this method may provide greater accuracy. This study showing much individual variation in the amount of SLP insertion onto the disc/capsule interface may have correlation to the influence of this muscle on the disc during function.

KLUEBER, Kathleen M. and Paul D. BENSON*. Department of Anatomical Sciences and Neurobiology, University of Louisville School of Medicine, Louisville, KY. Cytoarchitecture of the motor cortex in long term diabetic mice. Prior research from this lab has indicated changes in myelination of axons within the corticospinal pathway of diabetic mice. Others have described slowing in the conduction velocity along the pathway as well. Damage to axons leads one to question if there are changes to the pyramidal cells of the pathway. The objective of this study was to examine changes within the motor cortex of long-term diabetic mice using electron microscopy. Diabetes mellitus (Type 1) was induced at 4 weeks in female Swiss Webster mice (N=6). Diabetic and control animals were sacrificed for ultrastructural examination of the motor cortex after one year of uncontrolled insulin dependent diabetes mellitus (IDDM). Previous light microscopic analysis of the same cortical region, as well as research on the corticospinal tract in the lumbar spinal cord, demonstrated progressive and significant demyelination and decreased axon diameter within the diabetic corticospinal tract. Light microscopic analysis of the motor cortex indicated decreases in neuronal cell density and cortical thickness within the diabetic cortex. Ultrastructural changes of the pyramidal cells were indicative of degeneration. (Supported in part by NCI Grant #R25 447789-06 and University of Louisville Medical School Research Fund)

KREYER*, Ruth, Sepp POISEL, and Wolfgang DORINGER*. Institute for Anatomy, University of Innsbruck, Innsbruck and Department of Radiology, Feldkirch, Austria (sponsored by S. Poisel). Kinking and Coiling, Case Reports of the Dissecting Course

On three corpses subject to preparation by students we accidentally found rather extraordinary cases of kinking and coiling. By studying the case-histories of the patients we could not find any clinical relevant references to diseases or cause to death called forward by these variations. Case 1: Striking small heart (certified cardiomyopathy since 5 years). Spectacular dilated ascendent aorta. Eye-catching kinking of both common carotid arteries. Kinking of the pulmonary trunk, shortly after its origin. Coiling of the left facial artery. Case 2: Coiling of both facial arteries. Transverse position of the left vertebral artery in its course on the clivus, including kinking. Elongation of the right vertebral artery. Distinct coiling of the basilar artery. Case 3: Coiling of both palmar arches and elongation of the distal radial artery on both sides. In the literature accessible to us (morphological and clinical, respectively) these variations never had been communicated before, especially not in the connections described above. Embryological and genetic aspects as well as clinical relevance are given consideration.

KYALYAN*, Gohar P., Anahit L. ZARGARYAN*. Department of Normal Anatomy; Yerevan State Medical University, Yerevan, Republic of Armenia (sponsored by D. O. GRANNEY)

The surface projection of intercostal nerves on the skin of the abdominal wall for harvest of musculocutaneous flaps.

Increasing use of the rectus abdominis muscle in plastic surgery as a source of musculocutaneous flaps often results in postoperative complications such as, weakness of the abdominal wall and hernia. One of the reasons for these complications is the disturbance of donor region's innervation during flap development. It was the aim of this work to specify the topography of intercostal nerves in the abdominal wall and their precise projection on the skin of relatively visible surface markers. We carried out the detailed dissections of 20 male cadavers of normal constitution. It was shown that the distances from the apex of the xiphoid process down the lateral edge of the rectus abdominis muscle to the projection of the point of entrance of its nerves on average compose up to 7th intercostal nerve- 7.5-7.8 cm., to 8th – 10.5-10.8 cm, to 9th –12.7-13 cm, to 10th –14.3-14.5 cm, to 11th – 15.8-16 cm. The point of the projection of 8th nerve's entrance into rectus abdominis muscle corresponds to the point of intersection of its lateral edge with the constitution of the line from lower edge of 10th rib. On the mamillary line the distance from the edge of costal arch to the point of the projection on the skin of the 9th nerve composes 2.5 cm, 10th-4.1 cm, 11th –6 cm. The points of final sensitive branches' projection of intercostal nerves are situated from the apex of the xiphoid process down the mid line of the abdomen on the distance: for 6th nerve –4.5-5 cm, for 7th-8th –6.1-6.6 cm, for 9th –10.6-11.1 cm, for 10th –13.3-13.8 cm, for 11th- 14.7-15 cm. Internervous communicants are projected on the vertical line which is situated on the distance of 5.6-6 cm from the rectus abdominis muscle's lateral edge. Preoperative marking taking into account the projection points, mentioned above, will allow clearly to border the sector of each intercostal nerve's disposition and to choose for flap's organization suitable fragments with minimal impairment of the innervation of the donor site.

LACHMAN*, Nirusha, Ebrahim A. VANKER* and Kapil S. SATYAPAL. Department of Human Biology, Technikon Natal and Department of Anatomy, University of Durban-Westville, Durban, South Africa. Racial differences of internal thoracic artery morphometry: significance in coronary artery bypass grafting.

The internal thoracic artery (ITA) is extensively used for coronary revascularization. Differences in the morphometry of the ITA between Indian and White groups have for long been recognised. However, accurate

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morphometric data comparing these differences is not found. This study, analysed the morphometry of the left and right ITA's in 62 cadavers (43 Blacks, 2 "Coloured", 9 Whites and 8 Indians). The lengths, and diameters (external) were recorded at the origin, 1st, 4th and 6th costal cartilages. Significant differences in length and diameter on the right and left sides between races were demonstrated. In particular, these differences were marked between the White and Indian groups.

Clinically, these differences can be so marked that in some instances, the left ITA in the Indian patient is too small at the point of take down to be suitable for use as an arterial graft and this has led to the development of the composite graft which combines the known advantages of a sequential vein graft and an arterial conduit.

This appears to be the first study which highlights this racial variation in these groups which confirms clinical impressions

LAMPERTI, Albert and Marvin SODICOFF*. Department of Anatomy & Cell Biology, Temple University School of Medicine, Philadelphia, PA. Introduction of magnetic resonance images into the neuroanatomy laboratory.

For the past three years we have used an interactive computer program as the main tool for the laboratory portion of our Neuroanatomy course. This past year we introduced into the program a highly interactive MRI Atlas that presents a sequential series of images in the coronal, horizontal and parasagittal planes. Students may select any image to study either with or without labels and leader lines. They may also choose to be given leader lines without the labels and, when they think they know the structure, click on the appropriate button to have the label appear. Alternatively, they may choose to have the labels without leader lines and, when they have determined the location of that structure, click to reveal the leader line location. The students are not responsible for the comprehensive listing of all the structures. However, in selected regions of the interactive laboratory sessions, we have incorporated navigation aids to direct the student to an MRI with only a few key structures labeled. For example, in the laboratory session on the Visual Pathways, we will have a coronal MRI with the optic chiasm labeled. In this way we are introducing the students to basic radiological images that are easily interpretable. This has also allowed us to incorporate MRI in the practical portion of our examinations.

LEBONA, Gregory T., and Benson OKOLI*, Departments of Human Anatomy and Neurosurgery, Medical University of Southern Africa, Medunsa, South Africa. Anatomical study of the anterior communicating artery.

The correlation between anomalies of the circle of Willis and cerebrovascular disease is high; it is most outstanding in the anterior half of the circle where

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hypoplasia of an A₁ segment of the anterior cerebral artery has a high rate of association with anterior communicating artery (AcoA) aneurysms (Rhoton & Perlmutter, *Neurol. Res.* 2:1980). This paper reports on the variability of the ACoA in a sample of black South Africans. A total of 320 adult brains (227 male, 93 female) were obtained at autopsy and examined with respect to the presence of the ACoA, its frequency, configuration and size. The ACoA was found in all specimens. In 218 (68.1%), a single trunk was present. In 78 (24.4%), a hypoplastic reticulate network replaced the artery. Duplication was observed in 17 (5.3%) and triplication in 7 (2.2%). The mean length was 2.8 mm (0.3-6.1 mm) and the mean internal diameter was 1.2 mm (0.2-1.8 mm). While the prevalence of a single trunk correlates with that reported in the literature, the overall duplication/triplication rate is considerably lower. Despite the high incidence of residual hypoplasia, no case of aneurysm was encountered. These are preliminary findings which may have important implications for reconstructive surgery involving the ACoA.

LILES*, Kristin L. and Lawrence M. ROSS. Department of Anatomy, Michigan State University, East Lansing, MI. Donor program survey: preliminary results.

Donor programs at U.S. & Canadian medical schools were sent a 38 item questionnaire concerning program operations and policies. A total of 151 questionnaires were mailed and 49 or 32% were returned with data. Among these 49 responding programs, 39 (80%) were department/university based programs. Of the 49 programs, 32 (65%) were department or university supported, (16%) were self-supporting and 5 (10%) were state supported agencies. A mortuary science licensee was a state or university requirement at 17 of the 49 programs; 18 of the 49 indicated a state anatomical oversight board. Other oversight mechanisms included departmental, university, health department or combinations of the above. 64% of responding programs reported an increase in the number of specimens received during 1994-96, and 31% reported female > male specimens received; 85% of the specimens received were willed, 15% were donated. Only 20% of the respondents had accepted unclaimed bodies during the reporting period. Institutions reporting inadequate numbers declined from a high of 26% to 17% during the reporting period. Programs experiencing inadequate numbers compensated by purchasing specimens from other programs and allocating bodies only to required courses. Allocation for research was most often eliminated together with reductions to allied health, postgraduate, surgical skill courses and research. Five (5) respondents indicated a policy of guaranteed acceptance. Funeral home and commercial removal services predominated as the method for specimen removal. Reimbursement vs. non-reimbursement for transportation was evenly split. 30% of the respondents

indicated a procedure of routine testing for viral agents, with HIV and Hepatitis B being most frequently cited, as was immediate cremation in the face of a positive report. Per body cost charged to another institution ranged from \$60-\$1,800. Among the respondents, 37% indicated there was no cost to the donor family, and transportation was the most frequently cited charge category.

LOZANOFF, Scott, David MOODY*, and Beth K. LOZANOFF*. Departments of Anatomy and of Surgery, University of Hawaii School of Medicine, Honolulu, HI, and Division of Computing and Network Services, University of Alberta, Edmonton, AB. Applying texture maps for rendering three-dimensional anatomical reconstructions.

Computerized three-dimensional reconstructions are becoming very popular for communicating spatial relationships in computer-aided learning packages. However, most reconstruction systems can only render smooth surfaces devoid of texture. Our laboratory developed a computerized reconstruction system called SURFdriver for generating three-dimensional models from two-dimensional contours. The program is implemented on both Mac and Windows 95 platforms. Data entry is accomplished using an edge detection algorithm facilitating automatic edge extraction. Using the Visible Human Male (VHM) data set, contours from various anatomical complexes and structures (elbow, kidney, mandible) were extracted. A smoothing function was developed utilizing a LSD algorithm in order to interpolate points within each surface tile. Once accomplished, the DXF export file was loaded into Ray Dream Designer, selected regions of the surface were selected, and the appropriate texture was selected and applied in a sequential fashion around the object. Multiple textures can be applied and manipulated if desired. Results from this study demonstrate a simple three-dimensional reconstruction program useful for smoothing and rendering textured surfaces for computerized anatomical models.

LUDINGHAUSEN, M. v. and M. MIURA*. First Department of Anatomy, University of Wurzburg, Wurzburg, Germany. Anomalies and variations of the extrinsic ocular muscles

Uni- and bilateral anomalies (duplication, triplication, accessory muscular bellies, interrectal muscular bridges) of the rectus muscles of the orbit and several variations of the levator palpebrae muscle were found both in the cadaver of an 84-year-old man which did not exhibit any eye-related diseases, and in two fetuses exhibiting a. prosencephaly and b. Fallot's tetralogy and hexadactyly respectively. An attempt is made to explain these anomalies and variations in the light of developmental and comparative anatomy. It will also be demonstrated how the anomalies would appear in coronal and horizontal sections such as those acquired from CT and MRI.

MacPHERSON, Brian R. Department of Anatomy and Neurobiology, University of Kentucky, Lexington, KY. Utilizing the web for instructional materials: Considerations for design and application.

Effective use of the internet is more than simply scanning class notes and/or diagrams and placing them on a server for universal access. This medium provides an exceptional opportunity to broaden availability of "value-added" course materials which for many reasons may have been previously restricted. A general well-designed site should have few moving distractions. Sophisticated movement - rotational ability, animation, etc. involve downloading various plug-ins. Simplicity and native intuitiveness are among the foremost enhancements an educational site can exhibit. Inclusion of interactivity helps stimulate student involvement and prevent daydreaming or onset of screen-trance. Incorporation of site, or internet, searching capabilities further enhance its usefulness to the student allowing them to use it as a reference tool. Random downloading of these "value-added" materials is now a significant issue and many forms of site security, from simple to highly complex, are being installed world-wide. Highly interactive and informative web pages/sites can easily incorporate the majority of these features by using software programs designed for this purpose. The sophistication and ease of use of these programs is rapidly evolving and enables the beginner to quickly produce an HTML-based site.

MacPHERSON, Brian R., David PECK, Kathryn M. WONG-RUTLEDGE*, Derek EGGERS*, Scott McDONALD* & Matt HAZZARD. Anatomy & Neurobiology and University Arts & Photography, University of Kentucky Medical Center, Lexington, KY. A web-based dissection tutorial for the perineum.

The perineum is a clinically important region that is difficult to dissect effectively in time-restricted curricula. The area is frequently approached by pelvic hemisection and/or the use of prosections. A deteriorating collection of prosections stimulated the development of an alternative, more time-effective and interactive method of understanding the anatomical relationships of the area. This computer-based tutorial allows the students to select one of 5 dissection levels, in sequence or randomly. Each level is accompanied by a labelled line diagram and comprehensive descriptive text, a correlating close-up photograph of the dissected level at the 0° X and Y axis, a rotatable (30° anterior to 60° posterior and 30° left or right) dissected image and a narrated movie covering the features of each dissection level. A *Magellan 1000* QuickTime VR® Object Rig was used to photograph each level at 5° increments. Bulk scanning of the 35mm slides, QuickTime VR® Object Digitizing software and RealVR® Xtra organized the images into a plug-in to Macromedia Director®.

The tutorial is web-based but is also available as a stand alone CD. We beta-tested the program in several student groups (medical, PA and PT). Results from these evaluations indicate the program provides an interactive environment that effectively stimulates independently-paced learning of a difficult anatomical region.

MARKS, S. C., JR.¹ and F.C.T. VOON^{1&2}. Department of Cell Biology, University of Massachusetts, Worcester, MA USA¹, Department of Anatomy, National University of Singapore, Singapore². Anatomy and anatomists in an information age.

Understanding changes in other fields can give insight into one's own. Information technology, cost accounting, decreasing curricular time and increasing emphasis on alternative educational methods are transforming education. Lessons from recent changes in other businesses suggest that medical education is also changing with emphasis on technology - driven, learner-centered information resources. We believe that for anatomists the questions are when to teach what anatomy by whom, or when to learn what from where/whom? Concerned teachers of anatomy will work toward 1. understanding the different ways anatomy is taught, learned, evaluated and used, 2. understanding 3-dimensional learning including the role, if any, of dissection and when/where it should occur, 3. the horizontal integration of anatomy throughout medical education and health care (different content and emphases for different groups), and 4. the development of a responsible and responsive cyber university. Assurance of information quality, one antidote for information overload, is rare on the world wide web and may be one way in which expertise in the AACA can have widespread influence.

MATTINGLY*, Mark, Richard E. DEAN, and Rexford CARROW. Department of Surgery, Michigan State University, College of Human Medicine, East Lansing, MI. Problem based anatomy for the surgical resident.

Graduating medical students who enter surgery residencies frequently have limited anatomic experiences during their undergraduate training. Throughout the five years of surgical training residents are exposed to the anatomy as it relates to the operative procedures performed. Frequently, however, many of the complex anatomic areas of the body escape the experience of a surgery resident in training. The American Board of Surgery requires that surgeons have comprehensive experience in problems located in the head and neck, chest, abdomen, pelvis and extremities. In an effort to provide an experience in the critical anatomic areas, the MSU Integrated General Surgery Residency developed a problem based anatomy course, which focuses on some of the most

difficult anatomic areas which surgeons are expected to provide life saving procedures.

A program was developed which would present a series of clinical scenarios focusing on critical anatomic approaches and related structures in the head and neck, thorax, abdomen, pelvis, perineum, upper extremity and lower extremity. The program involved 60 individual clinical scenarios, each requiring specific dissections. The course was directed by a surgeon and anatomist with the discussion focused entirely on surgical approaches, related anatomic structures and the options of therapy. The course has been taught for two years with great success. The program is now being extended to all affiliated general surgery residencies in the MSU system.

A problem based anatomy course has been developed which addresses many of the complex, anatomic areas, in which surgeons are expected to provide safe operative intervention. A problem based approach has provided opportunities for surgical residents to consider operative approaches necessary to perform procedures in a safe competent manner. The success of this approach would lend credence to expanding its utility to other specialties and even medical student training.

MORIGGL, Bernhard F., Erich R. A. BRENNER, Florian N. STADLER, and Peter KOVACS. Institute of Anatomy, University of Innsbruck, Innsbruck, Austria. Anatomic study on the (extrapelvic) inferior gluteal artery (IGA) and sciatic nerve (SN): basics for and first experience with ultrasound evaluation.

Among other reasons (pseudo)aneurysms of the IGA may cause atypical sciatica due to its close relationship to the SN. This study was undertaken in order to get anatomical details for ultrasound evaluation of the IGA and SN aiming at an early, non-invasive diagnosis. A total of 94 gluteal regions (48 male, 46 female) from 49 cadavers of adult individuals were dissected macroscopically. Location of the trunk of the IGA within the "infrapiriform foramen" was referred to a line connecting the posterior superior iliac spine with the "tuberosity point", TP (88,3% medial/6,4% on/5,3% lateral to that line) and relative to the SN, respectively. The caliber of the IGA was measured immediately prior to division (mean diameter 4,4 mm), in case of SN penetration (6,4%) at that very place too (4,7 mm). In 4,3% of cases only a branch (2,7 mm) of the IGA penetrated the SN. The posterior femoral cutaneous nerve was pierced by an IGA-branch in 21,3% of specimens. Except for the TP-trochanterion (TROCH) distance ($p < 0,001$) no statistically significant sex or side differences could be evaluated. In view of a quick tracing of the SN by means of sonography, its location between TP and TROCH was determined. In addition, five healthy test persons have been sonographically investigated so far using a color-flow-imaging system. Our first

experiences allowed exact determination of above mentioned relationship of IGA and SN, thus indicating a promising new investigation technique in this area.

MUNTAN*, Charles D., Michael J. SUNDINE*, and Richard D. RINK*. Division of Plastic and Reconstructive Surgery, University of Louisville, Louisville, KY. (sponsored by R.D.ACLAND). The inframammary fold: a histological appraisal.

The inframammary fold is a defining element in the shape and structure of the female breast. It should be preserved whenever possible in ablative procedures, and re-created accurately when the breast is reconstructed following mastectomy. To date, there is no accurate anatomical description of this important structure. Previous studies have suggested that the fold is produced by a supporting ligament. This has been described as running from the dermis in the region of the fold to a variety of locations on the rib cage. Our clinical experiences in both augmentation mammoplasty and breast reconstruction have failed to confirm the existence of this ligamentous structure.

To define the morphology of the inframammary fold, we studied ten female and two male cadavers. The anterior chest wall from the mid-sternal line to the middle axillary line was removed en bloc and frozen in the upright position. Parasagittal sections were made of the inframammary fold region, with the chest wall intact. The ribs were decalcified, and thin sections were stained with Gomori trichrome stain using standard histological techniques. On light microscopic examination, a demonstrable ligamentous structure of dense regular connective tissue was not seen in the fold region in any of the twelve specimens. A deep investing layer of fascia was uniformly found over the pectoralis major and serratus anterior muscles. This fascial layer was connected to the dermis in the region of the inframammary fold in a variety of configurations. In some cases, the deep fascia fused with the superficial fascia at the level of the inframammary fold. In other cases, bundles of collagen fibers, arising from both superficial and deep fascial layers, were found to insert into the dermis at the inframammary fold and/or slightly inferior to it. These collagen bundles were observed consistently from the sternum to the middle axillary line. These were distinct from the suspensory ligaments of Cooper which are seen more superiorly in the glandular tissue.

By defining the anatomy of this important structure, we hope to improve the outcomes for patients who are treated for breast absence, hypoplasia, deformity and asymmetry.

NAGY, Frank, Jane N. SCOTT*, Dan NOLAN*, and Kim WARREN*. Department of Anatomy, Department of Obstetrics and Gynecology, and Clinical Research Center, Wright State University School of Medicine, Miami Valley

Hospital and Grandview Hospital, Dayton, OH. Multiple congenital defects in a stillborn fetus from a mother known to consume large volumes of alcohol during pregnancy

A 20-week fetus was terminated as a result of a therapeutic abortion subsequent to a diagnosis of renal insufficiency; the immediate cause of death was listed as renal agenesis. The mother's history indicated the consumption of at least one six pack of beer per day during her pregnancy. The fauces appeared unremarkable and the typical facial features of a fetus suffering from FAS were not evident. A large cystic structure in the immediate vicinity made the external genitalia ambiguous although a penis appeared to be present. The urethra was obstructed and a fistula was present between the hindgut and cloacal region; the anus was imperforate. Remaining structures of the G.I. tract seemed to be normal. An enlarged left kidney was completely cystic while the right was absent. Suprarenal glands were identified on both sides and appeared to be normal. Structures and relations in the thorax and cranium were unremarkable and no digital deformities were observed.

NIEDER*, Gary L., and Jane N. SCOTT* (sponsored by Frank NAGY). Department of Anatomy, Wright State University School of Medicine, Dayton, OH. Using QuickTime VR in computer-assisted instruction of gross anatomy: Yorick the VR Skull.

QuickTime VR is a software technology which creates, on a normal computer screen, the illusion of holding and turning a three-dimensional object. QTVR is a practical photo-realistic virtual reality technology which is easily implemented on any current personal computer or via the Internet with no special hardware requirements. We reasoned that QTVR can provide a more realistic presentation of anatomical structure than two dimensional atlas pictures and allow observation of specimens outside the dissection lab. We created QTVR objects from various anatomical specimens, including the skull, which we have incorporated into a self-learning program. To obtain images, the bones of the skull were mounted on a rotating table, while a digital camera was positioned on a swinging arm so that the focal point remained co-incident with the rotational center of the object as the camera was panned through a vertical arc. Digital images were captured at intervals of 10° rotation of the object (horizontal pan). The camera was then swung through an arc with additional horizontal pan sequences taken at 10° intervals of vertical pan. The images were edited to place the object on a solid black background, then assembled into a linear QuickTime movie using Adobe Premier. The linear movie was processed with Apple's QTVR development tools to yield a QTVR object movie which can be manipulated on vertical and horizontal axes using the mouse. QTVR movies were incorporated into an interactive environment, created with Macromedia Director, which

provided labeling, links to text-based information and self-testing capabilities. The accompanying demonstration shows the resulting QTVR-based program Yorick: the VR Skull during development, the program was used in our medical gross anatomy course. Student feedback by survey indicated that QTVR-based programs are an effective learning tool.

NORTON, Neil S., James R. McCONNELL*, Manuchair EBADI*, and Jorge F. RODRIGUEZ-SIERRA*. Department of Oral Biology, Creighton University School of Dentistry, and Departments of Radiology, Pharmacology, and Anatomy, University of Nebraska Medical Center, Omaha, NE. Lack of neuroprotection by NBQX in thioacetamide-induced fulminant hepatic encephalopathy in the rat.

The clinical syndrome fulminant hepatic encephalopathy (FHE) is characterized by a cascade of neuropsychiatric and motor dysfunctions. We have observed neurodegeneration in the CA₁-CA₂ sectors in the terminal stages of FHE. The purpose of this study was to investigate whether the administration of NBQX would decrease the neurodegeneration observed in the hippocampus in rats with FHE. The animals were divided into four groups: 1.) treated with thioacetamide (600 mg/kg) and NBQX (30 mg/kg) via i.p. injection at hours 0 and 24; 2.) treated with only thioacetamide (600 mg/kg); 3.) treated with only NBQX (30 mg/kg); 4.) treated with only saline. All animals were sacrificed at Stage IV of FHE, or the equivalent times. Quantitative morphometric analysis was used to examine the severity of the damage to the hippocampus using a cell counting procedure. The first section was taken at -2.3 Bregma. The next two sections were taken at 50 μm intervals following the first and stained with hematoxylin and eosin. The number of normal and pathological pyramidal cells in the was analyzed by projecting the sections at a magnification of 100X onto a transparent test lattice using a microscopic image projector and counting the number of normal and pathological pyramidal cells in the section. The results were expressed as the percentage of normal or pathological neurons/mm² based on the total number of neurons counted. A one-way analysis of variance (ANOVA) with a Newman-Keuls post-hoc test was performed to evaluate the statistical differences between groups. No changes in the structural integrity of the pyramidal cells were noted in controls or group treated only with NBQX. Neuronal damage was observed in the CA₁ and CA₂ regions of the hippocampus in the thioacetamide treated group. The group treated with thioacetamide and NBQX did show less neurodegeneration than the thioacetamide group, but the difference was not significant. These results suggest that NBQX does not significantly alter the necrotic changes that occur in the pyramidal cells of the CA₁ and CA₂ regions of the hippocampus in Stage IV of FHE in rats.

OXBERRY, Brett A. and Marvin SODICOFF*. Department of Anatomy and Cell Biology, Temple University School of Medicine, Philadelphia, PA. Comparative effectiveness of a computer-based laboratory exercise versus a microscope-based laboratory exercise in helping students learn to identify developing blood cells found in bone marrow.

The objective of this study was to evaluate the relative effectiveness of a computer-based laboratory exercise in helping medical students learn to identify developing blood cells found in bone marrow when compared to a traditional microscope-based laboratory exercise. Bone marrow smear slides from the student slide boxes were photographed to create a collection of 35 mm color slides. Selected slides were digitized and incorporated into a computer program. All students attended two hours of lecture on Blood and Blood Development immediately followed by two hours of faculty supervised, laboratory study. During the first hour of lab, all students used their microscopes to study peripheral blood smear slides. During the second hour of lab, one group of 32 students used only the computer program to study developing blood cells found in bone marrow while the remaining 47 students used only their microscopes and bone marrow smear slides. Both groups then took a practical exam in the lecture hall. The exam utilized projected 35 mm color slides from the previously created collection and asked the students to identify developing blood cells found in bone marrow. Statistical analyses showed that the performance of the computer group was significantly better than that of the microscope group.

OXNARD*, Charles, and Alanah BUCK*. Department of Anatomy and Human Biology, University of Western Australia, Nedlands, WA. Australia. (sponsored by D. O. GRANEY). Some complexities of vertebral cancellous bone as revealed by the combination of Fourier and multivariate morphometric analyses.

Overall vertebral body size seems to be associated with impressed mechanical loads; both increase monotonically from the upper thoracic to the lumbar regions. Vertebral body cancellous bone seems to vary in a more complex way and in addition differs markedly with sex, age and in conditions such as osteoporosis. Cancellous bone patterns can be revealed using Fourier transforms combined with multivariate statistical analyses. In this study, this combination of techniques was used to analyze radiographs of sagittal sections of the second lumbar vertebra in 27 males and 33 females of varying ages (16-88 years) and of radiographs of thick parasagittal sections in 7 complete thoraco-lumbar columns in 4 young and 3 old males. Computational Fourier transforms show clear visual differences in cancellous patterns (a) in different quadrants in the vertebral body, (b) between the sexes, (c) with different aged individuals, and (d) in relation to osteoporosis. Multivariate statistical examinations of the Fourier data using principal components and canonical variates not only provide statistical

validity but also demonstrate additional differences (a) amongst the very oldest subjects, (b) within females around the time of the menopause and (c) between the sexes at even the youngest ages. These additional data also emphasize special features of the anterior superior quadrant of the vertebrae evident in some females as young as 25 years. They may be relevant both to the question of early diagnosis of osteoporosis and to the fractures that complicate the late disease. "(Sponsored by funds from the Australian Research Council, the National Health and Medical Research Council of Australia and the Centre for Human Biology, University of Western Australia)".

OXORN, Valerie*, AGUR, Anne, and Nancy MCKEE*, Departments of Anatomy and Cell Biology, Surgery, and Biomedical Communications, University of Toronto, ON. Resolving discrepancies in image research: The importance of direct observation in the illustration of the human soleus muscle.

A historical analysis of fourteen published illustrations of the soleus muscle from the sixteenth to the twentieth century reveals obvious inconsistencies in the representational accuracy of the architecture of the muscle. To ensure the most accurate illustrations possible, biomedical communicators should conduct direct laboratory observations. A review of reference images alone is insufficient for assuring anatomical accuracy. Having followed this protocol, three architecturally distinct regions of soleus were observed and illustrated and the final results suggest that soleus is a complex multipennate muscle with significant architectural characteristics not typically represented in published illustrations.

PARK*, Adrian. Department of Surgery, University of Kentucky, Lexington, Kentucky (sponsored by J. HOLSINGER). Advanced laparoscopy of the retroperitoneum and spleen: new anatomic perspectives.

Recent advances in Laparoscopic Surgery (L.S.) have brought with them dramatic improvements in patient outcomes across a wide range of operative procedures. In various studies comparing perioperative data between open surgery (O.S.) and L.S. patients undergoing for e.g. herniorrhaphy, splenectomy, colectomy; L.S. patients had shorter postop stays and fewer complications than O.S. patients. This may result from enhanced visualization of the operative field, magnified image and greater access to the target anatomy afforded by the laparoscope. Moreover, the trauma and extent of the dissection required to perform the operation is more limited and focused. This new clarity and magnification of the anatomy, rarely seen in O.S., has created new challenges for the laparoscopic surgeon. Investing layers, ligaments and branch vessels, now apparent, must be recognized and appropriately left, incised or dissected. Novel L.S. approaches to various structures require immediate orientation and

recognition by the surgeon, often necessitating relearning of the anatomy. In this study five years of experience in advanced laparoscopic procedures of the retroperitoneum and spleen will be reviewed. Specifically, lessons learned in orientation to and identification of relevant gross anatomy from various laparoscopic approaches will be presented.

PARKE, Wesley W., Harry E. SETTLES, Paul C. BUNGER, and Suleman SAID*. Department of Anatomy and Structural Biology, University of South Dakota School of Medicine, Vermillion, SD. Lumbar anterolateral spinal arteries and other "accessory" longitudinal arteries of the spinal cord.

The lumbar anterolateral spinal arteries (LALSA) were studied in fourteen injected human lumbosacral spinal cords. Contrary to many previously published opinions which claimed that virtually all of the formerly described "accessory" longitudinal arteries of the vasa corona were too inconstant to be of significance, the LALSA, in this series, were reliably present bilaterally and averaged a length of 8.4 cm. They ran in the acute angles formed by the emergence of the fascicles of the lumbosacral anterior spinal nerve roots, and in this position, served as the origin for most of the proximal radicular arteries that supply the cranial half of the motor roots of the cauda equina. A review of the literature and analyses of other accessory longitudinal spinal arteries revealed that two other pairs of accessory spinal vessels, the lateral cervical spinal arteries (LCSA) and the lateral spinal arterial axes (LSA), have a demonstrable functional role and were sufficiently constant, along with the LALSA, to warrant their inclusion in detailed descriptions of human spinal cord vasculature.

PEDALINO* , Ron, Essy WHITERU* , Mohd, MOINUDDIN* , and Mak KHAN. State University of New York, Departments of Medicine & Anatomy; HSCB, Brooklyn, NY; Baptist Memorial Hospital, University of Tennessee, Memphis, TN. The subclavian steal syndrome: an appraisal

The subclavian steal syndrome (SSS) results from occlusion or stenosis of the subclavian artery proximal to origin of the vertebral vessel causing retrograde flow in the ipsilateral vertebral artery. The most common etiology is atherosclerosis but cases have been associated with congenital cardiac defects, arteritis and metastatic carcinoma. Cases of coronary SSS associated with the use of internal mammary arteries for bypass grafting are increasing. In this phenomenon, the subclavian artery at the origin of the grafted internal mammary is stenosed, promoting retrograde flow through the internal mammary artery. Most patients with the syndrome are asymptomatic. Symptomatic patients, however, present with syncope, claudication and paresis of upper limb, vertigo, ataxia, dysarthria, transient paralysis and visual disturbances. The latter two symptoms are indicative of coexisting carotid disease. Patients with coronary steal usually present with angina pectoris.

ABSTRACTS

However, signs of the syndrome include cervical bruits, a brachial systolic pressure difference of at least 20 mmHg, diminished pulses and muscle wasting. Investigative studies include arteriography, duplex sonography and magnetic resonance angiography (MRA). Surgery restores permanent anterograde flow in the vertebral arteries and ameliorates syndromes. The common surgical procedures, include carotid subclavian bypass or carotid subclavian transposition, axillo-axillary bypass, and bypass using the contralateral subclavian or axillary artery. Angioplasty is also used, but long term patency rates are lower compared to the above mentioned extra anatomic bypass procedures. This paper will highlight the statistical evaluation of the signs/symptoms, surgical procedures and other important facets of this common disorder.

PERCAC, Sanja. Department of Anatomy, University of Zagreb School of Medicine, Zagreb, Croatia. Clinical case discussions in anatomy: Who are the best facilitators?

Clinical Anatomy is a problem-based interdisciplinary course that students take in the second year after they have passed a traditional dissecting anatomy course. Composed of case discussions, radiology sessions and a few lectures Clinical Anatomy serves as a bridge from basic sciences to clinical clerkships. Case discussion facilitators are clinicians from medicine, surgery and gynecology departments and anatomists. The aim of this study is to compare teachers from different departments using student evaluations and final exam scores. 253 students (98%) completed evaluation forms. All teachers received excellent evaluations and there was no statistically significant difference between any two departments. However, students taught at the Anatomy Department gave the whole course a statistically higher grade than students taught by clinicians. At the end of the course students take written examination where the questions are divided in five sections according to regions of the body. The medicine department produced the students with the best overall scores, closely followed, in order of success, by departments of anatomy, gynecology and surgery. The difference is not statistically significant except for the scores on the extremity section. The results of this study show that clinicians from every department and anatomists are equally successful in facilitating clinical case discussions in anatomy.

PHAM*¹ Gia Liem and Dzung H. VU ². ¹Eurokios, Paris, France, ²School of Anatomy, University of New South Wales, Sydney, Australia. The use of touch screen in anatomy computer-assisted instruction programs.

Touch screen has been successfully used in computer information display in public places because it is more convenient and more intuitive than mouse or

keyboard. However, it has not been used much in computer-assisted instruction (CAI). All interactive CAI programs require learners to perform two coordinated movements: i) moving the mouse to place its indicator over a button on screen, and ii) click on a mouse button. The use of QuickTime VR © facilitates learners' three-dimensional visualization by giving them the ability to rotate an object on the monitor screen in all directions. This rotation is controlled by an unnatural movement: holding down a mouse button and moving the mouse in the desired direction while looking at the screen. Touch screen would allow learners to press a button or push an object on screen with their fingers, a much more intuitive method than using the mouse which is outside one's visual axis. Our touch screen can be simply attached in front of any existing computer monitor and can be easily adapted to any software by adding a driver. It obviates the need for a mouse or keyboard and provide a more intuitive interactivity in CAI programs. It can also be useful in group presentations using large screen television display or data projectors. Trial is under way in our computer teaching laboratory to assess the advantage of touch screen over mouse input.

PIETRASIK, K.(1), Beata LAKOMIEC*(2), Marek MOLSKI*(3), and Bogdan CISZEK(1), .(1) Department of Anatomy, University Medical School of Warsaw; (2) Department of MRI Analysis, Brodno Hospital, Warsaw; (3) Department of Plastic Surgery, Medical Center of Postgraduate Education, Orłowski Hospital, Warsaw, Poland. Morphology and morphometry of the styloid process of the radius

Morphology of the styloid process of the radius may play an important role in some pathologies of the hand. Long styloid process coming into contact with scaphoid bone or trapezoid bone may significantly limit abduction in the radiocarpal joint. Appropriate anthropomorphic measurements were performed to determine actual and relative length of the styloid process in respect to previously set orientation points. 30 NMR images of the hand in "normal anatomical" position and the same number in submaximal abduction were analyzed with the aid of computer image analyzing system. Two main parameters were evaluated: length of the styloid process and percent of its congruence to the navicular bone. On the basis of gathered data we conclude that morphology of the styloid process of the radius and especially its length, may be responsible for some clinical complaints. Additionally, we state that NMR is a very good method of visualization of soft tissues and bone structures of the distal forearm.

PORTA, David J.^{1,2}, Stephen J. FRICK², Tyler A. KRESS³, and Peter M. FULLER². ¹ Department of Biology, Bellarmine College, Louisville, KY. ² Department of Anatomical Sciences and Neurobiology, University of Louisville

ABSTRACTS

School of Medicine, Louisville, KY. ³ Engineering Institute for Trauma and Injury Prevention, University of Tennessee, Knoxville, TN. Transverse, oblique, and wedge fracture patterns: variations on the bending theme.

In order to better define human tolerance to trauma, and document the anatomical effects of said trauma, fracture experiments were performed on the long bones from cadavers bequeathed to a medical school. Over 300 geriatric long bones have been fractured to date. The focus of this paper is on the resultant patterns of fracture. Specimens were subjected to pure bending forces via two different 3-point loading set-ups. In both cases, the impactor was a 4.75 cm diameter instrumented steel pipe. In one set-up, the epiphyses were supported by concrete blocks while the mid-diaphyseal region was impacted by the pipe swung manually at approximately 5 m/s. In the second set-up, the pipe was connected to the front of a 50 kg impact cart which was propelled into the specimen at an average velocity of 7.5 m/s. After fracture, the periosteum was stripped from the fragments and minute fracture lines were noted. The lines consistently emanated from the surface of the bone in tension during the impact (the bone surface opposite of the impact site). Various fracture patterns resulted depending on which of these "tension lines" extended the full circumference of the bone. Thus, transverse, oblique, and wedge (a.k.a. butterfly or delta) fracture patterns, as well as various comminuted permutations, were all produced experimentally during *pure bending* impact studies. Previously, it was thought that an oblique fracture resulted from the combination of bending and torsion. This research indicates that the oblique pattern can be expected from bending forces alone.

PORTA, David J.^{1,2}, Stephen J. FRICK², Tyler A. KRESS³, and Peter M. FULLER². ¹ Department of Biology, Bellarmine College, Louisville, KY. ² Department of Anatomical Sciences and Neurobiology, University of Louisville School of Medicine, Louisville, KY. ³ Engineering Institute for Trauma and Injury Prevention, University of Tennessee, Knoxville, TN. The fine points of spiral fractures.

In an effort to gain a better understanding of the fractures that result from torsional forces, geriatric human cadaver long bones (over 50 femurs and tibias to date) were subjected to relatively pure torsion by a simple machine. The machine was constructed so as to eliminate axial or compressive loading and very nearly eliminate all bending forces. All of the fractures that occurred in the shaft of the bones were true spirals- a helical fracture line (running roughly at a 45° angle to the long axis) that extended at least 360° around the bone and whose end-regions were connected by a longitudinal fracture. This simple fracture resulted in only 2 fragments that were often *hinged* together by the periosteum at the longitudinal fracture line. Experimentally produced spiral

fractures were fairly smooth compared to non-torsional fractures and they rarely comminuted. There were three notable variations of the spiral fracture pattern. 1) Often the helical fracture line extended, sometimes several centimeters, past the longitudinal hinge at one or both ends. 2) Occasionally, a second longitudinal fracture line developed parallel to the other. This gave rise to a third fragment which was roughly rhomboid-shaped and could potentially be confused with a wedge-type fragment. 3) In the rare cases when torsion resulted in a fracture in the epiphysis, the angles of the helical and longitudinal components were greatly altered such that the pattern nearly approximated an oblique fracture.

RIBAS*, G. C. and A. J RODRIGUES, JR. Department of Surgery, Faculty of Medicine, University of Sao Paulo, Sao Paulo, SP, Brazil. 3-D Anatomy of the cerebral sulci and ventricles.

Three dimensional views of fixed brain dissections are presented through projections of stereopaired slides. Each stereopair is composed by a picture obtained from the right side and by another picture obtained from the left side of a still dissection specimen, according to 3D conventional photography techniques. The images were obtained both with macrolenses and through two cameras attached to a surgical microscope. The main purpose of this technique is to use it as a teaching tool for graduate and post-graduate students. The dissections intend to be particularly surgically oriented, in the sense of being able to show the neural structures mainly from the cerebral spinal fluid (CSF) spaces. The main sulci of the brain surface are then presented as extensions of the subarachnoid space, and the ventricular cavities as chambers delineated by the surface of the inner structures. Spatial relationships between the depth of these main sulci and its closest ventricular portion are emphasized considering the fiber bundles in between these CSF spaces, and having as its aim the understanding of the main deep microneurosurgical approaches.

ROBINSON, Clive M*,and Joao MOTA*. University of Kentucky Medical Center, Section of Cardiothoracic Surgery, Lexington, Ky. (sponsored by J. HOLSINGER). Surface Anatomy Concepts Form Basis of Minimally Invasive Cardiac Surgery.

For access, spatial and technical requirements, cardiac operations have traditionally been completed using full median sternotomy with wide separation of the sternal edges. Stimulated by healthcare cost constraints and demands for expedient recovery, minimally invasive surgical methods have emerged. These include small incisions and where feasible, routine dispensing with cardiopulmonary bypass. Such methods are based on surface anatomy for localization of new approaches to underlying cardiac structures. As well, there

has been evolution in thoracoscopy, ergonomics, augmentation of visual and motor aspects of surgical coordination and advances in miniaturized articulating robotic instrumentation. Methods of coronary artery grafting include thoracoscopic internal mammary artery dissection with grafting of the left anterior descending and right coronary artery via 5cm parasternal incisions and posterior descending artery grafting with the gastroepiploic artery using a small subxiphoid incision. Surface anatomy of the cardiac valves enables similar direct or imaged access to these structures via right third intercostal space incisions or partial sternotomy. These developing techniques are expanding and clinical results show lower cost and more rapid return to gainful activity.

RODRIGUES, A. J. JR., C. J RODRIGUES, and G. C. RIBAS*. Department of Surgery, Faculty of Medicine, University of Sao Paulo, Sao Paulo, SP, Brazil. Surgical Anatomy of the inguinal region.- a 3-D vision

Modern herniology applied to the treatment of inguinal hernia is bringing some new challenges: it is, recently, being discussed the particular role of extracellular matrix upon groin hernia genesis; it is under evaluation the impact of the utilization of prosthetic meshes on surgical practice and many trials are designed to answer what could be surgeon's choice between classic or laparoscopic way of surgical correction. To all these changes it must be added to the classical statement by Condon (1978): " the anatomy of the inguinal region is misunderstood by some surgeons at all levels of seniority". As a contribution to this statement we revisited the inguinal anatomy babel by displaying a 3-D vision. A classical anatomical inguinal region dissection was performed in a normal male fresh cadaver and a through projection of stereopaired slides was applied. Each stereopair is composed by a picture obtained from the right aspect and another one from the left aspect, both focusing the same structure. Each image was obtained by macrolenses.

We applied this anatomical set to medical graduating students and residents in surgery and assistant professors and it was possible to assume that this conception clearly contributed to understand anatomical structures, inguinal hernia classification and the correct placement of prostheses. We concluded that when you are dealing with a complicated stratigraphy, as it occurs in the inguinal region, the best way to understand it, is an spatial displaying brought by the 3-D vision.

RODRIGUES, C. J., M. C. SHIH*, and A. J. RODRIGUES, Jr. Department of Surgery, Faculty of Medicine, University of Sao Paulo, Sao Paulo, SP, Brazil. Age-related changes of the collagen and elastic fibers of the corpora cavernosa in men.

ABSTRACTS

The erectile dysfunction has a multifactorial etiology. Some reports has been showed changes in the collagen and elastic fibers in the tunica albuginea or reduction of smooth muscle and increase of collagen in the corpora cavernosa. It has been know that the extracellular matrix of any parts of body either was composed by elastic fibers system that promotes the elasticity of the tissues. However, we should remember that the integration of the elastic fiber system with collagen fibers is an important factor for the maintenance of normal tissue resistance. In order to evaluate the collagen and elastic fibers, specimens of the corpora cavernosa was obtained from 17 cadavers, ages ranging from 1 month to 83 years. The amount of the elastic fiber was determined by linear density in different stains for elastic fibers: Weigert's stain for mature and elaunin elastic fibers and Weigert's stain with oxidation for mature, elaunin and oxytalan elastic fibers. The amount of collagen was evaluated by colorimetric analysis. We demonstrated a significant negative linear correlation between age and elastic fibers, and we showed a significant positive linear correlation between age and amount of collagen. We concluded that there are great increase of collagen and decrease of elastic fibers in the corpora cavernosa with age. Thus, altering the composition of collagen and elastin or changing the architectural arrangement certainly the tissue compliance was compromised and this promoting a deterioration in the erectile function.

RODRIGUES, C. J. and , A. J. RODRIGUES Jr. Department of Surgery, Faculty of Medicine, University of Sao Paulo. Sao Paulo, SP, Brazil. Brazilian experience in Clinical Anatomy teaching.

In the last four years, it was introduced at Sao Paulo School of Medicine, the PBL in clinical anatomy teaching. The course is offered to second year graduating medical students. One particular attention was paid to integrate sectional anatomy studying. The purpose of the course is to introduce the students on clinical skills, nomina medica, anatomical bases of physical examination and clinical anatomy.

Method: The course ranges for the first six weeks of the second-year of medical graduation, involving 40 hours of structured activity per week. The program is divided per week in modules: Thorax, Abdomen-Pelvis, Head and Neck, and Clinical Neuroanatomy. At each week, one specific module, the students discuss ten different cases, scheduled as PBL. The classes include an expositive explanation, forty minutes, about the major clinical skills, as for example: the physiopathology of abdominal pain, anatomical vision through optical instrumentation, laboratory and imaging examinations. The students discuss each case and are challenged to answer clinical questions by reviewing anatomical aspects displayed on previous dissected specimens. The pertinent sectional anatomy correlation is taught by using a self-learning CD-ROM

program and by handling plastinated flat chamber specimens. This course format was each year evaluated by an educational board questionnaire. The results evidenced a gratifying adhesion of the students to the program and clearly has brought the interest in clinical examination during the clerkship.

RODRIGUES, C. J., U. TANNURI*, A. C. TANNURI*, L. T FIGUEIRA*., and A.J. RODRIGUES, JR. Department of Surgery, Faculty of Medicine, University of Sao Paulo, Sao Paulo, SP, Brazil. Purpose to histomophometric evaluation of pulmonary hipertension.

We previously investigated the structural and functional immaturity of the lungs associated with congenital diaphragmatic hernia (CDH) in rabbits. The CDH lungs showed elevated glycogen concentration, indicative of immaturity, decreased amount of elastic fibers and increased amount of collagen, that promotes low pulmonary compliance of the CDH. Some studies described pulmonary hypertension with proliferation of the media arterial layer. In our study we demonstrated any significant difference of the vessels thickness from control and CDH lungs, verified under histological routine slices. The purpose of the present study was to develop a method that could demonstrate both smooth muscle cells and elastic fibers framework in the vessels' walls. Our results are based on specimens fixation with formalin and impregnation with Histoiresin; staining by Weigert in 1µm thick sections, for elastic fibers, and by Hematoxylin for smooth muscle nuclear profiles. Evaluation was by histomorphometrical analysis for amount of elastic fibers, number of muscle cells and thickness of the vessels under computer-assisted program (Optimas) with personal macro routine. We concluded that it is easy to evaluate pulmonary hypertension by using this methodology.

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RODRIGUES, A. J. JR., C. J. RODRIGUES, , R. TERRA*, and C. POPLER*, Department of Surgery, Faculty of Medicine, University of Sao Paulo, Sao Paulo, SP, Brazil. Anatomical study of venous architecture at the space of Bogros by pre-peritoneal approach.

In 1823, Bogros described a new approach for the ligation of the epigastric artery. The result of this study was an accurate anatomical description of what would be later called the " space of Bogros". The actuality of this space is that it is through the space of Bogros that pre-peritoneal inguinal hernias will emerge. Vessels, nerves and pre-peritoneal fat run along the walls of the space of Bogros, covered by the parietal peritoneum. By performing any pre-peritoneal hernioplasty, classical or laparoscopic, the surgeon must dissect and recognize the nerves and vessels. Bendavid (1992) described the deep inguinal venous circulation at the space of Bogros. Otherwise, is description was obtained under

ABSTRACTS

a classical anterior dissection. In this study 50 male fresh cadavera, with no previous surgical intervention or inguinal hernia, were studied. A transverse incision 3cm below the umbilicus was performed and fascia transversalis was incised and the pre-peritoneal space of Retzius and Bogros was displayed. The venous arrangement was described: in 8% of the cases was present a venous anastomosis between the right and left iliopubic veins, it was found in 75% the rectusial veins and in 70% these rectusial veins, do participate, in deep venous ring, according to Bendavid. This study pointed out the venous arrangement at the space of Bogros and differed from what was stated, previously, by Bendavid for two reasons: first is the amount of dissections and second by the pre-peritoneal approach was utilized.

SATO*, Tatsuo, Hirokazu SAKAMOTO*, Sadao TAKAHASHI*, Sadaaki HEIMA*, Yoko Tsuboi*, and Keiichi AKITA*. Department of Anatomy, School of Medicine, Tokyo Medical and Dental University, Tokyo, Japan. Video demonstration of the lymphatics and the autonomic nerves of the pancreas head. As the pancreas transversely crosses the abdominal aorta and is wedged between the origins of the celiac trunk and superior mesenteric artery, this organ is closely related to the lymphatics and autonomic nerves surrounding the abdominal aorta. Therefore, precise knowledge of the topographical anatomy of the pancreas is crucial in function-preserving procedures for cancer of the abdominal organs. However, due to the deep location and the difficulty in dissection, demonstration of minute dissection is necessary to obtain a clearer understanding of the detailed relationships of the structures. In this video demonstration, of the following actual dissections are included. Lymphatics from the anterior surface of the pancreas head obliquely descend and converge to the large nodes along the superior mesenteric vessels at the level of the pancreatic notch. Lymphatics from the posterior surface of the pancreas head converge at the interaorticocaval nodes to the left of the left renal vein, directly or by way of large nodes at the crossing point of the upper margin of the pancreas and the portal vein. After removal of these posterior lymphatics the autonomic nerve plexus to the pancreas head can be seen. This plexus consists of numerous branches which mainly originate from the right celiac ganglion and reach the pancreas head directly or along the inferior pancreaticoduodenal artery.

SATYAPAL, Kapil S. Department of Anatomy, University of Durban-Westville, Durban, South Africa. Left and right renal veins: comparative study and clinical significance.

There is no unanimity in the literature regarding comparative morphometry, drainage patterns, valve presence and variations of the left and right renal

veins which are clinically relevant. The study aimed to compare the left and right veins in morphologically normal kidneys using the above comparative modalities. A) Cadaveric study : analysis of 153 kidney pairs harvested (100 resin casts, 53 plastinated) and 78 venograms. B) Clinical study : retrospective analysis of 104 venograms, 148 donor left kidneys from live related renal transplants and 525 patients undergoing abdominal aortic aneurysm surgery. Total sample size 1008. The lengths and diameters (*cm*) of the left and right renal veins were : 5.9, 1.2; 2.4, 1.2; first additional vein : 5.5, 0.9; 2.5, 0.7; second additional vein (right only) 2.4, 0.7, respectively. Three classification patterns (Types IA, 38.6%; IB, 25.2% : IIA, 11.8%; IIB 10.1% : III 14.4%) were identified. Valves were absent on both sides in intra and extra renal veins. Single additional veins were common on the right (26%), rare on left (2.6%); second additional veins infrequent on right only (5%). Variations, left only: renal collar, 0.3%; retro-aortic vein, 0.5%. These comparisons impact in the clinical context particularly in renal surgery and uro-radiology.

SAXTON*, Ernestina H., James D. COLLINS, Anthony DISHER* and Theodore Q. MILLER*. UCLA School of Medicine, Departments of Radiological Sciences and Neurology, Los Angeles, CA. Migraine complicated by brachial plexopathy as displayed by MRI and MRA.

Ten patients presented for evaluation of intractable headaches descriptive of migraine with and/or without aura. In addition to the usual triggers, their typical migraine symptoms could be triggered by arm abduction and external rotation and/or neck extension. Symptoms accompanying the attacks also included upper extremity tingling, numbness and pain. Thoracic outlet syndrome (TOS), suspected by history and on examination, was confirmed by bilateral multiplanar magnetic resonance imaging (MRI) and angiography (MRA) of the brachial plexus on a 1.5 Tesla G.E. Signa unit, 5.5 software, 4.0 mm thickness, with saline water bags along side the neck to enhance signal to noise ratio (Clin.Anat. 8:1-16). Among the abnormalities of the thoracic outlet found were cervical ribs in two patients, an aberrant subclavian artery compressing the stellate ganglia, fibrosis and scarring compromising the neurovascular bundle, compromise of the neurovascular bundle by scalene muscle, by fibrous bands and costoclavicular compression. Surgical decompression of the more symptomatic side was undertaken on the basis of the MRI/MRA findings in five patients without the need for other more invasive imaging. At surgery the sites and causes of brachial plexus and vascular abnormalities confirmed the imaging studies. All patients had resolution of the intractable migraine symptoms after surgery. This presentation will demonstrate the sites of brachial plexus compression as displayed by MRI and MRA.

SCOTT, Jane N*., Frank NAGY, and Gary L. NIEDER Department of Anatomy, Wright State University, School of Medicine, Dayton, OH. (sponsored by F. NAGY). Evolution of gross anatomy into human structure: a new design for old content.

Before 1995, the medical Gross Anatomy course was taught in a traditional format of one hour lecture followed by three hours of dissection with four students per dissection table. There were forty-four hours of lecture and one hundred fourteen hours of dissection. Given administrative encouragement, the course was revised to 1. reduce lecture hours, 2. incorporate peer-teaching, 3. promote small group interaction, 4. introduce clinical problem solving and 5. encourage independent learning. To insure that clinically important material was not omitted, a content survey was sent to all clerkship directors. Based on results of the survey and input from a content committee, lectures were reduced to 17, of which 11 were based on embryology. All other material was covered in small group interactions and by a computer program, Beyond Vesalius. While computer time was scheduled, students had to master the material without faculty input. Once a week students were given clinical problems based on content covered previously. After solving the problems in small groups, they presented their solutions to their peers. Faculty facilitated these sessions but only provided answers after students completed their presentations. In the laboratory six students were assigned to a dissection table. During the first two hours, two students dissected and in the last hour the dissectors peer taught those who did not dissect earlier. All students were task oriented when dissecting. Most students (91%) agreed that the course provided opportunity for active participation and integrated content from basic science and clinical medicine (83%). Students (83%) felt that the small groups encouraged questions, discussion and interaction. With reference to the number of lectures, 66 % of the class felt that the amount of material presented was satisfactory. Overall, student evaluations were very positive.

SHIMOKAWA, Takashi*, Keiichi AKITA*, Kunimichi SOMA*, and Tatsuo SATO. First Department of Orthodontics, Department of Anatomy, Tokyo Medical and Dental University, Tokyo, Japan. An anatomical study of the muscles innervated by the masseteric nerve

For an accurate assessment of jaw movement, it is critical to understand comprehensively the formation of the masseter. Detailed dissection was performed on fifteen head halves of eight Japanese cadavers in order to obtain precise anatomical information of the course and distribution of the masseteric nerve in the masseter muscle, especially in the muscle bundles of the border region between the temporalis and the masseter. In the present study, we

tentatively consider the muscle part which is located lateral to the aponeurosis of the main part of the temporalis and medial to the main trunk of the masseteric nerve as the posteromedial muscle bundles. Based on detailed innervation investigation, we conclude that these bundles may be considered as transitional muscle bundles between the masseter and the temporalis. We will discuss the stratified structure of the masseter, as well as the formation of the posteromedial muscle bundles.

SILVA* E. S., A. J. RODRIGUES, JR, C. J. RODRIGUES , E. M. C. TOLOSA* and A. ZANOTO*. Department of Surgery, Faculty of Medicine, University of Sao Paulo, Sao Paulo, SP, Brazil. Variation of infrarenal aortic diameter. A necropsy study.

Purpose. The authors performed six hundred and forty five infrarenal aortic dissections in individuals submitted to necropsy with the aim of studying anatomical changes in this segment's diameter.

Method. We built a special device designed to distend the vessel in order to evaluate the correct diameter and avoid empty aorta underestimation. Dissections were performed using surgical technique and the measurements were taken in an individualized and prospective manner.

Results. The population included 645 patients, ages ranging from 19 to 97 years (mean age 55.8 years). Most individuals were male (65.5%), 523 white (81%) and 122 (19%) non-whites. Five hundred and seventy five aortas had normal diameters, 29 (4.5%) were aneurysmatic, 19 (2.9%) were ectasic and 10 (1.6%) presented arteriomegaly. The diameters of the arteries without anomalous dilatation (aneurysm, ectasia or arteriomegaly) varied according to age, gender, body length and the degree of aortic atherosclerosis ($p < 0,01$). Hypertension, coronary disease and chronic obstructive pulmonary disease did not determine significant differences in this diameter. Twenty (69%) out of the 29 aneurysms had diameters less than 4.0 cm, 4 (14%) had diameters between 4.0 cm and 5.0 cm and 5 (17%) had diameters of more than 5.0 cm (in the last group there were four ruptures). **Conclusion.** The authors conclude that the aorta suffers a dilatation process associated with aging and it appears earlier and more intensively in males. Larger aortic diameters were observed in individuals of longer body length and those with advanced atherosclerotic disease. The study found a high prevalence of aneurysms (particularly of small size), and rupture were present only in those with diameters greater than 5.0 cm.

SKANDALAKIS, John, Centers for Surgical Anatomy and Technique, Emory University, School of Medicine, Atlanta, GA. Hepatic surgery and hepatic surgical anatomy: historical partners in progress.

Whether for hepatic trauma or transplantation, a surgeon's knowledge of hepatic anatomy commonly determines a patient's outcome. The first medically relevant anatomic studies of the liver emerged with the endeavors of Herophilus and Erasistratus between 310 and 280 B.C. Yet it was not until after the development of anesthesia and antisepsis that the first formal resections were performed during the late 1800s. After vascular occlusion principles had been developed as a means of successful hemorrhage control, several deliberate attempts were made to repair the liver surgically. Such efforts culminated in the work of Wendel in 1910 when he followed avascular planes during hepatectomy. The functional anatomy of surgery and surgical technique had suddenly joined in an effort to advance the practice, and eventually the efficacy of hepatic surgeons in facilitating the modern era of segmental anatomy extended hepatectomies and transplantation surgery.

TAKAHASHI*, Sadao, Keiichi AKITA*, and Tatsuo SATO, Department of Anatomy, School of Medicine, Tokyo Medical and Dental University, Tokyo, Japan. Anatomical basis of partial resection of the head of the pancreas.

Partial resection of the head of the pancreas has recently reported in Japan. Although this procedure is based on the spatial arrangement of the pancreatic ducts, it remains very difficult to comprehend. The head regions from 25 cadavers were used in the present study. After injection of silicon rubber and contrast medium into the ducts, radiograms using a soft X-ray apparatus were taken. Then we dissected carefully under a binocular microscope. We noticed some ducts which were difficult to confirm by the rentogenogram and found three drainage routes for the uncinate process. According to the findings, we classified the arrangement of the pancreatic ducts into three types. Type 1: The uncinate process was drained by the main pancreatic duct proximal to the junction and by the accessory pancreatic duct. Type 2: The process was drained by the main duct distal to the junction and by the accessory duct. Type 3: The process was drained only by the main duct. This classification was found to not only reflect the drainage pattern of the uncinate process, but also the spatial arrangement of the pancreatic ducts in the head of the pancreas. The point of junction between the main and accessory pancreatic ducts appears to be a good marker for classification.

TOEROEK*, Robert, Sepp POISEL, Reinhard WISSER*, and Karl COLLESELLI*. University of Innsbruck, Institute of Anatomy and Department of Urology, Innsbruck, Austria (sponsored by S. POISEL). Female rhabdosphincter – morphology, innervation, blood supply and clinical relevance. Studies on the blood supply as well as the innervation of the urethral sphincteric system are of crucial importance for postoperative continence while allowing

spontaneous residual free micturition at the same time. Anterior exenteration was performed in 15 adult specially fixed alcohol-glycerin cadaver specimens. Using magnifying lenses, both somatic and possibly autonomic innervation and the blood supply were dissected. In the female the rhabdosphincter is arranged as a circular collar around the urethra, and the fibers of the rhabdosphincter form an omega shaped loop around the anterior and lateral aspects of the membranous urethra. Fine branches of the superior vesical artery to the rhabdosphincter were identified. We did not find any blood supply to the rhabdosphincter from the internal pudendal artery. Previous studies on the nerve supply to the membranous urethra and the new study concerning its blood supply are of crucial importance for radical surgery in the true pelvis. Innervation of the urethral sphincter is mainly by the pudendal nerve, however, some innervation by the autonomic fibers from the pelvic plexus can not be excluded. It can be considered that urethral dysfunction in orthotopic neobladders may not only be due to postoperative denervation, but also to ischemia.

TRELEASE, Robert B., JR. Department of Pathology and Laboratory Medicine, UCLA School of Medicine, Los Angeles, CA. Development of 3D virtual anatomy image resources for use in multimedia education programs distributed by the World Wide Web.

In prior articles published in Clinical Anatomy, the author described a computer technology, based on stereoscopic 3D display methods used in immersive "virtual reality" systems, that could be employed to simulate object presence for anatomical specimens. Although such virtual anatomy programs had been used for several years in gross anatomy instruction at UCLA School of Medicine, they were hosted on a type of computer workstation not in widespread use. Over the past 5 years, the author has experimented with different types of display interfaces and software in an effort to repurpose the existing virtual anatomy and neuroanatomy image databases and programs for use on inexpensive Windows and Macintosh personal computers (PCs). Most recently, it was found that virtual anatomy images could be transmitted via appropriately programmed World Wide Web (Web) servers and displayed on PCs using new, inexpensive viewing systems. Subsequently, a new stereoscopic 3D image format was developed based on the existing Joint Photographic Experts Group (JPEG) standard, and 3D display plug-ins are being distributed for Web browsers. This has allowed the development of a Web site distributing stereoscopic 3D multimedia, with images ranging in scale from virtual anatomy dissections through molecular models of DNA-protein interactions.

VOON, F.C.T. and S. C. MARKS, JR. Department of Anatomy, National University of Singapore, Singapore and Department of Cell Biology University of Massachusetts Medical School, Worcester, MA.

Market forces in business (commerce, education and medicine) and the implications for medical education.

Market forces periodically forge a considerable structural transformation in all businesses. Based on the recent bestseller by Andrew S. Grove (Only the Paranoid Survive, Doubleday, 1996), which describes changes in the computer industry, we have examined the businesses of education and medicine and see similar changes. Unequal external forces (existing and potential competitors, suppliers, complementors and customers) in all businesses shape their dynamics at any given moment. The vertical organization of the traditional computer industry has reorganized into horizontal components with dire consequences for those unable/unwilling to follow. Similar changes are taking place in education. Department power is being diluted by interdisciplinary teaching and research and the information age is unrelentingly transforming both the site and the quality of interactions in education. The world-wide web and CD Roms are ready sources of an overwhelming amount of information accessed by an increasing population of students. This too often produces information anxiety rather than understanding if the knowledge, skills and expertise of personnel accompanying the information age go unappreciated (Grove). These are key educational issues when contemplating the potential for any cyber (on-line) university. We compare and contrast the visions of change in one business (computers) to those in another (education including medicine) and suggest ways for active engagement in the latter by individuals and organizations.

VOPPICHLER, Michelle D., Bernhard F. MORIGGL. Institute of Anatomy, University of Innsbruck, Innsbruck, Austria. Investigation of the inferior epigastric vessels for application in reconstructive surgery. Part I: anatomy.

We report the detailed anatomy of the inferior epigastric vessels as a basis for both preoperative color flow imaging and operative procedures (e.g. TRAM-flap). These vessels were bilaterally investigated by dissection of 44 embalmed human cadavers (mean age: 70,3; 25 men, 19 women) up to the level of the umbilicus. Using a system of coordinates the following was noted among others: site of origin from and inosculation with the external iliac (femoral) vessels, respectively; point of intersection with the interfoveolar ligament as well as the lateral border of the rectus abdominis muscle; site and pattern of furcation (if any) within the rectus sheath; position of perforating branches. By mapping the perforating branches specific areas of congestion could be identified. As to the course of the vessels within the rectus sheath, four types could be noted relative to the muscle. At the

level of the Lenzmann-line the stem of the epigastric artery was found within a section of only 1 cm (3,9 – 4,8 cm lateral to the median line) in the majority of cases. In about a quarter of specimens a true (bi- or tri)furcation was detected. Very constantly the medial accompanying vein was dominant (1,5 : 1). Formation of a common trunk (length 0,1-5,7 cm) for both veins entering the external iliac (femoral) vein differed significantly between sexes. Detection of all observed details with high resolution color flow ultrasound probes (part II) will further facilitate operative management in this area.

VU, Thao P.*¹, Manh H. VU*², Dzung H. VU¹. ¹School of Anatomy, University of New South Wales, Sydney, Australia and ²Citi Centre X-Ray and Ultrasound, Peterborough, ON. Ultrasonographic imaging of the coracoclavicular ligament. The coracoclavicular ligament (CCL) is very frequently compromised in sports injuries and its integrity is an important factor in the choice of treatment modality. According to the Rockwood six point scale classification of acromioclavicular joint (ACJ) injuries, disruption of the CCL in types III-VI is an indication for surgical treatment. Until now, evaluation of the CCL was limited to magnetic resonance imaging (MRI). In this study, we demonstrated how ultrasonography can be used to visualize the CCL and other major structures around the clavicle, including the coracoacromial ligament and the subclavius. The scans were made on a Diagnostic Ultrasound Unit Siemens Versa-pro, using high frequency linear transducers (7.5MHz and 10Mhz). The patient can be seated or lying supine. The position and angle of the probes were based on a detailed knowledge of the anatomy of the conoid and trapezoid ligaments because an angle of incidence of 90 degrees to the ligament will minimize anisotropy which degrades visibility. The scans of this series were obtained from a normal subject in sitting position and were all normal. This is the first report on ultrasonographic examination of the CCL. Being more readily available, and less costly than MRI, ultrasonographic evaluation of the CCL can be used as the initial imaging test for patients with injury to the ACJ.

WAHBA*, Mark Y., Gurdev D. SINGH, and Scott LOZANOFF. Department of Anatomy and Cell Biology, College of Medicine, University of Saskatchewan, Saskatoon, SK, Department of Dental Surgery, School of Dentistry, University of Dundee, Scotland, UK, and Departments of Anatomy and Surgery, University of Hawaii School of Medicine, Honolulu, HI. Identification of an anomalous accessory flexor digiti minimi profundus muscle.

A well developed anomalous muscle within the forearm flexor compartment was discovered during a routine cadaveric dissection. The identified muscle originated from the intercompartmental septum on the medial side of the forearm just proximal to the wrist joint and inserted on the proximal phalanx of

the fifth digit. When stressed, the tendon of the muscle produced flexion of metacarpophalangeal joint of the fifth digit. Contiguous muscles, including the flexor digitorum profundus, displayed normal morphology. The muscle appeared to be an accessory belly of flexor digitorum profundus. The combination of an accessory flexor digitorum profundus muscle belly acting on the metacarpophalangeal joint of the little finger has not been previously reported. Based on its origin, insertion and action we have named this variant accessory flexor digiti minimi profundus. This muscular variant could have clinical relevance, possibly affecting ulnar nerve function and circulation in the hand.

WEIGLEIN, Andreas H. and Heinz SCHMIDBERGER*. Anatomical Institute and Department of Radiology*, Karl-Franzens-University Graz, Austria, Europe Radiodiagnosis of cervical spine diseases based on radio-anatomical details of the atlas.

The transverse ligament of the atlas is attached to bony bumps on the antero-medial aspects of the lateral masses of the atlas that we called the colliculus atlantis. Accentuated posterolaterally by a deep pouch, which we called the foveola atlantis, through which an artery enters the lateral mass this bony structure can be easily viewed on open-mouth view radiographs as well as in CT-scans.

In a study in 145 cadaver and skeleton the colliculus atlantis was found to be present starting in between ages 10 and 13. These findings were proved by a retrospective study of more than 20.000 radiological exams of the cervical spine. The rare missing of the colliculus atlantis in the adult was found to be associated with lack of tension to the transverse ligament and thus to it's attachment point due to dysfunction of the craniocervical joints. The dysfunction may be congenital (e.g. Morquio's syndrome, Kniest's syndrome) or acquired before age ten (e.g. trauma).

In conclusion, the attachment point of the transverse ligament was found to be a product of normal function of the craniocervical junction. Thus, changes of the morphology and the site of the colliculus atlantis in adults were found to be pathological, the reason of which were certain inflammatory (e.g. juvenile chronic polyarthritis, salmonella spondylitis) or traumatic diseases (Jefferson fracture)

ZARDETTO-SMITH, Andrea M. and Gail M. Jensen*. Department of Physical Therapy, Creighton University School of Pharmacy and Allied Health, Omaha, NE. Narrative: a teaching tool for reflection in the gross anatomy laboratory.

Facilitating reflective habits of the mind should be central to professional training. The ability of health professionals, such as occupational therapists (OTs), to assess experience, context and possible outcomes is vital to professional

ABSTRACTS

practice that is reflective and not routine. Narrative is a powerful pedagogical strategy that encourages reflective thinking, consideration of beliefs, and context. This approach is currently being used in the gross anatomy laboratory course (part of the BSOT program) at Creighton University. OT students are given a vignette on the first day of gross anatomy laboratory prior to receiving any course information. The vignette portrays a student's first day in anatomy lab and their reaction to the situation. Students (n = 119) wrote an essay as to how they would react to the situation. Qualitative analysis of the responses indicated that 30% of the students focused on religious aspects of the experience; about 34% focused on the educational benefits of the experience, and 32% would convey empathy and support to the other student. In a separate question about their fears related to the course, 30% of the students most feared the possible information/work overload, while 36% of the students feared negative emotional repercussions from the experience. The use of narrative in this fashion in the gross anatomy lab encourages the OT students to reflect on the experience of human dissection and helps place the factual knowledge learned in a larger context of meaning.

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Hyatt Regency Floor Plan

