
American
Association
of Clinical
Anatomists
37th
ANNUAL
VIRTUAL
MEETING
2020
JUNE 15-19
www.clinical-anatomy.org

American Association of Clinical Anatomists

President's Report

June 15-19, 2020
Virtual Meeting

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

#AACA Strong

Due to the unprecedented COVID-19 pandemic, our 2020 annual AACA meeting in June 15-19 at Weill Cornell in New York City has been canceled. While this is disappointing on many levels, it was an obvious decision (a no brainer for this neurosurgeon) given the current situation and the need to be safe. These past few weeks have been stressful and uncertain for our society, but for all of us personally, professionally and collectively. Through adversity comes opportunity: how we choose to react to this challenge will determine our future.

Coming away from the 36th Annual meeting in Tulsa (hosted by Elmus Beale) on June 11-15, 2019, we were all energized. An informative inaugural newsletter edited by Mohammed Khalil was launched in the summer. In the fall, Christina Lewis hosted a successful regional meeting (Augmented Approaches for Incorporating Clinical Anatomy into Education, Research, and Informed Therapeutic Management) with an excellent faculty and nearly 50 attendees at Samuel Merritt University in Oakland, CA. The midyear council meeting was coordinated to overlap with that regional meeting to show solidarity. During the following months, plans for the 2020 New York meeting were well in motion.

COVID-19 then surfaced: first with its ripple effect and then its storm. Other societies' meetings - including AAA and EB – were canceled and outreach to them was extended for them to attend our meeting later in the year. Unfortunately, we subsequently had to cancel the plans for NY. Estomih Mtui and Anthony D'Antoni are to be commended for their efforts arranging and then halting the meeting (without any financial implications to our society).

Carpe diem. During this challenging time, our society and members are in the middle of change and redirection. It is a time of disruptive transformation: we are all not only adapting but also innovating. Interestingly, the forced slowdowns have, for many of us, made us work harder and differently, often out of our comfort zone. Clinicians may be treating patients in aspects of medicine beyond their norm. Anatomists may be designing new virtual curricula and exams. The platforms of tele-medicine and tele-education have accelerated out of necessity at a pace beyond words.

In that vein, we are planning our first tele-meeting to run during the pre-scheduled time of the AACA annual meeting. I can assure you it will be the best one we have ever had! Instead of our watching "Live from New York, it's Saturday night!" from our televisions, our meeting will be viewed live and taped from our computers. It will be offered free to members. There's a lot for us to talk about, a lot for us to learn from each other, and a lot to celebrate. In a time of social distancing, it will also allow us the opportunity to connect/reconnect from afar and remove barriers to attending. Jennifer Burgoon and MOPP are working diligently and creatively to roll out detailed plans for the abridged meeting: including prerecorded e-platform papers and symposia and previously uploaded e-posters, with opportunities for feedback and live Q/A sessions (eligible abstracts will be published in Clinical Anatomy). At our business meeting on Thursday, June 18th, Stephen Carmichael will receive virtually the AACA Honored Member Award and Neil Norton, the R. Benton Adkins, Jr. Distinguished Service Award. Council will meet virtually during this tele-meeting via Zoom, and new council and committee members will be welcomed. There will not be a banquet but there will be a virtual toast. A template of the virtual meeting is being sculpted that will be distributed by email, included in the next newsletter and displayed on our website.

We are looking forward to the Post-COVID state. We have big plans to ramp up and accelerate. The regional meeting, cohosted with HAPS, is scheduled for October 3, 2020 at the University of Massachusetts Medical School in Worcester, MA being coordinated by Jon Wisco, Eustathia Lela Giannaris and Alexandra Wink (deadline for proposals and early bird registration is August 4th).

The 2021 annual meeting is planned for June 28 - July 2 in Bellevue, Washington. Hosts will be R. Shane Tubbs and Joe Iwanaga. The meeting focus will be injecting more clinical into our clinical anatomy society. Two presidential speakers arranged for the

continued on next page

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2020 meeting have agreed to participate at the 2021 meeting: L. Scott Levin, M.D., the Paul B. Magnuson Professor of Bone and Joint Surgery, Chair of the Department of Orthopaedic Surgery at the University of Pennsylvania, and a board certified orthopedist and plastic surgery (responsible for developing the field of 'orthoplastic surgery') will talk on the History of Surgical Anatomy; and Robert (Bob) Morreale, Administrative Chair, Division of Experiential Learning (overseeing these specialty areas: Biomedical and Scientific Visualization, Clinical Anatomy, Microsurgery training, Multidisciplinary simulation and the procedural skills Mastery) at the Mayo Clinic will present An Administrative Leader-Medical Artist's Vision for Clinical Anatomy.

The 2022 meeting will be in Fort Worth, TX in hosted by Rusty Reeves. Consider hosting the 2023 meeting.

AACA is alive and well. Our membership and leadership (including executive committee, council and standing committees) are active. Marios Loukas has helped smooth the presidential transition. Caitlin Hyatt and the ASG team have been instrumental in the inner workings on a daily basis of the society; their dedication to our society has not wavered in this time of transition. Finances are strong. Clinical Anatomy is thriving under Shane's command. The journal's print form (per Wiley's directives) has undergone a face lift. The journal had a record number not only of submissions in 2019 but of higher quality ones (on similar pace year to date). A special edition on dentistry and oral surgery will be published later this year.

Through this process, we are communicating and collaborating better. Virtual meetings are demonstrating greater engagement and attendance; team building and team-work are occurring through teleconferences. Ideas are being shared freely and transparently. While physical barriers are keeping us locked in, virtual opportunities are being discovered.

I thank the members of AACA for their support, understanding and enthusiasm during this challenging time. AACA is positioned to thrive post COVID. Our society will be even stronger. Indeed #AACAstrong is our new motto.

Robert J. Spinner, M.D.

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

American Association of Clinical Anatomists on Social Media



Stay up to date with news



Discover new job opportunities



Hear about upcoming events



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Twitter

Follow @AACAnatomy & engage with our growing online community on Twitter!

Facebook

Like and subscribe to @aacapage on Facebook, or search "American Association of Clinical Anatomists"!

American Association of Clinical Anatomists on Social Media

LinkedIn

Follow the "American Association of Clinical Anatomists" page on LinkedIn!

Keep up with the 2020 AACA Virtual Annual Meeting using **#ClinAnat20**



Tag your anatomy-related posts and photos with **#ClinAnat** all year round

American Association of Clinical Anatomists

www.clinical-anatomy.org

Save the Dates!

HAPS
HUMAN ANATOMY & PHYSIOLOGY SOCIETY

VIRTUAL
Joint Regional Meeting
HAPS and AACA

American Association of Clinical Anatomists

OCTOBER 3RD, 2020

Hosted by the University of Massachusetts





Mark your calendar for these upcoming events!

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Block Schedule

Virtual 05/29/2020
All times are shown in Eastern Daylight Time

Monday, June 15th		Tuesday, June 16th	Wednesday, June 17th	Thursday, June 18th	Friday, June 19th
8:30					
8:45					
9:00	AACA Council Meeting Zoom (Closed Meeting) 9:00 AM - 4:00 PM	Attendees can view accepted ePosters and ePlatforms on Planstone all week at their leisure. Be sure to provide evaluations for your colleagues at the end of their presentations. Additionally, ASC and EAC Symposia, along with links to exhibitor presentations are available in the container as well..	Attendees can view accepted ePosters and ePlatforms on Planstone all week at their leisure. Be sure to provide evaluations for your colleagues at the end of their presentations. Additionally, ASC and EAC Symposia, along with links to exhibitor presentations are available in the container as well.	Attendees can view accepted ePosters and ePlatforms on Planstone all week at their leisure. Be sure to provide evaluations for your colleagues at the end of their presentations. Additionally, ASC and EAC Symposia are available for viewing as well.	Attendees can view accepted ePosters and ePlatforms on Planstone all week at their leisure. Be sure to provide evaluations for your colleagues at the end of their presentations. Additionally, ASC and EAC Symposia are available for viewing as well.
9:15					
9:30					
9:45					
10:00					
10:15					
10:30					
10:45					
11:00					
11:15					
11:30					
11:45					
12:00					
12:15		Clinical Anatomical Terminology (CAT) Committee Meeting - Zoom 12:00 PM - 1:45 PM	Educational Affairs Committee (EAC) Meeting - Zoom 12:00 PM - 1:45 PM	Career Development Committee (CDC) Meeting - Zoom 12:00 PM - 1:45 PM	Anatomical Services Committee (ASC) Meeting - Zoom 12:00 PM - 1:45 PM
12:30					
12:45					
1:00					
1:15					
1:30					
1:45					
2:00			ASC Symposium Q&A - Zoom 2:00 PM - 2:45 PM	EAC Symposium Q&A - Zoom 2:00 PM - 2:45 PM	
2:15					
2:30		Elsevier 2:30 PM - 3:00 PM			
2:45					
3:00		Wolters Kluwer 3:00 PM - 3:30 PM		State of the Association & Business Meeting - Zoom 3:00 PM - 4:00 PM	
3:15					
3:30		MOPEC 3:30 PM - 4:00 PM	BodyViz 3:30 PM - 4:00 PM		
3:45					
4:00		Anatomic Excellence 4:00 PM - 4:30 PM	Visible Body 4:00 PM - 4:30 PM		
4:15					
4:30		Carolina Biological Supply 4:30 PM - 5:00 PM	3D Organon 4:30 PM - 5:00 PM		
4:45					
5:00		Infosight 5:00 PM - 5:30 PM	Touch of Life Technologies 5:00 PM - 5:30 PM		
5:15					
5:30					
5:45					
6:00					

2020 Member Sponsorship Donors as of 5-11-20

Emerald ($500)

Anthony J. Weinhaus

Ruby ($250)

Terence Ma

Efrain A. Miranda

Lawrence Wineski

Sapphire ($100)

Emilio Puentedura

Vick F. Williams

Other Amount

Jenine Boyd

Deepti Dabral

Carlos A. Suarez-Quain

Interested in becoming a member sponsor donor?

Visit **https://clinical-anatomy.org/Member_Sponsorship** for more details.

Tuesday, June 16 Exhibitors

Elsevier
2:30 - 3:00 PM Eastern Daylight Time
1600 John F. Kennedy Blvd.
Suite 1800
Philadelphia, PA 19103
USA
www.elsevier.com
Elsevier is a world-leading provider of information solutions that enhance the performance of science, health and technology professional via web, published journals and more.

Wolters Kluwer
3:00 - 3:30 PM Eastern Daylight Time
2001 Market Street
Philadelphia, PA 1903
USA
www.lww.com
Medical Books and Journals

Mopec
3:30 - 4:00 PM Eastern Daylight Time
800 Tech Row
Madison Heights, MI 482071
USA
www.mopec.com
Mopec provides American-made equipment and supplies to anatomy laboratories, pathology labs, animal research facilities and medical examiner facilities. Founded in 1992, Mopec solutions are among the very best as demonstrated by the vast number of installations in America's top healthcare institutions and universities. Our reputation is built on decades of superior customer service specializing in consultation and customization. Mopec is committed to designing and manufacturing ergonomic equipment to enhance your lab's safety, flexibility and productivity.

Anatomic Excellence
4:00 - 4:30 PM Eastern Daylight Time
1013 Ashley Road
Savannah, GA 31410
USA
www.anatomicexcellence.com
The von Hagens Plastination Specimen Range including Silicone Plastinates, Sheet Plastinates, Anatomy Glass, Blood Vessel Configurations, Skeletons & Skulls. We will also discuss the Institute for Plastination and Body Donation Program used by von Hagens Plastination.

Carolina Biological Supply Company
4:30 - 5:00 PM Eastern Daylight Time
2700 York Road
Burlington, NC 27215
USA
www.carolina.com
Carolina offers solutions for online, hybrid, and face-to-face anatomy and physiology courses. Learn about student and teacher materials for use as distance or remote labs and laboratory essentials for use on campus. Carolina can help you maintain continuity in your courses and ease the transition into summer and fall classes.

Tuesday, June 16 Exhibitors

InfoSight

5:00 - 5:30 PM Eastern Daylight Time
P.O. Box 5000. 20700 US Hwy 23
Chillicothe, OH 45601
USA
www.infosight.com
InfoSight provides nearly indestructible identification for biological specimens through preservation process & for educational investigation. Barcode tags will survive long term exposure to formalin, glutaraldehyde, chemicals and organic cleansers.

Wednesday, June 17 Exhibitors

BodyViz

3:30 - 4:00 PM Eastern Daylight Time
8805 Chambery Blvd, Suite 300-242
Johnston, IA 50131
USA
www.bodyviz.com
BodyViz 3D virtual anatomy software provides students and instructors unlimited access to real human and animal anatomy.

Visible Body

4:00 - 4:30 PM Eastern Daylight Time
109 Oak Street, Suite 203
Brookfield, MA 01506
USA
www.visiblebody.com
Virtual Anatomy educational technology.

3D Organon

4:30 - 5:00 PM Eastern Daylight Time
2/23 Illawong St. Surfers Paradise
Gold Coat, QLD, 04217
Australia
www.3dorganon.com
3D Organon is a multi-award winning software platform for learning and teaching anatomy across desktop, mobile, and mixed reality (VR and AR) devices. Our Team has developed the first VR and MR Anatomy app. Our apps include an extensive knowledge-base of anatomical definitions translated into multiple languages. The new 2020 edition includes body actions, multiuser/crossplatform mode, microscopic anatomy, hundrends of quizzes/formative assesments, cadaveric images and many more.

Touch of Life Technologies

5:00 - 5:30 PM Eastern Daylight Time
12635 E. Montview Blvd..
Suite 350
USA
www.toltech.net/
Come learn how the real 3D and cross-sectional anatomy of the VH Dissector is allowing programs to fluidly adapt to changes in on campus laboratory and remote learning time for anatomy education. We will explore how different programs have tackled these challenges in 2020 and how use of the VH Dissector can adapt as needs change. Finally, we will provide an overview of our collaborative multi-touch table and VR and AR products that are integrated into the platform for use when on campus learning resumes.

Pre Meeting Events - Monday, June 15th

9:00 AM – 5:00 PM AACA Council Meeting.....Closed Zoom Meeting

Scientific Program - Tuesday, June 16th

All Day Attendees can view accepted ePosters and ePlatforms on Planstone all week at their leisure. Be sure to provide evaluations for your colleagues at the end of their presentations. Additionally, ASC and EAC Symposia are available for viewing as well. .....Planstone

12:00 PM – 1:45 PM Clinical Anatomical Terminology Committee Meeting (Open to all)..... Zoom Meeting

Links will be emailed and can be found in Planstone.

2:30 PM - 3:00 PM EDT
Elsevier Exhibitor Presentation

3:00 PM - 3:30 PM EDT
Wolters Kluwer Exhibitor Presentation

3:30 PM - 4:00 PM EDT
MOPEC Exhibitor Presentation

4:00 PM - 4:30 PM EDT
Anatomic Excellence Exhibitor Presentation

4:30 PM - 5:00 PM EDT
Carolina Biological Supply Exhibitor Presentation

5:00 PM - 5:30 PM EDT
InfoSight Exhibitor Presentation

Scientific Program - Wednesday, June 17th

All Day Attendees can view accepted ePosters and ePlatforms on Planstone all week at their leisure. Be sure to provide evaluations for your colleagues at the end of their presentations. Additionally, ASC and EAC Symposia are available for viewing as well. .....Planstone

12:00 PM – 1:45 PM Educational Affairs Committee Meeting (open to all)..... Zoom Meeting

2:00 PM – 3:45 PM Anatomical Services Committee Symposium Q&A Session on "The Ultimate Gift, A Conversation with Our Donors"..... Zoom Meeting (Actual Presentation in Planstone)

Links will be emailed and can be found in Planstone.

3:30 PM - 4:00 PM EDT
BodyViz Exhibitor Presentation

4:00 PM - 4:30 PM EDT
Visible Body Exhibitor Presentation

4:30 PM - 5:00 PM EDT
3D Organon Exhibitor Presentation

5:00 PM - 5:30 PM EDT
Touch of Life Technologies Exhibitor Presentation

Scientific Program - Thursday, June 18th

All Day	Attendees can view accepted ePosters and ePlatforms on Planstone all week at their leisure. Be sure to provide evaluations for your colleagues at the end of their presentations. Additionally, ASC and EAC Symposia are available for viewing as well. ..... Planstone
12:00 PM – 1:45 PM	Career Development Committee Meeting (open to all) ..... Zoom Meeting
2:00 PM – 2:45 PM	Educational Affairs Committee Symposium Q&A Session – "Integrated Anatomy Curriculum: A Friend or Foe" Zoom Meeting (Actual Presentation in Planstone)
3:00 PM – 4:00 PM	Business Meeting – Everyone is encouraged to attend!..... Zoom Meeting

Scientific Program - Friday, June 19th

All Day	Attendees can view accepted ePosters and ePlatforms on Planstone all week at their leisure. Be sure to provide evaluations for your colleagues at the end of their presentations. Additionally, ASC and EAC Symposia are available for viewing as well. ..... Planstone
12:00 PM – 1:45 PM	Anatomical Services Committee Meeting (open to all) ..... Zoom Meeting

Honored Member - 2020

The American Association of Clinical Anatomists

Recognizes and Awards Honored Membership to



Stephen W. Carmichael, Ph.D., D.Sc.

After earning an A.B. degree (with Honors in Biology) at Kenyon College in Gambier, Ohio and obtaining a Ph.D. in Anatomy at Tulane University in New Orleans, Stephen initially took up a position in the Department of Anatomy at West Virginia University in Morgantown for 11 years. He moved to Mayo Clinic in 1982 where he held a number of positions including Associate Professor then Professor of Anatomy, Chair of the Department of Anatomy and Professor of Orthopedic Surgery. Stephen has been a member of 22 scientific societies including President of the Association of Anatomy, Cell Biology, and Neurobiology Chairpersons, the Histochemical Society and Mayo Chapter of Sigma Xi. He was also a member of the Board of Directors of the American Association of Anatomists, Councilor of the American Association of Clinical Anatomists (AACA) and Editor-in-Chief of *Clinical Anatomy*, the official journal of the AACA. Stephen has been the recipient of several awards including Teacher of the Year at West Virginia University School of Medicine and Mayo Medical School, Mayo Clinic Alumni Association Distinguished Alumnus Award, R. Benton Adkins, Jr. Distinguished Service Award (AACA), Distinguished Member Award (Anatomical Society of Southern Africa), Life Member of the Australian and New Zealand Association of Clinical Anatomists, and "Volunteer of the Year" (Courage Alpine Skiers). His research interests include the adrenal chromaffin cell as a model neuron and he has published 160 papers and authored 7 books on this topic plus one book on climbing Mount Kilimanjaro (co-authored with his wife, Susan Stoddard). Stephen's teaching interests include gross anatomy, developmental (embryology) and microscopic anatomy (histology). He is currently Professor Emeritus of Anatomy and Orthopedic Surgery at Mayo Clinic. He is honored to be selected as the AACA Honored Member for 2020.

Previous Honored Members of the AACA

*W. Henry Hollinshead, 1984
*Chester B. McVay, 1985
*Donald James Gray, 1986
*Russell T. Woodburne, 1987
*Oliver Beahrs, 1988
*N. Alan Green, 1989
*Frank H. Netter, 1990
*Ralph Ger, 1991
M. Roy Schwartz, 1992
*Carmine D. Clemente, 1993
*Keith L. Moore, 1994
*Ray J. Scothorne, 1995
Robert A. Chase, 1996
Tatsuo Sato, 1997
*John E. Skandalakis, 1998
*Donald R. Cahill, 1999
*Sandy C. Marks, Jr., 2000
* David G. Whitlock, 2001
*Robert D. Acland, 2002
Arthur F. Dalley, II, 2003
*John V. Basmajian, 2004
Ian Whitmore, 2005
Peter H. Abrahams, 2006
Gary G. Wind, 2007
Vid Persaud, 2008
Richard S. Snell, 2009
Ray Gasser, 2010
Harold Ellis, 2011
Ronald A. Bergman, 2012
John T. Hansen, 2013
Victor M. Spitzer, 2014
Carol E. Scott-Connor, 2015
Carlos A. G. Machado, 2016
* James D. Collins, 2017
Anne Agur, 2018
Robert Anderson, MD, Ph.D., FRCPath, 2019

** deceased*

R. Benton Adkins Jr. Distinguished Service Award - 2020



The American Association of Clinical Anatomists

Recognizes and Awards the

R. Benton Adkins Jr. Distinguished Service Award to

Neil S. Norton, Ph.D.

Neil S. Norton, Ph.D., is a Professor of Oral Biology and Associate Dean for Admissions in the Department of Oral Biology at the Creighton University School of Dentistry in Omaha, Nebraska. He joined Creighton's faculty in 1996. Neil received his BA in Biology at Randolph Macon College (1988) and Ph.D. in Anatomy at the University of Nebraska Medical Center in 1995.

Neil has received over 30 Teaching awards including the Robert F. Kennedy Memorial Award for Teaching Achievement by the Creighton Student Union; the highest teaching award given by Creighton University, the GlaxoSmithKline Sensodyne Teaching Award given by the American Dental Education Association (ADEA), and the Stephen H. Leeper Award given by Omicron Kappa Upsilon Supreme Chapter. Additionally, Neil has been awarded Teacher of the Year Award honors by Dental School classes (freshman and seniors) on 23 occasions.

During his time at Creighton, Neil has served a variety of service roles including multiple terms as President of the University Faculty, Secretary of the University Faculty, Chair of the University Committee on Rank and Tenure, and Chair of the Committee on Academic Freedom. Neil's favourite role is serving as Creighton's Faculty Athletics Representative to the BIG EAST and NCAA.

Neil has taught in Creighton's Human Gross Anatomy, Head & Neck Anatomy, Human Neuroscience, and Pain control courses. In 2006 he authored Netter's Head & Neck Anatomy for Dentistry and Netter's Advanced Head & Neck Flash Cards (both are currently in their 3rd edition).

Neil has been a member of the AACA since 1996. He became Treasurer in 2006, and served in this position until 2013. In 2013 he became President-Elect of the AACA. He served as President from 2015-2017 and Past President from 2017-2019. Neil served on the Council for over 13 years and chaired or served on numerous AACA committees including Financial Affairs, Journal Committee, Membership, Program Committee, and Nominating Committee.

Previous R. Benton Adkins Jr. Distinguished Service Award Recipients

2004 – Robert J. Leonard
2006 – Daniel O. Graney
*2007 – Ralph Ger
2009 – Arthur F. Dalley
2011 – Carol Scott-Conner
*2012 – Keith L. Moore
2013 – Stephen W. Carmichael
*2015 – Lawrence M. Ross
2016 – Thomas Quinn
2017 – Ronald S. Wade
2019 – Brian R. MacPherson, Ph.D.

** deceased*

Committee Meeting Descriptions
(Open to all – not restricted to members of the committee)

Clinical Anatomical Terminology Committee Meeting
Tuesday, June 16th from 12:00 PM – 1:45 PM

Please join the Clinical Anatomical Terminology (CAT) Committee for our virtual lunch meeting. We are thrilled to announce a very exciting and timely talk by guest speakers Shane Tubbs, PhD, MS, PA-C and Tom Gest, PhD. Drs. Tubbs and Gest will be presenting an update on the second edition of Terminologia Anatomica (TA2). Together they will provide an overview of the procedure that was followed in the production of the TA2. In a process that has taken two decades and countless hours of effort, the TA2 is the most sweeping change in the way anatomical terminology is presented since the beginning of anatomical terminology in 1895.

Following our lunch presentation, we will be holding elections for a new member at-large. Anyone interested in anatomical terminology is welcome to run.

The lunch is open to all members and we look forward to seeing you there.

Evan Goldman, Co-Chair
Chelsea Lohman-Bonfiglio, Co-Chair

Educational Affairs Committee Meeting
Wednesday, June 17th from 12:00 PM – 1:45 PM

The topic for the 2020 EAC virtual lunch meeting is "Collaborating with Clinicians Outside the Clinic."

After a brief introduction on the benefits of educator and clinician collaboration, participants will discuss various scenarios in which collaboration did go well and did not necessarily go as expected. A facilitated open forum will follow where participants will discuss their experiences with collaboration. Participants will leave the meetings with ideas and strategies for how to best approach reaching across the aisle and incorporating clinicians into pre-clinical years.

Objectives:

1. Participants will be able to describe three specific activities in which a clinician can enhance student learning within the classroom
2. Participants will be able to list several benefits of collaborating with clinicians within the classroom.
3. Participants will be able to identify at least one way to establish collaborations with clinicians within the classroom

Priti Mishall, Chair

Career Development Committee Meeting
Thursday, June 18th from 12:00 PM – 1:45 PM

Mentorship

Over the past year the Career Development Committee has focused on mentorship and this will be continued throughout this year. Assisting members with building Mentor-Mentee relationships and career development of new members is our primary goal.

Unfortunately, we are unable to continue with our lunch meeting as planned. However, we will be voting for a new member, anyone who has an interest in career development and mentorship will be welcomed into our meeting.

Maira DuPlessis, Chair

Anatomical Services Committee Meeting
Friday, June 19th from 12:00 PM – 1:45 PM

The Anatomical Services Committee meeting is a great place to learn about what ASC does and how you can get involved. We will be discussing ASC business and electing a new member of the committee. If you would like to be a member of ASC, or know someone who would, please come to the meeting and nominate them or be nominated!

For our "Lessons Learned" segment this year, Amanda Mittelstadt from High Point University will present, "A Night of Appreciation: Honoring Future Whole-Body Donors". A unique gathering to say thanks to those who have registered to donate the ultimate gift.

The ASC meeting is a perfect forum to "Ask an Expert". This meeting is filled with experts on all aspects of body donation, from technical preparations to ethics, policies to PPE. Your colleagues bring years of experiences to the table, making our meeting a great place to find information and network.

Come to the ASC meeting to listen or to be part of the conversation by sharing your experiences. We hope to see you there!

Bobbi Morgan, Technical Co-Chair
Eileen Kalmar, Academic Co-Chair

Anatomical Services Committee Symposium

Wednesday, June 17th
Virtual Q&A Session
2:00 PM - 2:45 PM Eastern via Zoom
(be sure to view the pre-recorded symposia in Planstone prior to participating)

"The Ultimate Gift, A Conversation with Our Donors"

Anatomy education, anatomical research, medical device creation, medical procedure training, the list goes on and on, and none of these would be possible without the selfless act of body donation.

This year the Anatomical Services Committee Symposium will present a panel of body donation program administrative support personnel to participate in a Q&A with attendees. They will discuss their experiences with donors and their families and answer questions concerning reasons for donation, unique requests, family interactions, etc. We also have the unique opportunity to view clips from Chip Duncan's documentary "The First Patient". A discussion with Nirusha Lachman, PhD. will follow.

Contact the ASC Co-chairs
Bobbi Morgan: bmorgan@osteo.wvsom.edu or
Eileen Kalmar: Eileen.Kalmar@osumc.edu if you wish to submit questions in advance.



Erin Wilcox
University of California, San Diego School of Medicine

Dr. Erin L. Wilcox is an anatomical scientist at the University of California, San Diego School of Medicine. She is also an adjunct professor at Lake Washington Institute of Technology and Mid-American College. Dr. Wilcox completed her PhD at the University of Nebraska-Lincoln in 2019, doing her dissertation research on cadavers used in teaching anatomy.



Nirusha Lachman PhD
Mayo Clinic

Nirusha Lachman PhD is Full Professor and Chair of the Department of Anatomy, Mayo Clinic with joint appointment in the Department of Surgery, Division of Plastic Surgery at Mayo Clinic. Her primary focus lies in integrating anatomy education for everyday practice, and she is one of few clinical anatomists in the world who works collaboratively on a daily basis with clinicians in a practice-based setting. In her 25-year career as a clinical anatomist, Dr. Lachman has contributed at least 80 scientific publications in peer reviewed journals, 20 book chapters and numerous abstract publications, and national and international presentations. Dr. Lachman's main educational focus is on creating authentic curricula for practice-based anatomy through hands on fresh tissue dissection and review of current literature.

Educational Affairs Committee Symposium

Thursday, June 18th
Virtual Q&A Session
2:00 PM - 2:45 PM Eastern via Zoom
(be sure to view the pre-recorded symposia in Planstone prior to participating)

"Integrated Anatomy Curriculum: A Friend or Foe"

Do you teach or are you planning to teach in an integrated anatomy curriculum? If Yes, then please join us for the EAC symposium at AACA.

Over the past two decades, United States medical schools have been moving away from the traditional model of two years of pre-clerkship basic science curriculum plus two years of clerkship and clinical medicine experiences (2 + 2 model) to a more integrated approach. Integration of basic science and clinical medicine has been facilitated with the adoption of many diverse teaching approaches including problem-based, team-based, case-based and flipped curricula. These pedagogies provide learning sessions designed to train students to think critically and problem solve to prepare for careers in the rapidly evolving discipline of medicine. However, there is little evidence yet, that integrated curriculum design produces better physicians.

The 2020 Educational Affairs Committee Symposium will explore teaching in an integrated anatomy curriculum. The goal of the symposium is to highlight effective pedagogical strategies for an integrated anatomy curriculum and explore potential benefits and challenges. Our invited speakers, Dr. Keith Metzger, Dr. Mohammed Khalil and Dr. Melissa Taylor, will share their experiences of creating, assessing learners and evaluating curricular programs at new and established medical schools.



Dr. Keith Metzger
Hackensack Meridian School of Medicine at Seton Hall University

Dr. Metzger has over 15 years of experience in the development and implementation of innovative medical education programs at both new and established institutions. Trained as an anatomist, he utilizes his passion for the classroom and skill in curricular design as an Assistant Dean of Medical Education at the Hackensack Meridian School of Medicine at Seton Hall University. He is also a Professor in the Department of Medical Sciences and the Course Director for Structural Principles, an integrated first-year medical school course that includes basic anatomy, histology, medical imaging and foundational topics in pathologic principles.

Prior to joining the Hackensack Meridian School of Medicine, Dr. Metzger served as an Associate Professor of Anatomy & Structural Biology at the Albert Einstein College of Medicine. As part of Einstein's medical education reform effort, he served on the Curricular Design Executive Committee and co-chaired the group charged with transforming the College's traditional pre-clinical curriculum into a more modern integrated one that incorporated best practices in educational theory. Prior to joining Einstein, Dr. Metzger was part of the founding team at the Hofstra Northwell School of Medicine. There, he directed the development of a major portion of the pre-clinical curriculum, recruiting, managing, and leading interdisciplinary design teams to create inaugural courses.

Dr. Metzger has been actively involved with a number of preliminary, provisional, and full Liaison Commission on Medical Education (LCME) survey visits at multiple institutions. He has also served and led educational and administrative committees with the Associated Medical Schools of New York (AMSNY), American Association of Anatomists (AAA), and the American Association of Medical Colleges (AAMC).

In addition to his teaching and administrative experience, Dr. Metzger maintains an active research program in both medical education research as well as the functional morphology (form-function relationship) and biomechanics of vertebrates.

Dr. Metzger received his B.A. (Anthropology, Biology) from the University of California, Santa Cruz, his Ph.D. from Stony Brook University, and was a postdoctoral fellow at Brown University.

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Mohammed K. Khalil, DVM, MSEd, PhD
University of South Carolina School of Medicine Greenville

Dr. Khalil is a Clinical Professor at the University of South Carolina School of Medicine Greenville. He was trained in veterinary medicine and anatomy at the University of Khartoum in Sudan. In 1992, he moved to Alabama and the Tuskegee University to further his anatomy studies, earning a master's degree in anatomy. He earned a third master's degree in educational technology and a PhD in anatomy education from Purdue University in 2002.
Dr. Khalil has developed an extensive experience in teaching anatomical sciences. He taught human anatomy, comparative anatomy, and microanatomy to undergraduate, graduate and professional students for many years. In 2017, he earned the Garnet Apple Award for Teaching Innovation for the University's most exceptional faculty at the University of South Carolina. He has also received the Innovation in Education Award and the Golden Peach Award for excellence in M1 education, and several Student Choice Awards. Dr. Khalil has recently received the Alpha Omega Alpha Robert J. Glaser Distinguished Teacher Award from the American Association of Medical Colleges (AAMC).
Dr. Khalil's research is mainly focused on medical education. He is interested in the application of educational technology to enhance the teaching and learning of anatomical sciences. His scholarly activities also included a research on the design and development of medical school curriculum; a research based on cognitive load theory to inform the design and development of instructional materials; and the investigation of the relationship between learning and study strategies as it relates to students' performance on internal and external examinations.



Melissa Taylor, PhD.
University of Tennessee Health Sciences Center

Melissa Taylor received her PhD in Anatomy and Cell Biology in 2019 from Indiana University School of Medicine in Bloomington, Indiana. She is currently an assistant professor in the Anatomy and Neurobiology Department at the University of Tennessee Health Science Center in Memphis, Tennessee. Her research interests are in the field of anatomy education and pedagogy, specifically related to best teaching practices in the anatomical courses for health professional students. Additionally, she conducts research in curriculum of health professional programs, including how the anatomical sciences are organized in medical curricula across the United States.

American Association of Clinical Anatomists

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

Annual Business Meeting

Agenda
Thursday, June 18, 2020
Virtually Held - Via Zoom

CALL TO ORDER: 3:00 pm

Approval of Minutes of 2019 Annual Business Meeting (ABM) and the 2020 ABM Agenda

1. **President's Report** – *Rob Spinner* – ***10 minutes***
   a. 2020 Election Results
   b. 2021 Election – Positions open to the AACA Membership in 2021
      a. President-elect (1)
      b. Program Secretary (1)
      c. Special councilor – Anatomical Services (1)
      d. Councilors-at-large (2)
   c. Presidential Committee Appointments
   d. State of the Association

2. **Treasurer's Report** – *Anthony D'Antoni* – ***5 minutes***

3. **Membership Committee Report** – *Thomas Gest* – ***5 minutes***
   a. Remembrance of Deceased Members – *Peter Ward* – ***1 minute***

4. **Journal Committee Report** – *Marios Loukas – 2 minutes*
   a. Report of Editor-in-Chief of Clinical Anatomy – *R. Shane Tubbs* – ***7 minutes***

5. **Meeting Organization & Program Planning Committee Report** – *Jennifer Burgoon* – ***10 minutes***
   a. Report of 2020 Annual Meeting Committee
   b. Future Meetings:
      i. Oct 3rd – AACA/HAPS Fall Regional Meeting. Hosted by University of Massachusetts Medical School – meeting will be held virtually – *Lela Giannaris and Jon Wisco*
      ii. 2021 AACA Annual Meeting, Seattle, WA. – *Shane Tubbs*
      iii. 2022 AACA Annual Meeting, Fort Worth, TX. – *Rusty Reeves*
      iv. 2023 AACA Annual Meeting - TBD

6. **Committee Elections**[1] – *Rob Spinner* – ***10 minutes***
   a. Election of Members-at-Large for Nominating: 3 vacancies
   b. Bylaws Committee: 2 vacancy
   c. Financial Affairs Committee: 1 vacancy

7. **Annual AACA Awards** – *Rob Spinner* -***10 minutes***
   a. Honored Member Award 2020 – Stephen Carmichael
   b. R. Benton Adkins Service Award – Neil Norton

8. **Old Business** – 2 minutes

9. **New Business** – 3 minutes

ADJOURNMENT: 4:00pm

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

American Association of Clinical Anatomists

Minutes

Annual Business Meeting
Wednesday, June 14, 2019
Hyatt Regency Tulsa
Tulsa Oklahoma

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

CALL TO ORDER: 1:34 PM

Approval of Minutes of 2018 Annual Business Meeting (ABM) and the 2019 ABM Agenda. Approved by membership.

1. **President's Report** (Marios Loukas – AACA President)
   - **a. 2019 Election Results** – Marios announced the winners of the 2019 AACA election. Committee members are listed below.

   - **b. 2020 Election** – The positions open in next year's election are:
     a. Association Secretary (1)
     b. Special Councilor – Allied Health (1)
     c. Councilors-at-large (2)

   - **c. Presidential Appointments and Members Elected to AACA Special Interest Groups**

Anatomical Services Committee
Anatomical Services Councilor, ex officio: James Coey
Presidential Appointees
2017-2020: Nirusha Lachman (completing term of James Coey)
2018-2021: Bobbi Morgan, Technical Chair
2019-2022: Eileen Kalmar, Academic Chair
Members Elected at Annual SIG Meeting of Committee
2017-2020: Dianne Person
2018-2021: Scott Barton
2019-2022: Kelsey Byers

Career Development Committee
Presidential Appointees
2017-2020: Maira du Plessis, Chair
2018-2021: Estomih Mtui
2019-2022: Kirsten Moisio
Members Elected at Annual SIG Meeting of Committee
2017-2020: Natalie Langley
2018-2021: Eiman Abdel Meguid
2019-2022: Adam Wilson

Educational Affairs Committee
Presidential Appointees
2016-2019: Mohammed Khalil, Chair
2017-2020: Vaughan Lee, Chair
2018-2021: Priti Mishall
2019-2022: Lela Giannaris
Members Elected at Annual SIG Meeting of Committee
2017-2020: Dolgor Baatar
2018-2021: Saskia Richter
2019-2022: Krista Johansen

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Clinical Anatomical Terminology Committee
Clinical Councilor, *ex officio,* Vice Chair: Koichi Watanabe
Presidential Appointees
2017-2020: Richard Tunstall
2017-2020: Anthony Weinhaus
2018-2021: Paul Gobee
2018-2021: Evan Goldman, Chair
2019-2022: Ian Whitmore
2019-2022: Brad Martin
Members Elected at Annual SIG Meeting of Committee
2017-2020: Sakti Srivastava
2018-2021: Noel Boaz
2018-2021: Amy Mork
2019-2022: Sara Sulaiman
2019-2022: Efrain Miranda

d. Presidential Appointments and Committee Elections at Business Meeting

Bylaws Committee
Presidential Appointees (2018-2020)
Kathleen Bubb, Chair
Jon Jackson
Nirusha Lachman
Members Elected at Annual Business Meeting – One year term
Ashley Petrone
Diana Pettit

Financial Affairs Committee
Treasurer, *ex officio* (non-voting), Chair: Anthony D'Antoni
Presidential Appointees (2017-2020)
Lonie Salkowski
Mohammed Khalil
Member Elected at Annual Business Meeting – One year term
Yasmin Carter

Nominating Committee
Presidential Appointees – One year term
Anthony D'Antoni, Chair
Mohammed Khalil
Members Elected at Annual Business Meeting – One year term
Erika Blanck
Greg Brower
Sarah Greene

Journal Committee
Past-President, Chair: Marios Loukas
President, Rob Spinner
Treasurer, Anthony D'Antoni
Editor-in-Chief, *ex officio*: Shane Tubbs
Presidential Appointee: Neil S. Norton (2018-2020)
Presidential Appointee: Kazzara Raeburn (2019-2021)

Membership Committee
President-Elect, Chair: Tom Gest
Past President: Marios Loukas
Presidential Appointee: (2018-2020) Quentin Fogg
Presidential Appointee: (2019-2021) Rachel George

e. State of the Association and Strategic initiatives 2018 and 2019

Marios walked the membership through the various initiatives that have been initiated during the last two years. These included:

1. Expanding the awards at the annual meeting
2. Recording special lectures for the benefit of AACA members
3. Recording of specific lectures at the annual meeting
4. Creating a section of the website covering the history of the association
5. Selecting invited speakers to the annual meeting to strengthen the scientific talks
6. Creating a bi-annual AACA newsletter
7. Signing of a MOU between the AACA and HAPS
8. Improving AACA social media presence
9. Establishing centers for translational anatomical research
10. Providing translational anatomical research fellowships
11. Creating certification programs in clinical anatomical topics
12. Restructuring of the budget request process
13. Revision of the AACA bylaws
14. Revising AACA standing rules and procedures
15. Increasing the amount and breadth of liability insurance
16. Looking for ways to strategically locate our annual meetings to increase attendance
17. Creating additional MOU with other professional associations
18. Creating webinars with our affiliated associations
19. Restructuring the AACA webpage.

We have inaugurated several *ad hoc* committees and identified people to chair them.

1. Ad hoc Committee for Clinical Anatomy Certification (Jonathan Wisco)
2. Ad hoc Committee on Awards (Chelsea Lohman Bonfiglio)
3. Ad hoc Committee on Self Plagiarism (Shane Tubbs)
4. Ad hoc Committee on Donations (Anthony D'Antoni)
5. Ad hoc Legacy committee (Anne Gilroy)
6. Ad hoc Committee on Newsletter (Mohammed Khalil)

2. Treasurer's Report *(Tom Gest – AACA Treasurer)*

The association is standing on a very firm financial footing. Our investments, particularly the boost from Wiley and *Clinical Anatomy*, have recovered the costs associated with opening our investment accounts. This money is now bringing in a decent amount each year, allowing us to maintain our financial stability.

The income related to the annual meeting this year was not as robust as projected but will still make a profit. Attendance at this meeting was down as was sponsorship, partially due to a shortage of table space for vendors. We were unable to offer a post-graduate course this year. The regional meetings are not money-makers but that is not the intent of running those sessions, they do an excellent job of spreading the word about the AACA and they do not lose money.

3. Membership Committee Report *(Peter J. Ward for Neil Norton – AACA Past-President)*

At the time this report was generated, we have 557 active members, with 162 new members.

Remembrance of Deceased Members *(Peter J. Ward – Association Secretary)*

The membership recognized the members who have passed away during the last year: Jim Collins, M.D., Ben Pansky, M.D., and Anca Stefan, M.D.

Support for Members in times of difficulty *(Peter J. Ward – Association Secretary)*

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

We have reached the highest submission rate in the history of the journal – over 600 submissions projected for this year.

Our new impact factor will be released in the next month, last year's impact factor (based on 2017 articles) was our highest ever, 1.908. Shane shared the top-cited CA articles in 2018 and noted that we are on-tract to have an excellent year for number of downloaded articles.

There are two special issues this year: clinical anatomy of fascia and clinical anatomy of children and adolescence. Additional special issues are planned for the following year.

Phillip Adds joined us and gave an update to us from BACA editorial office. There has been a drop in new submissions this year for reasons that are unclear. Phillip was pleased to note that the 2nd most downloaded paper in CA in 2018 was a BACA submission. The summer meeting will occur in July with fewer abstracts than anticipated. This may be a by-product of the IFAA meeting in London occurring shortly thereafter.

5. MOPP Committee Report *(Jennifer Burgoon – Program Secretary)*

Thanks to our meeting managers: Sarah Green and Melissa Quinn for their work this year. Our moderators did an outstanding job, keeping everyone on time.

The Planstone software was fine-tuned this year and the MOPP committee improved the submission guidelines and post-conference survey. During abstract submission the committee watched for multiple submissions from the same author to insure that they were grouped into the same session and they also checked for IRB approval in any project involving human subjects. Unfortunately, we were unable to host a tech-fair this year due to having too few submissions in that category.

The 2019 regional meeting will be October 26th, 2019 in Oakland, CA, hosted by Christina Lewis and Samuel Merritt University. Annual meetings will be in New York (2020) and Seattle (2021). Rusty Reeves is exploring the possibility of hosting a Dallas/Fort Worth meeting in 2022. Rusty gave a quick overview to the membership regarding the benefits of having a meeting in Texas. He is exploring a post-conference course regarding hand transplantation.

Please fill out the post-conference survey!

Upcoming Meetings

a. 2019 AACA Regional Meeting, Samuel Merritt University, Oakland, CA. – *Christina Lewis*
b. 2020 AACA Annual Meeting, New York, NY. – *Anthony D'Antoni*
c. 2021 AACA Annual Meeting, Seattle, WA. – *Shane Tubbs*

6. Annual AACA Awards *(Marios Loukas – AACA President)*

Marios recognized our 2019 AACA Honored Member, Dr. Robert Anderson and the 2019 R. Benton Adkins Service Award Winner, Dr. Brian MacPherson. They will be featured at the banquet in the evening.

7. Old Business

None

8. New Business

The silent auction remains open until 4 PM and we have currently raised to $1,232 to scholarships.

ADJOURNMENT: 3:12 PM

2019-2020

Officers of the AACA Council

President – Robert J. Spinner, M.D.

President-Elect – Thomas Gest, Ph.D.

Secretary – Peter J. Ward, Ph.D.

Treasurer – Anthony V. D'Antoni, D.C., Ph.D.

Past-President – Marios Loukas, MD, Ph.D.

Program Secretary – Jennifer M. Burgoon, MS, Ph.D.

Councilors

James Coey
Joe Iwanaga
Nirusha Lachman, Ph.D.
Lisa M.J. Lee, Ph.D.
Estomih P. Mtui, MD
Maria du Plessis, MS
Shane Tubbs, Ph.D.
Gilbert M. Willett, Ph.D, PT, OCS
Koichi Watanabe, MD, Ph.D.

Clinical Anatomy

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

Editor-in-Chief – R. Shane Tubbs

Editor Emeritus – Stephen W. Carmichael

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

BACA Editor – Philip Adds

Assistant BACA Editor – Jenny Clancy

ANZACA Editor – Stephanie Woodley

ASSA Editor – Graham Louw

Founding Editors: Ralph Ger and Ray J. Scothorne

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Keiichi Akita
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Nihal Apaydin
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Committee Reports

Anatomical Services Committee
Brand Promotion and Outreach Committee
Career Development Committee
Clinical Anatomical Terminology Committee
Educational Affairs Committee
Journal Committee
Listserv Admin Report
Membership Committee
MOPP Committee
Nominating Committee

2020 Anatomical Services Committee Report

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

2019-2020 ASC Highlights

- During our meeting in Tulsa, we welcomed two new members to our committee: Eileen Kalmar and Kelsey Byers.
- Review of the 2019 ASC meeting and planning for 2020 meeting and symposium
- Revised the Anatomical Services Award description to clarify participation and eligibility. Submissions for the Anatomical Services Award were organized for judging and presentation at the annual meeting
- Currently working toward creating a 'Best Practice Guideline for Social Media Use in the Anatomy Lab'. We anticipate completion by the end of the June 2020 meeting.

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

Anatomical Services Committee events at the 2020 AACA Annual Meeting:

The 2020 ASC Symposium titled "The Ultimate Gift, a Conversation with Our Donors" will be uploaded to Planstone for attendees to view at their leisure throughout the week of June 15 – 19. This session will feature body donation program administrative staff who will speak about their experiences with donors and their families. The follow up live Q&A session will take place via Zoom on Wednesday, June 17, 2:00 PM – 2:45 PM Eastern.

The Anatomical Services Committee Meeting will be held on Friday, June 19, 12:00 PM – 1:45 PM Eastern. The agenda for this year's meeting features our popular *Lesson Learned* session where real case studies in academic donation programs will be presented and Ask an Expert where questions concerning anatomical donation programs will be posed and advice solicited from AACA colleagues in attendance at the session. Other agenda items include a report on the work of the ASC during the last year and discussion of current topics, future meetings, and symposia. Active AACA members will also be electing a new ASC member. All meeting attendees are welcome! Details of the ASC meeting are at: https://clinical-anatomy.org/Anatomical_Services_Committee_Meeting.

Current ASC members:

Presidential Appointees:

2018-2021: Bobbi Morgan, West Virginia School of Osteopathic Medicine, Technical Co-Chair, bmorgan@osteo.wvsom.edu

2019-2022: Eileen Kalmar, Ohio State University, Academic Co-Chair, Eileen.kalmar@osumc.edu

2018-2020: Nirusha Lachman, Mayo Clinic College of Medicine, Lachman.nirusha@mayo.edu

Elected Members:

2017-2020 Dianne Person, Elon University, dperson@elon.edu

2018-2021: Scott Barton, University of California, stbarton@ucsd.edu

2019-2022: Kelsey Byers, Indiana University, ktbyers@iu.edu

Ex Officio:

James Coey, St. George's University - ASC Special Councilor, jamescoey@me.com

Brand Promotion & Outreach Committee (BPOC)

Members

Christina Lewis (Chair), Jonathan Wisco (Outgoing Chair Emeritus, Advisory), Nena Lundgreen Mason, Scott Barton, Soo Kim, Mikeala Stiver

BPOC Activities

The bylaws governing this ad hoc committee are as follows:

The Brand Promotion and Outreach Committee (BPOC) is responsible for the promotion and maintenance of strategic initiatives of the AACA by:

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

Subcommittee Work

We have organized our committee into 5 subcommittees (Regional Meetings, Silent Auction Subcommittee, Community Outreach, Social Media, Website).

(1) Regional Meetings Subcommittee

Members: Jon Wisco, Christina Lewis, Soo Kim

Purpose: Organize and run two regional meetings per year (previously, just one per year).

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

On October 26, 2019, we had a successful meeting at Samuel Merritt University, in Oakland, CA. The planning committee included members Dr. Jonathan Wisco (Boston University School of Medicine), Dr. Christina Lewis (Samuel Merritt University), Dr. Greg Smith (St. Mary's College), and Dr. Soo Kim (University of Saskatchewan), as well as non-member Dr. Barb Puder (Samuel Merritt University). The theme was on the use augmented approaches for the application of clinical anatomy to inform education, research, and clinical management. The major topics included 3D modeling, simulation, and motion analysis as approaches to clinical anatomy. We had a total of 47 attendees.

The upcoming AACA/HAPS joint Regional Meeting is scheduled for Saturday, October 3, 2020 at the University of Massachusetts School of Medicine (Worcester, MA). The planning committee includes members Dr. Jonathan Wisco (Boston University School of Medicine), Dr. Christina Lewis (Samuel Merritt University), Dr. Lela Giannaris (University of Massachusetts School of Medicine), Dr. Alexandra Wink (University of Massachusetts School of Medicine), as well as non-members Dr. Rebecca Luffler (Tufts University School of Medicine), Dr. John Harrison (University of Connecticut Health Center), Dr. Kathleen Pappas (Springfield College), Dr. Linda Afifi (Boston University School of Medicine), Dr. Trudy vanHouten (Boston University School of Medicine), and Dr. Mina Moussavi (Boston University School of Medicine). The theme will be "Innovation and integration: Resources and relationships needed for a successful cross-disciplinary education." In light of COVID-19 social distancing recommendations that will likely extend into the Fall semester, the planning committee decided to be proactive and designate this to be an online synchronous and asynchronous meeting. We look forward to planning a vibrant conference that highlights in-person and online activities to engage students and promote basic science, clinical science, and educational scholarship.

(2) Silent Auction Subcommittee

Members: Christina Lewis, Soo Kim

Purpose: Organizes and runs a recurring Silent Auction at the Annual Meeting, as well as at Regional Meetings (when possible/ appropriate). Funds raised will fund Early Career Travel Awards to eligible individuals who are attending the Annual Meeting and who have had an abstract for presentation accepted by the Programming Committee. Early Career is defined as students, postdocs, residents, and junior faculty within 10 years of their terminal degree.

At the 2019 Annual Meeting at the University of Tulsa and at the 2019 Regional Meeting at Samuel Merritt University, we were able to raise a total of $1,288.50 through the silent auctions.

(3) Community Outreach Subcommittee

Members: Christina Lewis, Soo Kim

Purpose: Identifies and establishes collaborations with professional and avocational groups to promote AACA and serve the community.

The Community Outreach Subcommittee continues to build upon the following milestones:

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

We are working with community outreach partners located in the proximity of Regional Meetings to host enrichment service activities for local elementary and secondary school children. Our hope is to provide community service opportunities for AACA members and colleagues.

We have created a survey to send to the Canadian membership in AACA. The survey will help us determined if needs and interests of Canadian members are being met and will assist with engaging and potentially attracting more Canadian members. The survey will be launched shortly.

This past year, our team has created new marketing and promotional items. First, we have designed and printed new AACA postcards that provide more information about our organization, provides a QR code to our website and links to our Twitter, LinkedIn and Facebook platforms. We plan to give these out at other conferences where attendees might be interested in checking out and joining the AACA. Second, we have designed some anatomy themed socks with the AACA logo. We are just finalizing our design and are excited to have these ready for sale soon.

(4) Social Media Subcommittee

Members: Nena Lundgreen Mason, Scott Barton, Mikeala Stiver

Purpose: Determines strategies for and implements AACA social media presence

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

We now have a very strong Twitter, LinkedIn and Facebook presence. There are currently 1,816 followers on Twitter, 346 on LinkedIn and 1,107 on Facebook. You can follow on any of these outlets by clicking on the appropriate icon on the AACA website. We encourage you to participate in the opportunity to stay connected through social media!

Tweet with us! @AACAnatomy and use the hashtag #ClinAnat20

Like us on Facebook at the American Association of Clinical Anatomists (@aacapage)!

Follow us on LinkedIn! Stay up to date with AACA news, discover new job opportunities, connect to other members: go to https://www.linkedin.com/company/american-association-of-clinical-anatomists.

(5) Website Subcommittee

Members: Scott Barton

Purpose: Works with Association Services Group to maintain content and relevancy of our AACA website.

The Website Subcommittee has achieved the following milestones this year: Check out the most recent Member Spotlight on the AACA website!

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

Career Development Committee

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

The CDC has been working hard on expanding mentorship opportunities both within and outside of the annual meeting platform. In conjunction with ASG we have been updating our mentor list and hope to have the webpage updated with the same information on a regular basis. After the 2019 meeting we have been working on a mentorship program which will assist new members in establishing a mentor-mentee relationship within the association. The Mentor Reception is a time when we will encourage networking between mentees and mentors. For the 2020 meeting, we planned to have the mentorship reception associated with a poster session to encourage a good foundation for the mentor-mentee relationship.

If you are interested in serving, have a passion for mentoring, or have innovative ideas to promote career growth, please consider becoming a member of the CDC. We will be electing one new member at our online lunch meeting on Thursday, June 18th from 12:00 PM - 1:45 PM Eastern.

Presidential Appointees

Maira du Plessis (maira.duplessis@gmail.com)

Estomih Mtui (epmtui@med.cornell.edu)

Kirsten Moisio (k-moisio@northwestern.edu)

Members Elected at Annual SIG Meeting of Committee

Natalie Langley (langley.natalie@mayo.edu)

Eiman Abdel-Meguid (e.abdel-meguid@qub.ac.uk)

Adam Wilson (adam_wilson@rush.edu)

Clinical Anatomical Terminology Committee

Co-chairs: Chelsea Lohman Bonfiglio and Evan Goldman

Presidential Appointees

2017-2020: Richard Tunstall (r.g.tunstall@warwick.ac.uk)

2017-2020: Anthony Weinhaus (weinh001@umn.edu)

2018-2021: O. Paul Gobée (o.p.gobee@lumc.nl)

2018-2021: Evan Goldman, Chair (Egoldman1@pennstatehealth.psu.edu)

2019-2022: Chelsea Lohman Bonfiglio (chelsea.lohmanbonfiglio@cuanschutz.edu)

2019-2022: Brad Martin (bdmartin@llu.edu)

2019-2022: Ian Whitmore (iwhitmore@argonet.co.uk)

Members-at-Large

2017-2020: Sakti Srivastava (sakti@stanford.edu)

2018-2021: Amy Mork (amork@msm.edu)

2018-2021: Noel Boaz (nboaz@ehc.edu)

2019-2022: Efrain Miranda (dremiranda@gmail.com)

2019-2022: Sara Sulaiman (sara.sulaiman@bristol.ac.uk)

The CAT committee holds meetings on the 1st Wednesday of each month. Subcommittees were consolidated to handle a new set of initiatives; the subcommittees meet on alternate weeks to the regular CAT meetings, or as needed. All CAT meetings are held via video conferencing using "Zoom". The CAT has continued creating and reviewing definitions, based on the Patterns and Guidelines document. The definitions are created using CAT's online "definition machine" (a web-based, database system). During 2019-2020, the CAT has worked on improving the content of the AnatomicalTerms.info (ATI) website. The website now has approval from the IFAA/FIPAT for ATI to formally house the official Terminologia Anatomica terms. The CAT is currently working to fix any existing errors on the website with TA terms to ensure they are accurate and current. Finally, the CAT is working on increasing international awareness and recruit individuals for participation in the CAT initiatives (ATI/definition machine). To that end, the CAT is working on having a presence at a variety of conferences and working towards promoting ATI to journal and book editors as the recommended reference for authors.

At the 2020 virtual meeting, CAT's lunch meeting will include guest speakers, Dr. Tom Gest and Shane Tubbs. They will be discussing the upcoming TA2 including major changes from TA1 and offer insight on the estimated timing of adoption.

Educational Affairs Committee Report

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

During the 2019-2020 monthly EAC meetings, discussions focused on planning for the EAC symposium and EAC lunch meeting.

The topic for the 2020 EAC symposium is "Integrated Anatomy Curriculum: a friend or foe?" The objectives of the symposium are to

- provide an overview of definitions of integrated curriculum.
- discuss best practices when planning curricular integration and
- focus on appropriate assessment and evaluation methods in an integrated anatomy curriculum.

The symposium will also explore benefits and challenges of an integrated anatomy curriculum.

The topic for the EAC virtual meeting is "Collaborating with Clinicians outside the Clinic".

We hope you'll view the pre-recorded symposium in Planstone, and join the discussion at the virtual meeting!

For those interested in getting more involved, we will be electing a new member to the Educational Affairs Committee at the lunch meeting on June 17th. Looking forward to seeing you!

EAC Members:

Presidential Appointees 2016-2019:

2017-2020: Vaughan Lee (vlee@southalabama.edu)

2018-2021: Priti Mishall, Chair (priti.mishall@einstein.yu.edu)

2019-2022: Eustathia Lela Giannaris (EustathiaLela.Giannaris@umassmed.edu)

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

2017-2020: Dolgor Baatar (Dolgor.X.Baatar@kp.org)

2018-2021: Saskia Richter (srichter@udel.edu)

2019-2022: Krista Johansen (krista.johansen@tufts.edu)

Journal Committee Report

Committee Members: Marios Loukas, Rob Spinner, Tom Gest, Jinnie Kim (Wiley editor), Phil Adds (ex officio; Editor BACA), Shane Tubbs (Editor-in-Chief).

The journal *Clinical Anatomy* has had a very successful year and continues to grow and flourish. We continue to publish high quality papers devoted to all aspects of the anatomical sciences that have direct application to several disciplines in medicine, dentistry and surgery. The Journal received more submissions in 2019 than any previous year and will probably surpass this number in 2020. Additionally, several Special Issues are in the works and will be forthcoming.

The Journal is fortunate to continue to have an international group of experts serving on its editorial board and contributing as co-editors and reviewers. Many thanks to each of these individuals for their support and contributions to making Clinical Anatomy a success.

Please consider submitting your work to the Journal and continue to follow us online, in print, or on your mobile device with the *Clinical Anatomy* app for Android or iPhone users.

Listserv Report

AACA's Education Issues Listserv was moved from the mail server at Einstein to being hosted on Google Groups in February of 2016. There are currently 1,135 subscribers to AACA's Listserv. From May 1, 2019 to April 1, 2020 there were 40 subjects posted. To the right of this report is a table of those posts that received the most responses.

AACA Education List

Total Subscribers (as of 4/1/20) = 1135

Activity 5/1/19-4/1/20 = 40

May 2019 – April 2020 Monthly Email Activity

May '19 = 5

June '19 = 1

July '19 = 2

August '19 = 5

September '19 = 4

October '19 = 4

November '19 = 2

December '19 = 3

January '20 = 2

February '20 = 4

March '20 = 8

April 1, '20 = 0

Total Emails = 40

Total Replies = 147

Most Commented upon Threads
Value of cadaver use for anatomy education (22)
Service Dog in Anatomy Lab (19)
In Memoriam: Dr. Keith L. Moore - It is with great sadness that we announce the passing of Dr. Keith L. Moore (13)
iPads for lab practicals (9)
Inquiry re: legalities and ultrasound use in anatomy education (8)
Problem of forearm pronation during embalming (6)
Donor Body Storage (6)

Membership Committee

President-Elect – Thomas Gest

(2017 – 2019) Past President – Marios Loukas

(2018 – 2020) Presidential Appointee – Quentin Fogg

(2019 – 2021) Presidential Appointee – Rachael George

The membership committee is pleased to state that the following new members have joined AACA from July 25, 2019 to April 1, 2020. The total number of active members in the association is 580.

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AFFILIATE

Michael Hornby
Sahar Mohsin
Ivan Prithishkumar

ASSOCIATE PRINT COPY

Matthew Kayal

ASSOCIATE POST-DOC ELECTRONIC

Haider Hilal
Alpen Ortug
Ryan Timmins, PhD

ASSOCIATE ELECTRONIC

Lauren Adams
Azzat Al-Redouan, MD
Austin Taylor Armstrong
Katrina Bang
Christopher Barron
Rossini Batino
Elizabeth Baugher
Alessio Befa
Matthew Bell
Brandon Boeur
Libby Bradley
Georga Bruechert
Calli Carnavas
Jenifer Centeno Gavica
Angela Centeno-Gavica
Charles Coker
Daniel Copeland
Michael Cox
Miraal Dharami
Teresa Drake
Stephen Ford
Blair Freed
Yat Ching Fug
Melanie Gartz
Makayla Gologram
Jeremy Grachan
Daniel Gramer
Brennan Hansen
Shanni He
Katherine Henderson
Jakub Holda
Alonso Hormazabal-Peralta
Anna Iankovitch
Michel Kabbash
Krystina Kalland
JinWon Kim
Benjamin Kozlowski
Shelby Kuhnert
Alexander K. Lee
Hye-In Lee
Kyu-Lim Lee
Maciej Lis
Andrew Lombardi
Musa Muhtaroglu
Matthew Nankin
Jehoon O
Connor O'Neill
Lindsay Pacey
Chirag Patel
Mateusz Paziewski
Jakub Pekala
Ashley Pierce
Emily Porta
Natasha Puri
Andrew Rice
Joseph Rodriguez
Sukhpaul Sandhu
Marina Savoy
Garrett Michael Schick
John Sherrill
Marcellus Singh
Sigogini Sivarajah
Bendik Skinningsrud
Bernard Solewski
Robert Steele
Arthur Stone
Jonathan Sweeney
Casper Thorpe Lowis
Crystal Valadon
Matthew Wend
In-Seung Yeo
Fan Zhang

REGULAR ELECTRONIC

Kamla Ahluwalia
Nilo Alvarez Toledo
Kevlian Andrew
Woong Kee Baek
Barbara Ballyk
Reivian Berrios Barillas
William Bolger
Jennifer Burnham
Claudia Cárceles Román
Mairin Cahill
Mark Carrasco
Stacey Charles
Beom Sun Chung
Min Suk Chung
William Cullinan
Nicholas D'Alberto
Sujata K. Dass
Aron Davis
Shelley DiCecco
David Ebaugh
Anna Folckomer
Keyla García-Crescioni
Lucia Fernanda Garces
Lisa Garcia
Sarah Gluschitz
Raja GnanaDev
Severine Groh
Leslie Hammer
Aya Han
June Hanks
Joshua Hatfield
Tony Her
Mi-Sun Hur
Soichiro Ibaragi
Jessica Immonen
Kenneth Ivie
Michael Jones
Samuel Joshua
Rekha Kar
Michitsuna Katafuchi
Younsuk Kim
Valerie Lentz
Lindsey Liggan
Ruth Maher
Gaurav Mandal
Jeffrey Marchant
Shanu Markand
Tarik Massoud
Yuki Matsushita
R. Trigg McClellan
Dacia Milescu
Konstantinos Mountrakis
Kinuko Ogata
Adekunle Omole
Caitlin Patterson
Kevin Patton
Cristina Prall
Satish R L
Kumar Satish Ravi
Joanna Rayner
Holly Ressetar
Melissa Roberts
Oana Rosenthal
Tiwadayo Sam-Odusina
Sanjoy Sanyal
Christian Seedarnee
James Smiley
Ethan Snow
Kathleen Tallman
Selcuk Tunali
Sailabala Vanguri
SisirKumari Vettiyadan
Jennifer Weil

REGULAR – PRINT

Ferdinand Esser
Tyrone Genade
Somesree GhoshMitra
Bo Liu
Estelle Paris MD
Nabh Sharma

Meeting Organization & Program Planning (MOPP) Committee

Members:

Special Interest Committees

Anatomical Services Committee, Co-Chairs – Bobbi Morgan & Eileen Kalmar

Career Development Committee, Chair – Maria Du Plessis

Educational Affairs Committee, Chair – Priti Mishall

Clinical Anatomical Terminology Committee, Co-Chairs – Chelsea Lohman Bonfiglio & Evan Goldman

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

Melissa Quinn 2019-2020

Yasmin Carter 2020-2021

Local Hosts

Estomih Mtui and Anthony D'Antoni – 2020

R. Shane Tubbs – 2021

Rusty Reeves – 2022

ASG Representatives (Contracted Professional Organization Management Company)

Caitlin Hyatt, Executive Director

Jennifer Whitlow, Assistant Executive Director

Kendra Tyner, Program Coordinator

Executive Committee

Robert Spinner, President

Tom Gest, President Elect

Marios Loukas, Past President

Anthony D'Antoni, Treasurer

Peter Ward, Association Secretary

Jennifer Burgoon, Program Secretary & MOPP Chair

This report is being filed on April 28, 2020. The information contained herein is the most accurate available as of this date. I am completing my second year of my 3-year term as Program Secretary, after serving a 2-year term as a Meeting Manager.

During the 2019-2020 year, the Meeting Organization and Program Planning (MOPP) Committee has worked energetically to bring you the 2020 American Association of Clinical Anatomist (AACA) Annual Scientific Conference. Planning began in earnest immediately following the 2019 Conference in Tulsa by a thorough review of the post-conference surveys. During the year, the MOPP Committee held conference calls on the third Monday of each month. While the initial plans were to hold the Conference in New York City this June 2020, the AACA Executive Council made the decision in March 2020 to cancel the in-person meeting due to the implications regarding the COVID-19 pandemic. While we deeply regret that we could not gather as an association at the institution in New York City this June, we would like to thank Dr. Mtui and Dr. D'Antoni and all of their staff at Weill Cornell Medicine for their time and efforts in planning the meeting.

The 2020 AACA Virtual Annual Conference and the program you are reading are the direct result of the tireless effort of the MOPP Committee and through the exceptional professional support by ASG. Special thanks to Caitlin Hyatt, Kendra Tyner, Jennifer Whitlow, Melissa Quinn, and Yasmin Carter whose work behind the scenes on behalf of the MOPP Committee has made the 2020 AACA Annual Conference possible.

This year's meeting is certainly a unique experience, but one that we hope all attendees will enjoy. For the first time in the association's history, abstract authors will present their platform and poster presentations in a virtual setting (via Planstone). Additionally, attendees will be able to provide feedback for all platform and poster presentations they view. It is our hope that this will offer a forum for collegiately that is often experienced at the Annual Meeting.

In addition to the ePlatform and ePoster presentations, there will also be a few meetings held via Zoom. The standard committee meetings (ASC, CAT, CDC, and EAC - typically held during the breakfast hour onsite at a meeting) will be held

as different Zoom meetings during the week (12:00 PM – 1:45 PM Eastern Time). Additionally, the Symposiums for the ASC and EAC will have follow-up sessions via Zoom whereby attendees can participate in a question and answer forum regarding the symposia presentations they viewed in Planstone. Finally, the AACA Business Meeting will be held via Zoom when attendees can expect presentations of the R. Benton Adkins Distinguished Service and Honored Member Awards.

Preliminary Planning for Future AACA Meeting

One of my goals for the MOPP Committee is to have in place early the future AACA Annual Conferences. Thus far, we have been able to plan the following:

- 2020 Regional AACA Meeting to be held in Worcester, Massachusetts on October 3, 2020 and hosted by Lela Giannaris, Alexandra Wink, and Jonathan Wisco.
- 2021 National AACA Meeting to be held in Bellevue, Washington June 28 – July 2, 2021 and hosted by R. Shane Tubbs.
- 2022 National AACA Meeting to be held in Fort Worth, Texas June 13 – 17, 2022 and hosted by Rusty Reeves.

If you are interested in hosting a regional and/or national meeting, please contact me via email (jennifer.burgoon@osumc.edu).

Abstract Submissions

Each year, the MOPP Committee reviews all its documents, including the Abstract Submission Guidelines, in an effort to improve clarity. The AACA works to accept completed, original, previously unpublished work that has IACUC and IRB approval, if applicable.

The table below shows the recent trends regarding abstracts, attendance, and presentations at our conferences.

Meeting Stats	2020 Virtual	2019 Tulsa	2018 Atlanta	2017 Minnesota	2016 Oakland	2015 Vegas	2014 Orlando
Initial Abstract Subs	141	97	147	135	192	147	139
Returned for Format	15	16	13	10	32	51	20
Late-Breaking Subs	15	11	15	10	4	21	26
Total Rejections	6	3	2	1	23	24	10
Registrants	???	290	350	345	350	338	327
Platform Presentations	27	20	24	16	18	22	29
Tech Fair Presentations	0*	0*	7	7	5	3	6
Publishable Posters	104	63	98	97	115	78	80
Not Publishable Posters	19	11	29	22	26	43	40

*Note: No Tech Fairs were held during the 2019 or the 2020 AACA Meeting as not enough abstracts were submitted to necessitate the session.

In closing, please let the MOPP committee know of any improvements we can make to the conference through emailing those listed above and/or completing the post-conference survey. As always, we are striving to provide you with the best conference possible.

2020 Nominating Committee Report

The Nominating Committee consists of presidential appointees Anthony D'Antoni (Chair) and Mohammed Khalil, and elected members-at-large Erica Blanck, Greg Bower, and Sarah Greene. On January 9th, 2020 the Committee met for the first time on a conference call, the main aim of the discussion was to nominate a diverse group of candidates from members who are active within the association. The committee met several more times in 2020, with the slate of candidates finalized in February and forwarded to Peter Ward, the Association Secretary. Prior to the submission of names, each candidate was contacted by a member of the nominating committee to get their acceptance of the nomination, and each candidate was directed to send a copy of their CV to the committee and to the association in care of Caitlin Hyatt, the Executive Director. Nominations from the membership were also received and added to the ballot after receiving their supporting materials.

Abstracts – Platform Presentations

Accepted for Publication in Clinical Anatomy
(Listed by presenting author last name)

*ABDEL MEGUID, Eiman M.[1], Rachel SHEPPARD[1], Adam NILSON[2], and Nagy DARWISH [2]. [1]Centre for Biomedical Sciences Education, School of Medicine, Dentistry and Biomedical Sciences, Queen's University Belfast, Belfast, BT9 7AE, United Kingdom; [2]Royal Victoria Hospital, Belfast, BT12 6BA, United Kingdom.
Incidence of Vertebral Artery Injury in Cervical Spine Fractures.

INTRODUCTION. The risk of vertebral artery injury (VAI) secondary to cervical spine fracture is becoming increasingly recognized in the literature. The aim of this study was to determine the incidence of VAI in patients admitted to the Royal Victoria Hospital (RVH) with cervical spine fractures. The RVH is Northern Ireland's Regional Trauma Centre with emergency surgical spinal services. Identification of the types of cervical spine fractures associated with the highest risk of VAI will then provide recommendations for when to screen patients so that cases of VAI are not missed. METHODS. A retrospective review of 1,894 computed tomography (CT) reports of patients who underwent imaging of their cervical spine and/or vertebral arteries over a 12-month period, from June 2018 to June 2019, was conducted. This yielded 68 patients (3.59%) with a confirmed cervical spine fracture. These patients had an age range of 18-97 and included 39 males (57.4%) and 29 females (42.6%). The fractures were then classified according to the AOSpine cervical spine fracture classification. SUMMARY. Out of 68 patients with a confirmed cervical spine fracture, five (7.35%) were diagnosed with VAI, all involving fractures of their upper cervical spine. Two involved fractures extending into the transverse foramen, two involved subluxation of the vertebrae and one involved both. CONCLUSIONS. CT angiography of the vertebral arteries is therefore recommended following radiological findings of fractures involving the transverse foramen or fractures classified as Type C/subluxation. The most common mechanism of injury for VAI was a road traffic collision. Regarding management, the patients with VAI in this study were either monitored and given no specific treatment or treated medically with antiplatelet therapy, none required surgical intervention.

*BRUECHERT, Georga K.[1], Casper G. THORPE LOWIS[1], William H.B. EDWARDS[2], and Quentin A. FOGG[1]. [1]Department of Anatomy and Neuroscience, The University of Melbourne, Melbourne, VIC 3010, Australia; [2]Epworth Hospital, Melbourne, VIC 3121, Australia.
Relational Anatomy of the Medial Intermuscular Septum Redefining Understanding of the Plantar Foot.

INTRODUCTION. Obesity and diabetes are increasing globally, which may lead to an increase in tarsal tunnel and plantar compartment syndromes. Their aetiology is not always clear, however. This may be due to a limited understanding of the spatial relationships of the posterior tibial neurovasculature. There is no consensus on the number of plantar compartments, with some even doubting their consistent presence. The aim of the present study was therefore to map the neurovasculature of the plantar foot and, in doing so, move towards anatomical evidence for the plantar compartments and their boundaries. METHODS. A total of 20 specimens were analysed. Fifteen feet were dissected from which models were constructed within a 3D virtual space for each neurovascular structure and related soft tissues. The mean thickness of any fibrous tissue was also recorded. To validate these findings, 3mm sections were taken from five -800C frozen feet, from the hindfoot to the midfoot. SUMMARY. Neurovascular bifurcation occurred in the tunnel at varied levels. The vessels were closely related to the flexor retinaculum, abductor hallucis muscle and the septae which formed the flexor tendon sheaths. The medial walls of these sheaths were further identified to continue distally into the plantar foot, forming the medial plantar intermuscular septum (MPIS), the only longitudinal extent from the tunnel contributing to the compartmentalisation of the plantar foot. CONCLUSIONS. A distinct medial compartment is formed by the MPIS. This fibrous tissue band was much thicker than previously understood. Its relationship to the neighbouring neurovasculature is therefore of particular importance. Compression of these nerves and vessels may be associated with a range of structures in close proximity, especially in cases of tendonitis, abductor hallucis muscle hypertrophy, obesity and diabetes, contributing to tarsal tunnel and plantar compartment syndromes.

*CARTER, Yasmin[1],[2]. [1]Division of Translational Anatomy, Department of Radiology, University of Massachusetts Medical School, Worcester, MA, 01655, USA; [2]Innovations Lab, University of Massachusetts Medical School, Worcester, MA, 01655, USA.
Creation of an Anatomically Accurate Model of the Deltoid for Pediatric Injection Training.

INTRODUCTION. UMASS Medical School students provide yearly flu vaccinations to over 2000 local school children who may otherwise lack access. In their first year, all medical students are offered injection training. While reducing the spread of the flu virus, this program also provides practical training and clinical experience; however, it is difficult to safely and effectively train an adequate number of students in response to the increased demand for flu vaccines. To support this, a unique silicon deltoid model for bolus injection practice was designed and created, with the goal of being injectable, reusable, and anatomically accurate for the age of the child being injected. METHODS. Platinum cure silicon rubber was used in layers of differing densities to replicate muscle, fat, and skin and colored accordingly. Layers of fabric represent the fascial planes surrounding the deltoid. A metal plate acts as a proxy for the humerus and as a safety device. The depths of each layer were based on previously reported radiological studies of elementary school children (6-13 yrs). Together these different density layers provide haptic feedback to the injector when they are

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in the correct position. SUMMARY. The first iteration of the model was used in Fall 2019 and while reusable, some bubbled or leaked after prolonged use. A second generation is now being developed which has a more realistic skin texture and greater protection against leakage. The new model also incorporates dimensions that more realistically reflect the diversity of our community including variations in skin coloration, adipose deposition, and muscle mass. CONCLUSIONS. Previous studies suggest CDC needle-length guidelines may lead to under- or over-penetration of the deltoid up to 60% of the time in children. This model represents the most anatomically accurate pediatric deltoid injection trainer currently available, and as such may allow for practiced placement and reduction of these penetration errors.

*CHUNG, Beom Sun. Tulane University School of Medicine, New Orleans, LA, 70112, USA.
Comparison of Volume Models of Real Color Cadaver Images and Grayscale Patient Images.

INTRODUCTION. Volume models made from magnetic resonance images and computed tomographs are used widely in clinics. However, since the medical images are in grayscale and have low resolution, detailed anatomical structures are difficult to be identified. On the other hand, volume model made from real color cadaver images can show minute structures. Purpose of this study is to help learning the interpretation of medical images by comparing the volume models of cadaver images and medical images. RESOURCES. From serially sectioned images of cadaver, real color volume models of cadavers were produced. From magnetic resonance images and computed tomographs of patients, grayscale volume models were manufactured. Dicom Browser and MRIcroGL were utilized for the volume reconstruction. DESCRIPTION. The cadaver models and the patient models were sectioned in the same planes to be compared. The cadaver model with the voxel size of 0.5 mm × 0.5 mm × 0.5 mm showed more minute structures than the patient model with lower resolution. Referring to the cadaver models, locations of small structures could be estimated on the patient models. SIGNIFICANCE. The real color cadaver models can function as a bridge between the grayscale medical images and actual cadaver dissection. Medical students and doctors can download the cadaver volume models of this study from anatomy.co.kr for free. The cadaver sectioned images and volume reconstructing method can be provided to other researchers without commercial return.

*COLLINS, Amanda J.[1] and Yasmin CARTER[1],[2]. [1]Division of Translational Anatomy, Department of Radiology, University of Massachusetts Medical School, Worcester, MA, 01655, USA. [2]Innovations Lab, University of Massachusetts Medical School, Worcester, MA, 01655, USA.
Veteran Body Donation Trends at UMASS Medical School.

INTRODUCTION. With the recent expansion of US Veterans Affairs (VA) health care at UMASS Medical School (UMMS) and its associated Memorial Medical Center we were prompted to examine veteran anatomical donations to the UMMS Anatomical Gift Program (AGP). METHODS. Data on UMMS donations, including - age at death, sex, and veteran status were collated over a 10-year period. AGP data were retrieved from our RedCap database containing both the original donor registration and death certificate information. Most recent data (FY 2017) from the VA was collected on the percentage of veterans in the Massachusetts population and aggregated by sex for comparison. Statistical analysis was conducted utilizing STATA 16 (Stata Corporation; College Station, TX, USA). SUMMARY. In 2017 the total veteran population of Massachusetts was 323,253, representing 6.70% of the state population (6.6% nationally; 19,998,799). Of these veterans, 6.93% (22,391) were female (9.41% nationally; 1,882,848). In the years 2010 to 2019 UMMS AGP received a total of 928 body donations. Of these, 512 (55%) were female and 416 were male (45%). During this period 207 donors were veterans, with 197 males (21% of overall donation; ~95% of veteran donor population) and 10 females (1% of overall donation; ~5% of veteran donor population). These data demonstrate veterans have a high rate of donation, comprising 22.7% of our donor population. When accounting for sex, male veterans are more likely to be a part of the donor population (47.4% of the male donor population) than female veterans (1.9% of the female donor population). CONCLUSIONS. These findings highlight the importance of veterans in our anatomical education environment. AGP outreach efforts could benefit from this knowledge, as the data suggest veterans have a legacy of serving their communities. Considering this donation trend, AGPs may consider adapting or expanding their remembrance activities and events.

*DRAKE, Teresa[1], Fatemeh CHEHREHASA[1], [2], and Laura S. GREGORY[1]. [1]School of Biomedical Sciences, Faculty of Health, Queensland University of Technology, Brisbane, QLD, 4000, Australia; [2]Clem Jones Centre for Neurobiology and Stem Cell Research, Griffith Institute for Drug Discovery, Griffith University, Nathan, QLD, 4111, Australia.
The Aging Brain: An MRI Study of Volumetric Change.

INTRODUCTION. Neurodegeneration is considered a 'normal' part of the aging process, but at what point does it become pathological? Whilst studies have shown that the brain volume decreases as age increases, the rate and pattern of degeneration has yet to be quantified. The use of automated methods to establish quantifiable results has the potential to reduce subjectivity in imaging analysis through the use of research derived reference standards. METHODS. 330 cerebral MRIs consisting of 165 each for males and females, aged 20-75 were collected retrospectively and processed through the fully automated segmentation pipeline

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FreeSurfer. Volumetric data were collected for the caudate, putamen, thalamus, amygdala, hippocampus, globus pallidus, corpus callosum, lateral ventricles and the total cerebrum. All data were normalized using a manually calculated intracranial volume. Data analysis was performed through general linear models, curve estimation and T-tests in SPSS. SUMMARY. Age related volumetric change was evident in the caudate, putamen, thalamus, amygdala, hippocampus, lateral ventricles and cerebrum. However, the pattern of volume change differed between structures with some showing a linear decrease from 20 years of age, whilst others were quadratic in nature. The globus pallidus and corpus callosum showed no significant age-related volume change. Significant sex differences were found in all structures investigated; therefore, the sample was split by sex to further investigate age. Once split by sex, no significant age-related volume change was found in the caudate nucleus or hippocampus of females. CONCLUSIONS. Cerebral structures atrophy at different ages and rates, with some subcortical volumes relatively conserved until middle age. Females typically produced larger normalized volumes and less pronounced rates of degeneration.

*FABRIZIO, Philip A.[1], Anne M. R. AGUR[2], and Shannon L. GROFF[3]. [1]Physical Therapy Department, Philadelphia College of Osteopathic Medicine Georgia, Suwanee, GA, 30024, USA; [2]Division of Anatomy, Department of Surgery, Faculty of Medicine, University of Toronto, ON, M5S 1A8, Canada; [3]Department of Education and Human Services, Florida State College, Jacksonville, FL, 32202, USA.
Does Motivation and Test Anxiety Affect Success in a Physical Therapy Clinical Anatomy Course?

INTRODUCTION. Gauging the motivation of newly admitted Doctor of Physical Therapy (DPT) students, during their first foundational science course, Clinical Anatomy, may improve our understanding of academic success rates. Academic success has been shown to be impacted by motivation behaviors, self-regulated learning, and metacognition. The purpose of this study was to investigate how DPT student motivation behaviors and test anxiety impact academic success. METHODS. 32 DPT students (15 M/17 F) participated in the study. The survey consisted of six motivation behaviors and test anxiety which are included in the Motivated Strategies for Learning Questionnaire (7-point Likert scale). The motivation behaviors were compared with course grade using Pearson r correlation[strong/moderate/weak]. Independent t-tests[$p<.05$] were used to assess the relationship between gender and course grade. SUMMARY. Only one of the six motivation behaviors, self-efficacy for learning and performance, was strongly correlated with academic success [$r(31)=.44$], where higher self-efficacy for learning and performance scores were associated with a higher course grade. Course grade had a weak correlation with all other motivation behaviors and test anxiety. No gender differences were found for the six motivation behaviors and test anxiety. CONCLUSIONS. The results of this study suggest that self-efficacy for learning and performance is an important factor in DPT students' success in Clinical Anatomy. The need for Faculty to address self-efficacy for learning and performance could promote student success. Implementing strategies aimed to improve students' self-efficacy, such as providing timely feedback, delineating clear expectations, and incremental goal setting, may enhance academic success.

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Towards an Anatomical Analysis of Dart Thrower's Motion at the Wrist.

INTRODUCTION. Carpal mechanics are complex and poorly understood. Clinically, dart thrower's motion (DTM) is considered the benchmark of complete functional range in a single pattern of movement. Yet most biomechanical analyses still favour radial and ulnar deviation to best explain intercarpal motion; those that explore DTM are limited to bone or surface observations. This is partly driven by the complexity of simulating DTM. The result is a complete lack of understanding of the functional anatomy of DTM, and especially for intercarpal motion. This study aims to represent DTM in different wrist types in order to provide the first detailed analysis of the anatomy underlying DTM. METHODS. Unembalmed (n = 5) and Genelyn embalmed (n = 10) cadaveric hands were CT scanned, dissected under 6x magnification and modelled in a 3D virtual space. Stop-motion animation, puppetry and robotics were used in varied combinations to develop a DTM model for the cadaveric hand. Digital still and video analysis was used to quantify change in ligament dimensions throughout DTM. SUMMARY. Simulation of DTM in a cadaveric hand was a challenge that required multiple solutions. Stop-motion animation, aided by extensive intra-osseous wires allowed detailed postural analysis but lacked the dynamic influence on tissue strain. Robotics and puppetry provided avenues for more fluid movements, but these inhibited more detailed analysis. Further work is needed to advance the quality, realism and efficiency of the model. The initial data revealed the importance of the ulnar ligament complex and the sling-like function of the radiocarpal ligaments in ways not previously visualised. CONCLUSIONS. The differences in ligament loading patterns between DTM and classical, planar motion patterns are clear. The unique visualisation of this essential motion pattern will inform the more refined management of wrist dysfunction and may enhance post-operative and post-rehabilitative outcomes.

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An Investigation of Learning Features in Anatomy Videos.

INTRODUCTION. Digital videos can be useful adjuncts for learning anatomy. This project evaluates student preferences for video-based learning tools and the effects on student exam performance. METHODS. Two videos addressing different topics were distributed to dental students in their Head and Neck Anatomy course. The first video topic was the Carotid Triangle. It incorporated moving images, narration, implemented quiz questions, and background music. The second video was the Infratemporal Fossa. It incorporated still images, narration, digital highlighting, and implemented quiz questions. In both videos, the didactic information focused on the boundaries of each space, contents (muscles, vasculature, and nerves), and important relationships. Lab practical and lecture exam scores were compared between students that viewed and did not view the videos. A 2-sample T-Test was used to evaluate results between students that viewed and did not view the videos (N=100). Participants were given a survey to provide additional qualitative data. SUMMARY. The Carotid Triangle video showed a difference in mean exam scores, but there was not a significant difference for the lecture questions (P= 0.351) and practical questions (P=0.179). The Infratemporal Fossa video showed a difference in mean exam scores. While there was not a significant difference for the lecture questions (P=0.56), there was a significant difference for the practical exam questions (P=0.02). Survey results had common themes: both videos were ranked very helpful/useful (4.42/5 for the Carotid Triangle and 4.30/5 for the Infratemporal Fossa), engaging (4.20/5 for the Carotid Triangle and 4.18/5 for the Infratemporal Fossa), and 97.6% of the students that responded would like to have more videos. CONCLUSIONS. Using the most effective learning tools in an anatomy video can help students learn more efficiently. These results will help guide future production of anatomy videos intended for supplemental learning.

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Anatomical Injection Model Strengthens Clinical Skills in Dental and Emergency Medicine Trainees.

INTRODUCTION. Failure rates for local oral anesthesia are reported as high as 15-20% and are attributed to a variety of factors including abnormal anatomy, poor technique, and psychological factors. These factors are likely to have the greatest impact when injections are performed by dental medicine trainees or within specialties, such as emergency medicine, where little to no training of local oral anesthesia exists. The aim of this study was to develop an anatomical model for mandibular and maxillary oral injections with realistic tissue feedback and real-time visualization of anatomical landmarks and needle placement. METHODS. Lightly embalmed anatomical donors were prepared to provide intact oral landmarks with minimal loss of relevant anatomy of the injection placement sites. Real-time visual feedback regarding injection placement was provided via a camera for the inferior alveolar nerve block along with the anterior, middle, and posterior superior alveolar nerve blocks. To investigate the effectiveness of the model, dental students and residents along with emergency medicine (EM) residents and EM-interested medical students performed injections with the model. A pre and post survey was administered to determine self-efficacy for dental injections and general knowledge of anatomical landmarks for local oral anesthesia. Following the session with the anatomical models, attendees also participated in a focus group. SUMMARY. Marked improvement with self-efficacy was demonstrated after performing oral injections with the anatomical donor model. Thematic analysis from the focus group highlighted the model's ability to decrease anxiety and increase confidence, visualize/feel landmarks and technique approaches, and experience injections with anatomical variations and with edentulous patients. CONCLUSIONS. The anatomical model provided significant feedback and improved self-efficacy even for attendees with previous experience with local oral anesthesia.

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Chordae within the Transverse Sinus: Application to Understanding Transverse Sinus Thrombosis.

INTRODUCTION. It has been suggested that trabeculae within the transverse sinuses (chordae Willisii) might restrict venous blood flow, contribute to idiopathic intracranial hypertension, and result in thrombus organization. To investigate this potential cause of transverse sinus thrombosis, the anatomy of the trabeculae of the transverse sinus needs to be investigated in detail. Therefore, the current study aimed to better elucidate these structures within the transverse sinus via a morphological study in fresh cadavers. METHODS. Thirty fresh-frozen cadaveric transverse sinuses were dissected and their detailed intraluminal morphology recorded. Classification schemes were applied based on the anatomy and orientation of each chordae. The morphology of the chordae was documented. SUMMARY. Out of 30 sides, 34 chordae were identified; one chorda was found in 36.7%, two chordae in 23.3%, three chordae in 10.0%, and 30.0% had no chordae. Overall, chordae were found in 86.6% of right sides and 53.3% of left sides. There was a statistically significant difference between the number of chordae in left and right sides ($p<0.01$). Chordae were classified into three different types based on their shape and size; Type I: Thin string-like (29.4%), Type II: Narrow sheet-like (41.2%), Type III: Wide

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plate-like (29.4%). CONCLUSIONS. To date, a comprehensive anatomical evaluation of the intraluminal chordae of the transverse sinuses has been lacking. This study furthers our understanding of the internal architecture of the transverse sinus. Knowledge of these bands is essential for those performing endovascular procedures of the dural venous sinuses and for those interpreting imaging of these structures.

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Morphometric Analysis of Psoas Major Muscle to Lumbar Vertebrae Ratio: A Cadaveric Study.

INTRODUCTION. The dimensions of the psoas major muscle (P) has been utilized to evaluate sarcopenia as an indicator of pre-surgical risk. The optimal anatomic location for the measurement of P has not been determined. The goal of this study was to select an optimal site for measurement of P and determine the utility of an anatomic ratio between P and skeletal dimensions as an index independent of body height (H). The size of P in these elderly cadaver donors was small and not anticipated to affect the results of this study. METHODS. Measurements were taken of the diameter (D) and circumference (C) of both P and lumbar vertebrae (L) on 34 adult cadavers (N=34) at the level of L4 and L5. Cross sectional areas (A) of P and L were calculated. Ratios of psoas area (PA) to lumbar area (LA) were compared between the L4 (PA4:LA4) and L5 (PA5:LA5) levels. Correlation coefficient analysis was performed using the P:L ratios to assess the association with donor H. SUMMARY. P:L ratios were calculated in 25 female and 9 male cadavers (N=34) at the L4 and L5 levels. The mean donor age was 79 ± 9.8 years, H was 1.63 ± 0.1 m and BMI was 22.6 ± 6.3 kg/m2. The standard deviations (SD) for both PA and psoas circumference (PC) were less at the L4 level (PA4 ± 1.56 cm and PC4 ± 1.16 cm) than the SD at the L5 level (PA5 ± 1.74 cm and PC5 ± 1.38 cm). The PA demonstrated a moderate positive correlation (0.343) with donor H at the L4 level and a weak positive correlation (0.224) at the L5 level. In contrast, the PA:LA ratios demonstrated a weak negative relationship with donor H at both L4 (-0.094) and L5 (-0.162) levels. CONCLUSIONS. This study supports the measurement of P at the L4 level rather than the L5 level and confirms that the PA:LA ratio is independent of donor H. We recommend using the PA:LA ratio at the L4 level to evaluate for sarcopenia as an indicator of pre-surgical risk in future clinical studies.

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A Story Full of Twists and Turns: Investigating the Causes of Splenic Artery Tortuosity.

INTRODUCTION. The splenic artery is well known for its conspicuously tortuous path, often having many loops, turns, and even elaborate coils. Previous hypotheses suggest that the coiled nature of the artery accommodates the expansion of the stomach, the movement of the diaphragm, is a result of higher blood pressure, or even the result of vascular disease. Pathologically tortuous vessels are more likely to experience aneurysm. The purpose of this study is to quantify splenic artery tortuosity and identify explanatory and confounding factors. METHODS. One hundred thirty-one formalin-fixed donors were dissected to expose the splenic artery from its origin on the celiac trunk to its branching prior to entering the spleen (63 females, 68 males, aged 50-101 years). Vessel tortuosity, vessel diameter, vessel wall thickness, and splenic volume were measured with spreading calipers. Presence, extent and calcification of atheroma was visually observed. Sex, age of death, and cause of death were abstracted from donor records. Correlations between variables were calculated to explore potential relationships. ANCOVA was used to examine variable effect magnitude on tortuosity. All analyses were performed with a = 0.05 in SPSS v26. SUMMARY. The average tortuosity index is 1.80 (1.00-4.08) and 51.1% of the sample had atheromas. No significant associations exist between tortuosity and the other parameters. The general linear model shows that vessel thickness, splenic volume, and presence of atheroma influence tortuosity, explaining 0.5%, 15.1%, and 7.1% of the variation in tortuosity, respectively. All other variables have no effect. CONCLUSIONS. Results suggest that vascular health and biomechanical factors influence tortuosity. Atherosclerotic plaques would alter blood flow dynamics, vessel dimensions, and vessel wall microstructure. An incidental finding of marked splenic artery tortuosity in a patient could indicate systemic vascular disease that warrants further investigation.

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Brachial Plexus Anatomy in the Costoclavicular Space: Effective Location for Upper Limb Anesthesia.

INTRODUCTION. The interscalene block (ISB) is the gold standard for pain management following shoulder surgery. However, phrenic nerve blockade and associated hemi-diaphragmatic paralysis presents a potentially serious complication in patients with respiratory insufficiency. The newly described costoclavicular brachial plexus block (CCB) may offer a phrenic nerve sparing alternative to the ISB with equivalent analgesic efficacy. The costoclavicular space (CCS) is deep to the clavicle midpoint, where the brachial plexus cords are clustered together lateral to the axillary artery. This study investigates the anatomic distribution of injectate with ultrasound-guided CCB. METHODS. Five injections were performed on supine unembalmed cadavers with the arm abducted to 90º. A 20-gauge echogenic needle was inserted in-plane from lateral to medial until the needle tip was in the CCS adjacent to the brachial plexus cords; 20mL of 0.1% methylene blue dye was injected into the CCS. The region was dissected, and the phrenic nerve and brachial plexus were assessed for dye spread. SUMMARY. The injections showed a consistent pattern of supraclavicular dye spread. The C7, C8, and T1 nerve roots were dyed in all injections, but dye did not extend superiorly to the C5 and C6 roots. All trunks, cords, and divisions were dyed, as were nerves arising from these structures (e.g. medial and lateral pectoral nerves, upper and lower subscapular nerves, thoracodorsal nerve, proximal portions of the medial brachial and antebrachial cutaneous nerves, nerve to subclavius, and suprascapular nerve). The phrenic nerve was spared in all injections. CONCLUSIONS. The orientation of the brachial plexus cords in the CCS and the spatial separation of the phrenic nerve and brachial plexus at this location offer a safe anatomical site for upper limb regional anesthesia. The CCB may provide an alternative method of regional blockade for patients with significant pulmonary disease undergoing shoulder surgery.

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Instructional Guide to Intact Central and Medially Oriented Peripheral Nervous System Removal.

INTRODUCTION. Learning human gross anatomy can be overwhelming and challenging for first year medical students. While common learning modes like textbooks and flashcards are helpful, students struggle to connect anatomical relationships with 2-D pictures. Plastinated models are powerful in their ability to provide a 3-D visualization of the body systems, yet these models cost thousands of dollars to acquire. We provide an inexpensive protocol for producing an intact human cadaver central nervous system and peripheral nervous system plexi model for study that will benefit both students and dissector. RESOURCES. A cadaver was used for the intact dissection of the brain and spinal cord using tools commonly found in a graduate cadaver laboratory. DESCRIPTION. We provide a step-by-step guide for intact dissection of the nervous system starting with a new cadaver and subsequently dissecting out each region taking about 50 hours completed in 11 steps. Final dissection produced the brain and spinal cord with intact cranial nerves, eyes, brachial plexi, sympathetic chains, lumbar and sacral plexi, and all spinal roots. SIGNIFICANCE. Current dissection manuals do not provide instruction for a complete removal of the brain and spinal cord, forcing educators to purchase plastinated models if they want their students to appreciate the anatomy of the intact nervous system. Our guide instructs students and teachers to expose the complete nervous system through a hands-on approach, with tools commonly available in graduate cadaver laboratories.

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Anatomic Basis for Unconventional Trans-Sacral Punctures to Access the Caudal Subarachnoid Cistern.

INTRODUCTION. A standard lumbar puncture may be impossible for many technical reasons. By considering anatomy of the sacrum and its dural sac, we critically analyzed four alternative percutaneous intradural puncture techniques. Specifically, previous accounts of caudal epidural anesthesia via the sacral hiatus prompted us to test if image-guided percutaneous trans-sacral hiatus access to the caudal subarachnoid cistern would be anatomically feasible. METHODS. To study sacral canal morphometry and curvature, we analyzed midsagittal CT-myelogram images of 40 normal subjects and digitally measured sacral curvatures between S1 to S5 and S2 to S4 using two methods whereby a lower angle signifies a straighter sacrum. We measured midsagittal sacral canal area, hiatus width, dural sac termination levels, and distance from sacral hiatus to the dural sac tip (needle distance). SUMMARY. Subjects were F:M=25:15, with a mean age of 44.9 years. The two S1-S5 full sacral curvature mean angles were 57.3º and 60.4º. Almost all sacral hiatuses were at S4, and dural sac terminations were at S1-S2. The mean S2-S4 sacral curvature was 25.1º, and the mean needle distance was 57.7 mm. Using two-way ANOVA, there were significant sex differences for needle distances ($p=.001$), and full and limited sacral curvatures ($p=0.02$, and $p=0.046$, respectively). There were no significant linear correlations between age and sacral curvature, needle distance, canal area, or hiatus width. CONCLUSIONS. Despite a frequently prominent full sacral curvature, the combination of S1-S2 dural sac termination plus a relatively straight trajectory of the lower sacral canal between S2 to S4 support the theoretical feasibility of percutaneous trans-sacral hiatus and sacral canal access to the lumbosacral cistern using a standard spinal needle. We also review three other puncture techniques, namely: via S1 or S2 foramina, dorsal trans-osseous at S1/S2, and through a sacral spina bifida occulta in <5% of subjects.

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Essential Digital Anatomy Table Skills to Enhance Independent Anatomy Learning.

INTRODUCTION. Digital Anatomy (Anatomage) Table (DAT) is available at many medical schools; however, its adaptation within classrooms has been a considerable challenge. Instructors and students face a steep learning curve familiarizing themselves with the basic functioning of the Table, making it challenging to incorporate such systems into the curriculum. METHODS. This study is to determine the confidence level, operational skills, and ability of participants to independently learn the foundational gross anatomy after completing a short, comprehensive, self-guided training on the Digital Anatomy Table. First-year medical students in two consecutive classes of fifty-three and fifty-one students (designated Group 1 and Group 2) respectively participated in the study. Students with minimum or no experience on the DAT completed a self-guided training exercise on the DAT followed by a confidence level survey. They then took a formative assessment to demonstrate operational skills on the DAT and their ability to identify and explore from simple to complex anatomical structures not yet studied in the curriculum. SUMMARY. Using the DAT, students were able to complete the self-guided training in less than twenty minutes (mean 16.5 minutes). After the training, students ranked their confidence level of operating eighteen critical functions of the DAT on a scale of one to ten, where ten is very confident. Forty-six students (72%) of Group 1 and forty-nine students (96%) of Group 2 felt that they could operate the DAT with a confidence level of 7 or better. Upon assessment, students were able to demonstrate the critical skills to operate the DAT. Additionally, 89% of students independently uncovered challenging anatomical structures on the DAT, previously not studied in the curriculum. CONCLUSIONS. Our innovative approach would help medical schools confronted with the challenges of training faculty and students to use the Digital Anatomy Table efficiently to learn anatomy.

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Establishment and Cryopreservation of Camel Stem Cells from Wharton's Jelly of Umbilical Cord.

INTRODUCTION. Stem cells are special cells that have the ability to develop into many different cell types and also have the ability to repair damaged tissues. Mesenchymal stem cells (MSCs) are currently considered as 'Medicinal Signaling Cells' and a promising resource in regard to cell-based regenerative therapy. Umbilical cord is a term perinatal tissue which is easily attainable, and a promising source of stem cells with no associated ethical concerns. Wharton's jelly (WJ) is the gelatinous matrix that surrounds and provides protection to the umbilical cord blood vessels. Being more primitive, MSCs from umbilical cord exhibit greater proliferative capacity and immunosuppressive ability. Thus, as compared to adult stem cells it gives them a therapeutic advantage. METHODS. 25 camel umbilical cords were collected from Camel farms in U.A.E. Wharton's jelly was dissected from the umbilical cord by separating it from umbilical blood vessels. It was cultured by explant method using growth medium. It was then subjected to passaging the cell line to increase the confluency to more than 80%. They were then cryopreserved in liquid nitrogen (-120 degree) to be used again for future use. SUMMARY: The cultured Wharton's jelly showed fibroblast like cells spreading out after 4-5 days. These cells were then removed in to different culture plates and passaging of them was done to increase their confluency above 80%. The results were very encouraging. They were then cryopreserved in liquid nitrogen. CONCLUSION. Being a primitive stromal cell population, WJ-MSCs offer the advantage of faster proliferation rate and reduced immunogenicity as compared to adult tissue derived MSCs. Hence, successful isolation of robustly proliferating healthy MSCs from WJ of camel umbilical cord, which retain all the basic MSC properties, assumes importance in injuries occurring in racing animals and in any debilitating diseases of camels.

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Pre- and Post-Operative HARDI Tractography of Cerebellar Pathways i Posterior Fossa Tumors.

INTRODUCTION. This study aimed to demonstrate the role of high angular resolution diffusion imaging (HARDI) tractography in mapping of the cerebellar pathways associated with posterior fossa tumors and to determine whether it is useful for brain surgery planning and postoperative evaluation. METHODS. Data from 18 male and 12 female patients aged between 2-16 years who were diagnosed with posterior fossa tumor and 30 age- and sex-matched healthy controls were used. MRI was collected with a 3T MR system which included a diffusion-weighted sequence with 30 gradient directions at b=1000 and 5 b0 values. Whole brain fiber pathways were reconstructed using Diffusion Toolkit software, Q-ball model, FACT propagation algorithm, and an angle threshold of 45 degrees. Manually identified regions-of-interest (ROIs) were placed to identify reconstructed fiber pathways passing through the superior, medial and inferior cerebellar peduncles for the preoperative, postoperative, and the healthy control participant groups. Fractional anisotropy (FA), apparent diffusion coefficient (ADC), track volume, and fiber length measures were obtained and analyzed. SUMMARY. Statistically significant differences were found between the pre-op/post-op, pre-op/control and post-op/control comparisons for volume and length of the tracts. Displacement and disruption of the pathways were observed correlated to the grade of tumor. The loss of pathways after the operation was associated with selective resection during surgery due to tumor infiltration. Tumor infiltration was shown on the left middle cerebellar peduncle via a decreased FA and an increased ADC in that

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region. CONCLUSION. The effects of posterior fossa tumors on cerebellar peduncles and reconstructed pathways were successfully evaluated by HARDI tractography The technique appears to be useful not only for preoperative but also for postoperative evaluation. (Sponsored by Grant No. 2018/14 from the Research Fund of Istanbul Medipol University)

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Popliteal Arcuate Ligament - A Meta-Analysis of Prevalence and Morphometric Properties.

INTRODUCTION. The arcuate ligament (AL) is one of structures comprising posterolateral corner (PLC). It is a static stabilizer, restrains external tibial rotation, varus angulation, and posterior tibial translation. AL, is not properly described in literature. We aimed to conduct a meta-analysis assessing the prevalence of AL to raise awareness about possibility of AL and PLC injuries. Moreover, we wanted to compare the prevalence of AL between patients of different ethnicities. METHODS. All major medical databases were searched to identify valid studies including (PubMed, Embase, Scopus, ScienceDirect, Web of Science, SciELO, BIOSIS). Afterwards, the data extraction and statistical analysis was conducted. PRISMA guidelines were strictly followed in this study. SUMMARY. 30 articles representing a total of 1386 lower limbs were enrolled in this study. An overall pooled AL prevalence was 81.7% (95% confidence interval [CI], 69.3-91.6%). Its prevalence was the highest in intraoperative subgroup compared to cadaveric studies and MRI ones and equal 99.5% (95% CI: 97.9-100.0), 86.5% (95% CI: 73.8-95.7) and 57.3% (95% CI: 27.5-84.8) respectively with sensitivity 72.5% (95% CI: 51.5-89.6). In European studies, AL was present in 83.4% (95% CI: 58.9-98.8) of cases in comparison to 83.6% (95% CI: 59.1-100.0) in North American and 74.2% (95% CI: 49.3-93.3) in Asian articles. CONCLUSIONS. In conclusion, our meta-analysis shows that AL is highly prevalent structure. Surgeons should always remember about it when operating in PLC area.

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Radiation Induced Nuclear Changes in Oral and Oropharyngeal Cancer Patients - A Cytogenetic Study.

INTRODUCTION. Estimation of radio sensitivity of individual tumor is essential for planning optimum radiation schedule for each patient. Evaluation of radiation induced histomorphological modifications in the nucleus is known marker of radio sensitivity.Our study was to determine relationship between nuclear changes with radiation dose and to explore the prospect of utilizing them as an assay to envisage tumour response to radiotherapy in oral and oropharyngeal cancer. METHODS. The study included 60 patients (age range of 25-65yrs) which were histopathologically confirmed cases of oral and oropharyngeal carcinoma and being treated by radiotherapy alone with a radiation dose plan of 4, 14, 24 and 60 Gy respectively on 2nd, 7th, 12th and 30th day. All patients which were included in our study, buccal smear of the oral mucosa was collected. Smear was air dried and fixed with methanol. The Nuclear variations of Micronucleus (MN), Multinucleation (MNU) and Nuclear Budding (NB) were evaluated after staining with Giemsa and May-Grunwald's stain under the bright field microscopy. SUMMARY. Out of 60 patients included in our study, 42 were males and 18 were females (Mean percentage increase of MN and MNU were found to be statistically significant (p=0.001) when equated with pre-treatment day. Analogous findings were observed with NB, except between pre-treatment and after 14 Gy of dose (p-0.110). In this study the measurement of relative increment index done in regard to all nuclear variations show a sustained rise with increasing dosage of radiation. CONCLUSION. The progressive rise in nuclear variations indices with increasing dose of radiation proves that these parameters may be used as indicators for evaluating the response of tumour for radiotherapy. Study was undertaken to explore the probability of establishing a relationship between the incidences of nuclear variations in patients of oral and oropharyngeal carcinoma with applied dosage and duration of radiotherapy.

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Morphology of Blood Vessels - Relation to Microanatomical Features of Degeneration in Aortic Valves.

INTRODUCTION. Normal aortic valves are avascular, but in patients with calcific aortic valve disease, the presence of vessels in the aortic valves is often observed. However, little attention is paid to the morphology of these neovessels. The aim of this study was to morphologically classify neovascularization in calcified aortic valves and to evaluate the possible association between neovessels characteristic and features of valve degeneration. METHODS. Seventy-five consecutive aortic valves were obtained during routine aortic valve replacement surgeries and processed using histochemical and immunohistochemical methods to reveal blood vessels (CD34, laminin), calcifications (Alizarin red), hemorrhages (glycophorin, PTAH) and macrophages (CD68). In all specimens following parameters were examined: the presence of hemorrhages, structural degeneration (modified Warren and Yong scoring system), bone formation, and intensity of inflammatory infiltration. SUMMARY. Neovascularization was found in 63 (84.0%) valves. In 21 (28.0%) cases only capillary-like vessels were observed, while in the remaining 42 (56.0%) valves also large, sinusoid-like vessels were present. Between-group comparisons (I: avascular valves; II: valves with capillary-like vessels; III: valves with sinusoid-like vessels) revealed significant differences in the valve degeneration characteristics. The presence of sinusoid-like vessels was associated with the most severe hemorrhages ($p<0.001$), osteogenic metaplasia ($p=0.002$) and the highest level of structural degeneration ($p=0.001$) as well as inflammatory infiltration ($p=0.01$). CONCLUSIONS. Calcific aortic valve disease may lead to the development of different forms of blood vessels in the valve. The occurrence of blood vessels and their sinusoid-like morphology are significantly associated with inflammation, hemorrhages, osteogenesis and advanced valve destruction.

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Cephalic Vein: Anatomical Study/Evaluation of the Coracoid Process as a Topographical Bony Landmark.

INTRODUCTION. Clinicians require accurate anatomical information when gaining central venous access. Despite the cephalic vein cut down (CVCD) procedure being described as a superior choice to other methods, the cephalic vein's (CV) anatomical variations can make it challenging to locate. We asked if the coracoid process (CP) could be utilized as an accurate topographical landmark to locate the CV. The present study set out to prove the CV will be located within 1 cm of the CP with statistical significance. METHODS. We conducted bilateral shoulder dissections on 42 cadavers to determine the location of the CV in relation to the CP. Distances were measured horizontally, vertically and directly from the CP to the CV utilizing digital calipers. SUMMARY. Resulting means were: Straight line distance: 9.48 ± 4.45 mm, horizontal distance: 13.50 ± 6.45 mm, vertical distance: 11.03 ± 5.17 mm. A one sample student t-test on the straight-line distance, with the expected population mean set to > 1 cm, had a resulting $p=0.000134446$. This p-value decreased to -1.11022e-16 at population mean set to > 2 cm. CONCLUSION. We showed that the CV can be located within 1 cm of the CP with statistical significance. The average incision for the CVCD procedure is 3-6 cm. It can safely be assumed that the incision will be spread to a width of 2 cm. If the clinician does not quickly locate the CV, they can assume it is likely a variation or absent. This will aid clinicians in avoiding unnecessary time searching for the vein and instead rapidly transition to an alternative approach, transitioning the original CVCD incision to the reservoir incision. With this new information, we hope to persuade more clinicians to make the CVCD their first and primary attempt for central venous access over the subclavian puncture.

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Evaluation of Nerve Capture Using Classical Landmarks for Knee Radiofrequency Denervation.

INTRODUCTION. Radiofrequency (RF) denervation of the superolateral (SLGN), superomedial (SMGN), and inferomedial genicular (IMGN) nerves are commonly used to manage chronic knee pain related to osteoarthritis. Development of novel image-guided procedures, to increase capture rates, requires a detailed understanding of the classical target sites and their 3D relationships to articular branches of SLGN, SMGN, and IMGN. The capture rates of these genicular nerves, using classical target sites, have not been thoroughly investigated. Therefore, the purpose was to determine which articular branches of SLGN, SMGN, and IMGN are consistently captured using classical landmarking. METHODS. In this pilot study, RF cannulae were placed in 5 specimens. The cannulae were adapted to enable a metal insert to pass through the barrel and be embedded at the site of the needle tip. Next, the specimens were dissected to expose articular branches of SLGN, SMGN, IMGN and their relation to the metal insert. The articular branches and metal insert were digitized and modeled in 3D using Autodesk® Maya®. Nerve capture rates were assessed and quantified based on the visualization of articular branches overlapping with the 3D model of the lesion volume placed at the location of the metal insert. SUMMARY. In all specimens, the classical landmarks captured proximal branches of the SLGN and SMGN, while sparing the more distal branches. Also captured were the anterolateral (5/5 specimens) and anteromedial (4/5) branches of the nerve to vastus intermedius. Inferiorly, anterior branches of the IMGN (5/5) were captured while the more distal and posterior branches were spared. CONCLUSIONS. The classical landmarking techniques for RF denervation of the knee joint was found to only capture a select number of targeted articular branches. Additional landmarks to supplement current practice require further anatomical and clinical investigation to reduce the sparing of articular branches.

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Reflections on Life's Passing in the Anatomy Course – an International 14 University Comparison.

INTRODUCTION. Reflections on the topic of death and life's passing during the anatomy course can have a significant impact on medical and dental students' emotions. The goal of this qualitative study was to perform an international comparison at 14 universities, and to study whether variations in anatomy course formats may have an impact on the students' experiences. RESOURCES. Participants were pre-clinical students who volunteered in an international exchange program (65% female, 35% male; 24% were < 20, 70% were between 20 and 25, 6% were > 25 years old). Students were asked to reflect on one question ("How did your experience in the anatomy laboratory bring about your reflections on the meaning of life and human existence as well as the sanctity of one's passing?") – in self-reflection and together as an international small focus group (68 groups of 3 to 4 students connected online). Written assignments were anonymously coded into themes by 4 individuals – sorted by schools. Information on anatomy courses was obtained via faculty questionnaires. DESCRIPTION.151 individual and 44 group responses were received. One school does not offer cadaver dissection for all. Another school teaches via pro-sections only. Major themes included dignity, beneficence, dichotomy, appreciation, fragility of human life, spirituality, relationship, indifference. Themes varied among the different schools - cultural differences and possibly the way anatomy is taught may have an impact. Students who do not dissect tend to avoid responding on the topic of death. Students who visit donor families prior to the course mentioned dignity. SIGNIFICANCE. Anatomy dissection courses can have a major influence on initiating students' thinking about life's passing. Differences in responses by schools indicate cultural differences and the way how anatomy is taught.

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Abstracts – ePoster Presentations

Accepted for Publication in Clinical Anatomy
(Listed by presenting author last name)

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Theories of Gluteus Maximus Involvement in Low Back Pain Causation.

INTRODUCTION. There is a small but growing amount of research which supports a link between low back pain (LBP) and gluteus maximus (GM) weakness. Studies have found GM muscle atrophy, as well as EMG and strength changes, in the presence of LBP. We have, however, been unable to find any evidence demonstrating a specific mechanism explaining the connection between GM and LBP. RESOURCES. Skeletal models, cables and digital force gauges were used to create basic biomechanical models of the forces potentially involved in GM and LBP interactions. DESCRIPTION. Our strategy involved reviewing the anatomical relationships that exist in the gluteal/lumbar region, and then assessing potential, clinically relevant, biomechanical mechanisms deriving from these relationships. Four hypotheses were developed: Hypothesis 1: The protective effects of a strong GM during lifting may decrease the risk of intervertebral disc (IVD) herniation by moving the trunk into extension through a danger zone when IVDs are most susceptible to posterolateral herniation. Hypothesis 2: Hip extensor strengthening activities may indirectly exert a stabilization effect on the lumbar spine, via activation of deep muscles of the back such as multifidus during these exercises. Hypothesis 3: Attachments of the GM to the thoracolumbar fascia (TLF) may impart protective effects on the spine through multiple mechanisms including: facilitation of postural changes, increased paraspinal muscle force production, and motor control potentiation via GM's stimulation of afferent TLF receptors. Hypothesis 4: Incidental LBP-related disuse atrophy of GM may give the appearance of a relationship that does not exist. SIGNIFICANCE. LBP is a significant health problem worldwide. The theories proposed here can be used as a framework for future biomechanical studies that could support or refute the existence of a relationship between LBP and GM, and aid in the development of new exercise interventions for LBP.

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Persistent Left Superior Vena Cava with Aberrant Course of Right Common Carotid Artery.

INTRODUCTION. Persistent left superior vena cava (PLSVC) is a relatively rare congenital anomaly that has no adverse effects on daily life. The incidence of PLSVC in the normal population was reported to be 0.2-0.7%. Precise knowledge for the topology and variation of the superior vena cava is important for catheter-based therapy. Present case shows a rare anomaly of the PLSVC with aberrant course of the right common carotid artery. RESOURCES. An 89-year-old Japanese male donor whose cause of death was angiocholitis with common bile duct stone. DESCRIPTION. In this case, PLSVC passed anterior to the left pulmonary veins and drained into the right atrium via the coronary sinus. In addition, this PLSVC received a vein that coursed longitudinally along the vertebra. This left longitudinal vein gathered the 3rd to 6th right intercostal veins. Though the brachiocephalic trunk normally divided into the right subclavian and common carotid arteries, only the right common carotid artery passed anterior to the left brachiocephalic vein. SIGNIFICANCE. The PLSVC is the persistence of the left anterior cardiac vein in development. Left brachiocephalic vein derives from the anastomotic vein between bilateral anterior cardiac veins. In this case, this anastomotic vein drained into relatively posterior near the posterior cardiac vein, and therefore, the right common carotid artery could lie anterior to the left brachiocephalic vein. The internal jugular veins and subclavian veins have been used for a catheter in intravenous hyperalimentation and implantation of a wire for the pacemaker, etc. It is essential to evaluate the position surround the superior vena cava prior to catheter-based therapy to avoid complications.

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Popliteal Artery: Its Variants and Clinical Implications. A Pictorial Essay.

INTRODUCTION. Knowledge of popliteal artery and infapopliteal branching patterns are important in reduction of iatrogenic vascular complications as these are recipient sites for above and below knee by-pass grafts, popliteal entrapment, in arthroscopic knee surgery and in treating femoral artery blockade helping in minimizing severe symptoms needed to regain daily tasks completion such as peripheral arterial disease. METHODS. The popliteal artery has 3 main branches, anterior tibial (ATA), peroneal artery (PA) and posterior tibial (PTA) and their infrapopliteal branches concerned with vascularization of anatomical structures in the leg and foot regions. SUMMARY. 8 major variants of popliteal artery and branches were encountered on review of about 100 dissected limbs. High arising ATA coursing, 1)anterior, 2) posterior to the popliteus muscle, 3) segmental hypoplasty of the ATA, 4) dorsalis pedis replaced by an hypertrophied PA, 5) ATA- PAT, 6) hypoplastic PTA, 7) trifurcation of the popliteal artery, 8) peroneal arterial magna (PAM) . A high arising ATA coursing anterior to popliteus muscle stands a high risk of inadvertent ligation during a total knee replacement surgery. The dorsalis pedis pulsation will be absent in hypoplastic or aplastic ATA. Inadvertent ligation of the PAM may lead to gangrene and possible limb loss. CONCLUSIONS. Knowledge of variants of the popliteal and branches are important to vascular, orthopedic, and plastic surgeons in the selection of appropriate surgical interventions and to interventional radiologists in the interpretation of images. PAM plays a dominant role for lower leg perfusion and should be precluded for a fibular flap harvest.

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Case Report: A Unique Ipsilateral Branching Variation of the Axillary Artery.

INTRODUCTION. An unusual arterial branching pattern of the third part of the left axillary artery (AA) was observed in an 87-year-old male cadaver. RESOURCES. The cadaver was received through the Gift Body Program of the Center for Anatomical Science and Education, Department of Surgery at Saint Louis University School of Medicine. DESCRIPTION. A common arterial trunk arose from the third part of the left AA just inferior to the lower border of the pectoralis minor muscle. It quickly divided into the subscapular artery (SA) and a common stem for the deep brachial artery (DBA), the anterior humeral circumflex artery (AHCA), and the posterior humeral circumflex artery (PHCA). Both the SA and AHCA appeared normal regarding their course through the axilla. The PHCA traveled with the axillary nerve passing through the quadrangular space and gave off the radial collateral artery (RCA) in the posterior compartment of the arm. Superior to the elbow joint, the radial recurrent artery crossed anterior to the lateral epicondyle to anastomose with the RCA. The DBA traveled with the radial nerve through the triangular interval and continued as the middle collateral artery (MCA) in the posterior compartment of the arm. Distally, the MCA anastomosed with the interosseous recurrent artery deep to the anconeus muscle. Another unusual finding was the medial cord and lateral cord contributions to the median nerve formed posteriorly to the axillary artery. SIGNIFICANCE. Knowing anatomical variation of the axillary artery is clinically important. These anomalies should be considered during vascular and reconstructive surgeries of the arm and interventional radiology procedures.

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Variable Levels of Bifurcation of the Sciatic Nerve in Relation to the Piriformis Muscle.

INTRODUCTION. The ventral rami of the Lumbosacral plexus formed by L4- S3 make up the Sciatic nerve (SN). The SN exits the pelvis through the Greater Sciatic Foramen (GSF) & enters the gluteal region inferior to the Piriformis muscle (PM), leaves the gluteal region coursing down the posterior thigh where it divides into the CPN & TN at the apex of popliteal fossa. Radiating lower back pain is a prevalent clinical issue proven to be treated effectively with OMM, including treatment of the piriformis. RESOURCES. Dissection of 52 lower limbs (LL) in the gluteal region & posterior thigh was done to expose the SN bifurcation. DESCRIPTION. Based on the Grewal classification, we found in 8 LL the SN division occurred in the pelvis; of these specimens in 5 LL both the CFN & the TN emerged infra-piriformis & in 3 LL, the CPN exits through the piriformis & the TN infra-piriformis. In 44 LL of the specimens showed division of the SN after its exit from the GSF, specifically 10 LL divided in the gluteal region, 2 LL the SN divided between the junction of the gluteal region & the upper 1/3rd of the thigh, 2 LL the SN divided in the upper 1/3rd of the thigh, 6 LL SN divided at the junction of upper & middle 1/3rd of the thigh, 4 LL the SN divided in the middle 1/3rd of the thigh, 17 LL, the highest incidents, SN divided at the junction of the middle & lower 1/3rd (apex of the popliteal fossa) & 3 LL the SN divided at the lower 1/3rd of the thigh. SIGNIFICANCE. The study of the SN variations is important when conducting surgical, diagnostic & therapeutic treatment such as osteopathic manipulative medicine. As the SN exits the pelvis, piriformis syndrome has been known to cause compression of the nerve causing pain and pathology. This understanding increases the clinical effectiveness in treatment, while decreasing the risks of lower extremity disability. Key words: Sciatic Nerve, bifurcation, variations, Common Fibular Nerve, Tibial Nerve, piriformis muscle.

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Bilateral Anomalous Origin of Radial Artery from Axillary Artery – A Case Report.

INTRODUCTION. The axillary artery is the continuation of the subclavian artery at the outer border of the first rib and is the main source of arterial blood supply of the upper limb. The axillary artery lies between the lateral border of the first rib and lower border of the teres major muscle. Throughout its course in the axillary region, it is in close relation with the cords and branches of the brachial plexus. The axillary artery continues as brachial artery at the distal / lower border of the teres major muscle. The brachial artery ends at the level of the neck of the radius by terminating into radial and ulnar artery. There is a lot of variation in these arteries. High origin of radial artery from axillary artery is very rare. RESOURCES. During routine dissection for medical students, skin, superficial fascia, deep fascia was removed. Axillary artery and its branches were traced from the axilla to the cubital fossa. The axillary artery is the main artery supplying the upper limb and is clinically important. DESCRIPTION. In the present case, we report a bilateral arterial variation in a 95-year-old male cadaver in which radial artery was taking origin from axillary artery. SIGNIFICANCE. The incidence of such an anomaly is low and there have been few previous reports. Being aware of vascular variations is important for both radiologists and surgeons, and may prevent diagnostic errors. Radial artery being commonly used for inserting coronary artery stents, the anomalies associated with it serve as important factors for procedural failures.

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Anomalous Origin of Flexor Carpi Radialis Muscle from Bicipital Tendon – A Case Report.

INTRODUCTION. In the flexor compartment of the forearm there are four superficial, one intermediate and three deep muscles. The superficial flexor muscles include the pronator teres, flexor carpi radialis, palmaris longus and the flexor carpi ulnaris, the muscle in the intermediate layer is the flexor digitorum superficialis. Deep group of flexor muscle include flexor pollicis longus, flexor digitorum profundus and pronator quadratus. Flexor carpi radialis usually takes origin from the medial epicondyle of the humerus as common flexor origin of superficial flexors as well as from antebrachial fascia. It passes deep to flexor retinaculum and inserts on the base of the second and third metacarpal bones. RESOURCES. During routine dissection of forearm for medical students, we reflected the superficial and deep fasciae. Flexor muscles of forearm including flexor carpi radialis muscles were identified. DESCRIPTION. Several authors have reported the morphological variations of the flexor muscles in the forearm. Flexor carpi radialis is a superficial flexor muscle of the forearm. In addition to the medial epicondyle of the humerus, it was also seen taking origin from biceps brachii tendon. SIGNIFICANCE. The incidence of such an anomaly is low and there have been few previous reports. This kind of anomaly is important for clinical and radiological diagnosis of neurovascular compression affecting the upper limb distal to the cubital fossa and also to surgeons undertaking reconstructive surgery.

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Thoracodorsal Nerve Location Variability on the Thoracic Wall and Potential Surgical Complications.

INTRODUCTION. Damage to the thoracodorsal nerve can potentially produce profound functional deficits involving back and shoulder pain as well as reduced shoulder mobility. Investigations into the variation of this nerve have focused on its origin on the brachial plexus and its spinal nerve contributions. The present study aims to quantify the variation in the pathway of the thoracodorsal nerve relative to thoracic cage landmarks and is the first to investigate morphological variation relevant to surgical procedures involving the axillary region and the lateral thoracic wall. METHODS. A MicroScribe™ G2X digitizer was used to register 14, 3D landmarks from 44 thoracodorsal nerves in 32 fully embalmed, whole-body donors (20 males and 12 females, aged 50-97 years). After exposure via dissection, the nerve was examined from its origin on the brachial plexus to its entry in the latissimus dorsi muscle at points perpendicular to the anterior and mid-axillary lines along the ribs. Distances between the axillary lines and the nerve were computed from the raw coordinates. Geometric morphometric analyses of the landmarks were performed to visualize areas of greatest shape variation in the nerve and axillary lines. SUMMARY. Along the anterior axillary line at ribs 1-3, the nerve has an average distance of 98 mm (range 15-160 mm). Along the mid-axillary line at ribs 1-4, the nerve has an average distance of 58 mm (range 10-133 mm). The distance of the nerve from the axillary line increases in variation as the nerve descends along the thoracic wall. The terminus of the nerve is the most variable point, entering the muscle between costal levels four and seven. CONCLUSIONS. Surgeons can use these data to locate safe areas on the thoracic cage and avoid damage to the thoracodorsal nerve; thus, decreasing adverse outcomes in procedures such as chest tubes, video/robotic-assisted thoracoscopic lobectomies, and mastectomies.

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Multiple Osteochondromas Comorbid with Enlarged Parietal Foramina: A Case Report.

INTRODUCTION. Multiple osteochondromas (MO) is a condition that affects about 1 in 50,000 live births. Patients present with accessory bone growths, usually stemming from the epiphyseal plate of long bones. Furthermore, the presentation of MO comorbid with an underdeveloped skull is an extremely rare condition known as Potocki-Shaffer syndrome, with fewer than 100 documented cases. The present study investigates a unique case of MO and is reported in order to provide a deeper understanding of this anatomical variation for physicians in the clinical setting. RESOURCES. A 66-year-old Caucasian male donor was examined during a routine cadaveric dissection performed by medical students. Detailed exploration of the skeleton and organs was performed, and photographs were taken. Tissue samples were obtained from multiple outgrowths, and histopathological examination was done. DESCRIPTION. Bilateral bony growths were noted to arise from the long bones of the upper and lower extremities (femur, tibia, fibula and radius). An accessory muscle was found associated with the left radial bony growth. Histopathological examination was positive for osteochondroma. Inspection of the skull revealed enlarged parietal foramina. Other findings include tibio-fibular synostosis, abnormally shaped vertebral bodies and ribs, and elongated styloid processes of the skull. SIGNIFICANCE. Insight into the rare variation found in this case can be of use in a clinical setting. Individuals affected with MO have reported joint disorders, difficulty with movement, loss of circulation, and denervation. In some cases, malignancy of the bony overgrowths has been reported. The enlarged parietal foramina are associated with underdeveloped intellectual abilities, social skills, motor skills, and speech. This unique combination of bone pathologies provides a better clinical understanding of its presentation and necessitates further investigation on its pathogenesis.

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Student Perception and Self-Reported Outcomes Using Student-Created Questions for Exam Preparation.

INTRODUCTION. One of the initial obstacles of medical and graduate school is adjusting to the rigorous coursework and difficulty of exams. To assist with this transition, students at the Arkansas College of Osteopathic Medicine created Mockdocs.org, a question bank website designed to help students prepare specifically for first-year exams. Research has been conducted that demonstrated how practice tests help prepare students for exams, but none of these resources have been over questions created by students for students without faculty involvement. This study was conducted to determine the primary use, gauge how well-prepared students felt, and analyze self-reported outcomes after utilizing the student-made exam bank known as Mockdocs. METHODS. A multi-question survey with likert-rating, multiple-select, and open-ended questions was sent out to first-year students of the Arkansas Colleges of Osteopathic Medicine and to the students in the Master of Biomedical Sciences program at the Arkansas Colleges of Health Education. Results were analyzed by tallying students' responses to survey items and reported as percentages. SUMMARY. Of the students that completed the survey, a majority reported having used Mockdocs for exam preparation. Those who used Mockdocs reported higher exam averages when they used Mockdocs versus when they did not regardless of course. Students reported that Mockdocs was primarily used for content review and to gauge understanding of concepts presented in lecture material. CONCLUSION. Students believe that student-created exam banks are useful in preparing for exams. Mockdocs practice exams were viewed as an accurate depiction of what to expect on faculty-written exams and they perform better when utilizing them. According to the results, Mockdocs is a useful tool in preparing students for first-year medical and graduate school exams.

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Unilateral Absence of the Musculocutaneous Nerve and Associated Median Nerve Compensation.

INTRODUCTION. The brachial plexus is an ordered network of large nerves in which anatomical variations are not uncommon. The musculocutaneous nerve (MCN), one of the terminal branches of the brachial plexus, originates from the lateral cord and contains fibers from spinal cord levels of C5-7. It provides motor innervation to the anterior compartment of the arm and sensory innervation to the lateral forearm. On routine dissection of an embalmed 76-year-old female, the MCN was found missing on the right side. RESOURCES. The cadaver was obtained through the Gift Body Program of the Center for Anatomical Science and Education, Department of Surgery at Saint Louis University School of Medicine. DESCRIPTION. The right MCN was not observed during the dissection, rather, four branches arose from the median nerve at different levels. In proximal to distal order, the first three muscular branches supplied the coracobrachialis muscle, biceps brachii muscle, and the brachialis muscle. The fourth, most distal branch of the median nerve passed deep to the biceps brachii muscle and superficial to the brachialis and brachioradialis muscles. It continued to the lateral side of the forearm as the lateral antebrachial cutaneous nerve. The remainder of the brachial plexus, as well as the plexus on the contralateral side, appeared consistent with the typical pattern found in literature. Measurements at the convergence of the medial and lateral cord contributions showed the size of the median nerve was greater on the right side compared to the left side. SIGNIFICANCE. There have been reports of unilateral and bilateral absence of the MCN. An absent MCN that has been compensated for may not affect the daily life of the individual, but is still of surgical and anatomical interest. Specifically, it can be important in the settings of trauma, brachial plexus block, neurophysiological diagnostics, and nerve transplantation.

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Reliability of 3D Freehand Ultrasound -Triceps Surae Muscle Volume in Typically Developing Infants.

INTRODUCTION. The muscles of the triceps surae (gastrocnemius and soleus) are responsible for generating power to allow vital functions such as walking and maintenance of posture. While studies have extensively investigated these muscles in adults and children, there is a lack of research looking into the architecture of these muscles in infants who have not started weight-bearing. Understanding the architectural changes that occur during muscle growth in typically developing infants will allow more accurate assessment and treatment of neurodevelopmental conditions that cause alterations in said architecture (such as cerebral palsy). This study aimed to assess the reliability of freehand 3D ultrasound in measuring the muscle volume of the medial gastrocnemius (MG), lateral gastrocnemius (LG) and soleus in infants in vivo. METHODS. MG, LG and soleus from both limbs of 15 term-born infants aged 3 months were scanned using freehand 3D ultrasound, of those 10 were scanned again at 6 months of age. For intra-acquirer reliability, the right leg was scanned twice by the same investigator, with an interval of 10 minutes between acquisitions. For inter-processor reliability, two investigators manually segmented the images obtained to generate muscle volume measurements. Intra-acquirer reliability and inter-processor reliability was assessed using the intraclass correlation coefficient (ICC). SUMMARY. The intra-acquirer reliability for MG, LG, and soleus was 0.869, 0.896 and 0.972 respectively. Inter-processor reliability for the right MG, LG and soleus was 0.898, 0.708, 0.911 respectively, while the corresponding results for the left-sided muscles were 0.977, 0.868 and 0.863. CONCLUSION. Freehand 3D ultrasound is a reliable method for measuring muscle volume in vivo for infants. The reliability of repeated scans and the segmentation process is good (ICC>0.7), however further research is needed in this age group.

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Quantitative Analysis of Cadaveric Pelvic Lymph Nodes.

INTRODUCTION. Lymphedema commonly develops as a result of cancer treatments, including surgical removal of lymph nodes (LN). Research suggests there are 500-800 (LN) throughout the body. Deciding how many LN to remove and predicting possible severity of damage can become problematic when the range of LN in one area can vary by 30 LN. The purpose of this study was to investigate more precise ranges of pelvic LN within cadaver samples. RESOURCES. Quantification of LN for number occurred on cadavers simultaneous with DO, PT, and PA students' dissections. Demographics of the cadavers were 27 female, 16 male, 39 Caucasian, 3 African American, 1 Asian, with an age range of 42-102 and a mean of 70. The study utilized anatomical landmarks to identify and label the LN. Cadavers (N=43) inspected for lumbar LN and cadavers (N=86 sides) inspected for sacral, common, deep and superficial inguinal, and internal and external iliac LN. DESCRIPTION. Quantitative analysis of the pelvic region LN revealed a power analysis value of 0.733 with 43 cadaver sample size (unpaired LN regions) and a value of 0.954 with a 86 cadaver sample size (paired LN regions). Analysis of LN in unpaired lumbar region revealed the true mean of the LN lies between 20-28 [CI=95] while previous data shows LN quantity ranging from 20-50. The true mean of LN in paired regions lies between [CI=95] from 6-10(numerical range 5-30) for the common iliac, 2-3(numerical range 2-3) for the sacral, 5-7(numerical range 4-18) for the internal iliac, 10-13(numerical range 5-25) for the external iliac, 2-4(numerical range 1-3) for the deep inguinal, and 9-12(numerical range 4-25) for the superficial inguinal. SIGNIFICANCE. This study found reduced numbers of LN per 5 of the 7 regions from previous estimates. The common iliac and deep inguinal ranges did not change. These results could improve a surgeon's informed decision on the number of LN to remove with staging and treating cancer.

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Relationship Between Age and Pathological Stage of Colorectal Cancer in a Large Cohort of Subjects.

INTRODUCTION. The American Cancer Society recommends colonoscopy screening for colorectal cancer (CRC) begin at age 45 despite a recent increase in CRC in those <45 years. The purpose of this prospective study was to explore the frequency of delayed CRC diagnosis (stages III-IV) in symptomatic subjects <45 compared to those >45 with symptoms who received prompt testing and early diagnosis (stages I-II). METHODS. IRB approval was granted. An a priori power analysis revealed that the minimum sample size needed to achieve significance was 220 subjects (G-power Version 3.1.9.6, Germany). An electronic survey was distributed to CRC support groups. Total sample size was N=255. Inclusion criteria: 18-75 years, CRC diagnosis stages II-IV currently in treatment or remission, and a US resident. Exclusion criteria: <18 and >75 years, family history of CRC, and inherited CRC symptoms. Data were analyzed with IBM SPSS Version 24 (Armonk, NY), alpha level set at 0.05. SUMMARY. Respondent gender was F:80.78%, M:18.43%, and Other:0.78%. Over 90% of respondents were white and over 70% were 45 years or older. 39.22% of subjects were <45 years at time of diagnosis and 69.81% were diagnosed at stages III-IV. 45.5% of subjects did not seek care within the first 3 months of symptoms and 43.48% were not referred to a gastroenterologist. There was a significant inverse relationship between age category (ordinal data) and stage at diagnosis (ordinal data): Spearman's rho -0.123 (p=.049). CONCLUSIONS. There is no standard of care guidelines for patients <45 years who have CRC symptoms. Because we found that younger people are more likely to be diagnosed with CRC advanced stages (III-IV), any delay in diagnosis could result in poorer outcomes. In contrast, people over 45 with CRC symptoms are often diagnosed faster and possibly at an earlier stage. Our data may help develop guidelines that recommend colonoscopies at an earlier age.

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Injury Reporting in the Anatomy Lab.

INTRODUCTION. Institutional injury protocols for University of Massachusetts Medical School (UMMS) put the onus on individual departments to record, report, and direct students to Student Health Services for care. Historically, injuries occurring in the anatomy lab were treated without recording. In 2017 the lab moved from disposable scalpels to a permanent handle with replaceable blades. This requires students to place the blades themselves, with safety training falling to individual faculty. An increase in sharps injuries was noted after this change, prompting the creation of robust lab injury protocols and procedures for the academic year 2018/19 (AY18). METHODS. The creation and implementation of an incident report allowed for tracking. At the end of the academic year 2019/20 (AY19), reports were analyzed for total number and type of injury. Data were obtained from UMass Memorial Health Care (UMHC) system for comparison. SUMMARY. The UMMS first-year curriculum includes a 5-month lab dissection experience. There were 11 injuries reported in AY18 for 163 students and 14 injuries in AY19 for 165 students. Of the 11 injuries reported in AY18, all were scalpel injuries to the hands and fingers. Of the 14 AY19 injuries, 13 were scalpel injuries, one was cut by a bone. These data suggest ~7.5% of UMMS students will experience a sharps injury. Over 2019 UMHC reported 11 scalpel sharps injuries among the

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600 total residents (1.83%), suggesting that scalpel injuries occur at higher rates among medical students in the anatomy labs. CONCLUSIONS. This study highlights the need for more robust sharps training and incident reporting systems. Minor injuries tend to be underreported by students unless they require immediate care. Guidance is required for complete reporting in all areas of safety extending to all injury types which may occur related to the lab experience. Preliminary data suggest both introductory training and a later 'refresher' could reduce sharps injuries.

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Anatomy Lab Safety: When Good Isn't Good Enough.

INTRODUCTION. For cadaver-based anatomy labs, OSHA defines limits for acceptable occupational exposure to preservation chemicals and require careful environmental monitoring to prevent injury. But, even when monitoring results show exposure levels within acceptable limits, they may not tell the whole story as discovered at UMMS in October 2019, when a faculty member dissecting, was exposed to a waft of vapor which caused acute symptoms and long-term injury. RESOURCES. Injury response resulted in an analysis of historical and subsequent monitoring results, which determined that the formaldehyde and phenol levels in the anatomy labs were within acceptable limits. The proprietary nature of the embalming chemical blend hampered investigation as specific chemical information was unavailable. Facility-based factors that may impact exposure include embalming techniques, vapor reduction efforts, and facility controls such as temperature and ventilation systems. Individual characteristics also impact exposure, including donor characteristics and dissection techniques. DESCRIPTION. OSHA limits do not accurately represent the risks of exposure, leaving faculty, staff, and students at risk of injury. Further, these regulations do not consider the differences in exposure between faculty and students. Some research has been done on outcomes of long-term exposure in the anatomy lab outside of the USA. While best practices related to chemicals may change, regulations do not and it is the onus of each individual facility to maintain a working knowledge of potential exposure risks to prevent adverse long-term health outcomes. SIGNIFICANCE. There is little current research available on long-term chemical exposure in anatomy labs in the USA and how faculty and students are affected differently. The lessons learned from this accident and subsequent research have encouraged the creation of a larger multi-site analysis of faculty health concerns and possible chemical exposure.

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'Boning Up': Self-Directed Osteology Lab Stations Support Learning in Time-Crunched Labs.

INTRODUCTION. Human osteology is foundational for student understanding of gross anatomy, yet dedicated time for its study is often the first reduced along with decreased dissection hours. RESOURCES. Here we present the development and implementation of independent learning osteology stations with the goal of offering guided self-study of bones, whilst highlighting the clinical importance of osteological knowledge. DESCRIPTION. For each in-lab experience, specific bones, landmarks, and clinical relevancies were chosen to accompany the dissection and planned in concert with the course objectives. Interactive PowerPoints were created and installed on individual computers in the anatomy lab. Each guide began with an overview of the region and the key skeletal elements involved for each dissection session, then proceeded with specific landmarks, key facts, and tips and tricks for recall. Osteological specimens were provided next to the computer, with access to pre-created screens in the 'Complete Anatomy' atlas application. For rare specimens and models, students were directed to a secondary singular station. Key to the success of these stations was collaboration with course leaders while they set the learning objectives, timing, and planning of the dissection to allow an atypical regional approach to teaching osteological materials. SIGNIFICANCE. The self-directed nature of the station allows students to interact with the materials any time. This also allows the stations to be scalable depending on space, computers, and bones and support a high total class-size with limited osteological specimens, as not each student or group requires a specimen. Whilst it is always preferable for material to be taught concurrently, this set up provides a flexible educational opportunity, whilst continuing to highlight the clinical and anatomical importance of osteology in the anatomy lab.

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Duplicated Inferior Vena Cava with Transverse Interiliac Vein and Renal Vessels Abnormalities.

INTRODUCTION. The inferior vena cava (IVC) is formed by the joining of the right and left common iliac veins. It is located in the posterior abdominal wall and runs on the right side of the abdominal aorta (AA). On each side, a renal vein and artery are found draining and supplying the kidney, respectively. RESOURCES. During dissection of the abdominal region, a 77-year-old Caucasian male donor presented with a case of duplicated IVC (DIVC) with renal vessel abnormalities. DESCRIPTION. Abnormal DIVC was found running on each side of the AA. The right and left IVC joined at the level of L1 and measured 35.6 cm and 36.2 cm in length,

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respectively. The DIVC was observed with a transverse interiliac vein connecting the right and left IVC at the level of S2. During further dissection, an aberrant left accessory renal vein (LARV) was found draining into the left IVC from an atrophic left kidney. The LARV, measuring 4.4 cm in length, ran inferior to the main left renal vein and posterior to the left renal artery and ureter. Meanwhile, an atypical right accessory renal artery (RARA) was found arising from the AA and supplying the superior pole of a normal-sized right kidney. The RARA, measuring 6.9 cm in length, ran superior to the main right renal artery and posterior to the right renal vein. The embryonic venous system is developed by subcardinal, posterior cardinal and supracardinal primitive veins. Failure of the supracardinal and posterior cardinal veins to degenerate explains the DIVC with an interiliac vein. Persistence between subcardinal and supracardinal anastomosis leads to double renal veins while persistence in the lateral segmental arteries from a primitive dorsal aorta results in double renal arteries. SIGNIFICANCE. Understanding variations associated with DIVC are relevant during abdominal surgery, aortic aneurysm repair, and kidney transplant to avoid vascular injury. In patients requiring an IVC filter, DIVC must be ruled out to avoid pulmonary embolism.

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Abnormal Branching of the Celiac Trunk with Atypical Origin of the Middle Colic Artery.

INTRODUCTION. The abdominal aorta (AA), a continuation of the thoracic aorta, begins in the diaphragm and ends by dividing into right and left common iliac arteries. The AA gives off unpaired visceral branches: celiac trunk (CT), superior mesenteric (SMA), and inferior mesenteric (IMA) arteries; paired visceral branches: middle suprarenal (MSA), renal and gonadal arteries; paired parietal branches: inferior phrenic (IPA) and four lumbar arteries; and an unpaired parietal branch: median sacral artery. The CT, first ventral branch of the AA, trifurcates into left gastric, splenic and common hepatic arteries. RESOURCES. Dissection of a 94-year-old Caucasian female donor was performed during the study of the abdominal region. DESCRIPTION. A common trunk (CoT) was noticed as the first branch of the CT at a distance of 0.6 cm from its origin, and branched into a left MSA and IPA that measured 2.3 cm and 8.3 cm in length, respectively. The right IPA was observed as the second branch arising at a distance of 1.3 cm from the origin of the CT and measured 1.3 cm in length. Also, a middle colic artery (MCA) was found branching off the AA at the level of L3, 7.6 cm distal to the SMA and 2 cm proximal to the IMA. The MCA measured 0.8 cm in diameter by 11 cm in length and supplied the transverse colon. Embryologically, the paired dorsal aortae fuse to give rise to the descending aorta. Reshaping of the vitelline vessels then give rise to the CT, SMA, and IMA. Variations in the branching and fusion of lateral branches may explain the atypical origin of the MSA and IPA, while failure of ventral branches to regress could account for the presence of the MCA as an aberrant ventral branch of the AA. SIGNIFICANCE. This study aims to describe variations of the CT and MCA which may be involved in the treatment plan of unresectable hepatocellular carcinoma, source of gastrointestinal hemorrhage during surgical interventions, and risk of ischemia in the case of bowel obstruction.

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A Rare Trifurcation of the Common Hepatic Artery with Additional Vascular Variations.

INTRODUCTION. The celiac trunk (CT) is the first unpaired anterior branch of the abdominal aorta (AA) and divides into left gastric artery (LGA), splenic artery (SA), and common hepatic artery (CHA). The CHA gives rise to the gastroduodenal artery (GDA) and right gastric artery (RGA), after which continues as the proper hepatic artery (PHA). Right hepatic artery (RHA) and left hepatic artery (LHA) are arising from PHA to supply the liver and gallbladder. RESOURCES. During routine dissection of an 88-year-old Caucasian male donor, aberrations in the branching pattern of the CT and CHA within the abdominal region were studied and documented. DESCRIPTION. There is an unusual trifurcation of the CHA into LHA, RHA and GDA. LHA and RHA measures 1.9 cm and 3.8 cm in length, respectively. LHA is coursing anterior and medial to the hepatic portal vein (HPV), and is found giving off the RGA. RHA runs lateral to the HPV, medial to the bile duct (BD), and anterior to the common hepatic duct. RHA ascends towards the porta hepatis along with the BD and HPV. The cystic artery, a branch of the RHA, is situated medial to the cystic duct. The right inferior phrenic artery (RIPA) has an unilateral origin from the CT. RIPA is the first branch of the CT at a distance of 1.27 cm from its origin and measures 5.1 cm in length. An additional finding on further dissection is a partially duplicated left testicular vein draining into the left renal vein (LRV). The left testicular artery originating from the AA just posterior the LRV courses between the left medial and lateral testicular veins. SIGNIFICANCE. This case study is clinically significant for surgeons during laparoscopic hepatobiliary surgeries, diagnostic angiography for gastrointestinal bleeding, and transcatheter therapy in cases of unresectable hepatic malignancies. The left medial and lateral testicular veins pose an increased risk for varicocele and infertility in patients.

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Skull Thickness across Sutures and Grooves: Mapping Areas of Weakness.

INTRODUCTION. An epidural hematoma (EDH) is a bleed that occurs between the inside of the skull and the brain's Dural covering. Although EDH occurs in approximately 2% of head injuries, it results in 5-15% mortality. Epidural hematomas are frequently associated with a fracture along the temporal suture yet little research has assessed the temporal bone thickness and the surrounding region. Our study investigates skull thickness along the temporal suture and the middle meningeal arterial groove as we hypothesize these are areas of weakness. METHODS. 20 cadaver skulls from the Joplin and Kansas City Anatomy Labs (Kansas City University of Medicine and Biosciences) were measured along the temporal suture and middle meningeal arterial groove at 2 mm intervals using iGaging 8" Digital Outside Calipers. The artery's branching pattern was photographed and transcribed to compare individual skull laterality. SUMMARY. The average point values were transcribed to Excel to create a heat map. This map displayed the thickness of the skull along the temporal suture and the middle meningeal arterial groove providing visual information on relative thinness. CONCLUSIONS. As these temporal areas are thought to be weaker, finding a general fragile location may aid clinical assessment of head injuries. Our study could provide information on determining a greater relative risk of injury for one side of the skull or the other.

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Multiple Muscle Variations Altering Femoral Nerve Course and Distal Attachment of Iliopsoas.

INTRODUCTION. Typically, the psoas major muscle originates via slips from the transverse processes of lumbar vertebrae and the iliacus muscle originates from the iliac fossa. Fusion of psoas and iliacus muscles occurs inferior to the inguinal ligament before attaching to the lesser trochanter. In the present case, a variant psoas muscle belly and an unusual iliacus minimus muscle compressing the femoral nerve were discovered. RESOURCES. The variant muscles were found during routine dissection of an 83-year-old female cadaver during the Physical Therapy anatomy course. Typical dissection techniques were utilized to expose the inguinal and pelvic regions. DESCRIPTION. Iliacus minimus (length 151.01 mm, widest width 92.73 mm) coursed across the iliac fossa in a manner overlaying the femoral nerve. Iliacus minimus tapered in its course and was 31.92 mm wide at the point where the femoral nerve emerged from beneath it. The variant psoas muscle (length 49.27 mm), found medially at the distal third of the psoas major muscle belly, fused with the psoas major muscle at a point 71.4 mm lateral to the ipsilateral pubic tubercle. Distally, iliacus and iliacus minimus tendons fused and remained separate from the combined tendon of psoas major and the accessory psoas muscle. Thus, preventing the formation of an iliopsoas tendon of attachment. SIGNIFICANCE. An iliacus minimus muscle the size of the current finding has not been reported especially in combination with a previously unreported psoas muscle. The location of the femoral nerve, deep to iliacus minimus, invites speculation of possible femoral nerve entrapment leading to altered sensation along the femoral nerve cutaneous pathways and altered function of the quadriceps muscles. Further, the variant muscles preventing the conjoining of the iliopsoas muscle also invite speculation regarding altered hip flexor function and possible pain generating sources of two separate tendons attaching to the lesser trochanter.

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Thermal Ultrasound Induction of an Abdominal Heat-Shock Response Prevents Postoperative Ileus.

INTRODUCTION. Postoperative ileus (POI) is caused by the iatrogenic induction of an intestinal muscularis inflammatory molecular response that leads to the recruitment of leukocytes into the intestinal muscularis externa, which collectively causes POI. Currently, there is no therapeutic intervention to avert POI. The literature suggests that a preconditioning heat shock response is extremely protective via its modulation of the immune response to a subsequent injury, such as ischemia-reperfusion injury. To our knowledge, a focal, organ specific induction of a heat shock response has not been previously investigated in any experimental model. METHODS. We utilized a preconditioning, focused hyperthermic ultrasound (HUS) treatment to induce an organ specific protective heat shock response. We hypothesized that the administration of a HUS intervention will prevent the development of POI, as measured utilizing the fluorescent gastrointestinal transit assay and immunohistochemistry. SUMMARY. Compared to controls, pretreatment with therapeutic ultrasound significantly ameliorated the development of the delayed gastrointestinal transit of POI. Immunohistochemical studies reveal activation of HSP72 and contractility studies reveal improvement in jejunal muscle contractility following therapeutic ultrasound pretreatment. Neutrophil extravasation was significantly reduced in the treatment group following myeloperoxidase staining. CONCLUSIONS. A significant component of the protective heat shock response is known to be mediated by the activation of specific heat shock proteins. Interestingly, HSP70 upregulates a number of anti-inflammatory mediators, including HO-1 and IL-10. Moreover, previously published works have clearly demonstrated a significant role for both HO 1 and IL 10 in ameliorating postoperative ileus. However, no known study has ever explored the endogenous role of HSPs in the context of postoperative ileus.

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Cutaneous Arterial Supply of the Leg and Its Importance to Medical Students.

INTRODUCTION. The importance of perforating arteries to the skin are often over-looked by medical institutions which can put future doctors at a disadvantage during their clinical rotations. In the lab, most students are unaware of their existence since they are not shown in lab. Knowledge of these vessels is necessary in reconstructive surgeries for planning viable skin flaps preventing postoperative necrosis. RESOURCES. The available textbooks and atlases were reviewed, and a table was constructed identifying which mentioned or depicted superficial arteries. A total of eight legs from donated adult human cadavers (age range) were dissected. The average time taken to locate and completely expose one of the perforating arteries, either along bone or the intermuscular septa was recorded. This was done by following the larger superficial veins to identify their perforating branches through the deep fascia which are always accompanied by an artery. DESCRIPTION. Students are often only taught the large blood vessels supplying the tissues deep to the fascia. Our current textbooks focus primarily on the venous drainage of the skin, what they lack is the cutaneous arterial distributions of the skin. Some textbooks mention superficial arteries of the groin, hands, feet and networks around the elbow and knee joint but omit other areas. SIGNIFICANCE. Collaboration between clinicians and anatomists is necessary for introducing the importance of perforating arteries. Images and illustrations of these arteries should be included in all anatomy textbooks since dissection of these vessels is easy, only taking about 20 minutes to display.

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Clinical Relevance of Quantifying Pelvic Lymph Nodes for Predicting and Treating Genital Lymphedema.

INTRODUCTION. Anatomical research on the pelvic lymph nodes (LN) is inadequate. According to previous research there are between 41-154 LNs in the pelvic region (Inguinals-Lumbar) based on reported mean values across several studies. This range should be considered too large for a surgeon to decide how many LN to remove for diagnosing cancer without causing unnecessary harm or for a lymphedema therapist to explain expectations of involvement or improvement to a person with lymphedema. A more precise understanding of numbers and LN removed can help guide a therapist's treatment with genital lymphedema. Muscles can assist in pumping fluid from an involved region to an uninvolved region when LN are removed. The pelvic floor muscles are located in close proximity to 4 of pelvic LN groups (Iliacs and Sacral). RESOURCES. A study on 43 cadavers was completed to quantify the number of pelvic LN based on anatomical landmarks. Quantitative and qualitative research was conducted to assess volumetric reductions and quality of life (QOL) improvements with targeting portions of the pelvic LN via pelvic floor muscle contractions in treatment of 10 females with lower extremity lymphedema with and without genital involvement. DESCRIPTION. The cadaveric study found a true mean range [CI=95] of 54-77 LN in the pelvic region. The treatment study found significant reduction [p=0.006, a=0.05] in volume and significant improvement [p=0.035, a=0.05] in QOL. SIGNIFICANCE. Reducing the mean range of LN in the pelvic region should positively impact the medical community and patients. This is particularly true for lymphedema therapists treating those post cancer treatments in the pelvic region. Improved expectations for outcomes can be provided if the therapists know the number and location of the LN removed during diagnosis and/or treatment by the physician. Therapists can incorporate muscles near the removed LN in treatment to help reduce edema and improve QOL for cancer survivors.

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Horseshoe Kidney: A Vascular Survey with Surgical Significance.

INTRODUCTION. Reported rates of horseshoe kidney's are as frequent as 1 in 300 with a 2:1 predominance in males. This anomaly, in many patients, goes unnoticed due to its asymptomatic presentation, and, if identified, is typically an incidental finding from ancillary testing. In this case, several anatomical variations were present that will be documented for review. RESOURCES. This was the first case of horseshoe kidney identified in LMU's anatomy lab. Cadaveric dissection was used to visualize and record the vascular supply and orientation of the kidney. DESCRIPTION. In this case, the superior poles of the kidneys were located in approximately normal anatomical positioning with classic right kidney displaced inferiorly in relation to the left kidney; however, the right kidney's hilum was displaced more inferiorly than was expected. Both kidneys were elongated, extending down to the level of L3-L4 where the isthmus passed inferior to the inferior mesenteric artery. An impression was observed on the anterior surface of the isthmus due to its relationship to the inferior mesenteric artery. Multiple inferior polar arterial branches were seen branching from the right common iliac artery but were not observed on the contralateral side. Both testicular veins were observed coalescing into the left and right renal veins respectively. SIGNIFICANCE. The unique vasculature of this case has been documented in the report. This documentation has been done for future research and clinical evaluation prior to kidney transplantation or resection.

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Clinical Significance of Bedside Ultrasonography in Identifying Variations of the Radial Artery.

INTRODUCTION. The radial artery originates from the bifurcation of the brachial artery in the antecubital fossa. It courses down the medial aspect of the neck of the radius before subsequently crossing the floor of the anatomic snuff box deep to the tendons to form the deep palmar arch. Variations in the origin or proximal tortuosity of the radial artery are found in 15% of cases. Cadaveric studies describe a superficial radial artery in 0.5-1.0% of wrists, in which the distal radial artery passes superficially to the tendons of the anatomical snuff box. Arteriovenous fistulas can follow transradial procedure that damage the radial artery. This study aims to determine the clinical significance of using bedside ultrasonography in identifying anatomical variations in the radial artery. METHODS. Doppler ultrasonography was employed to investigate the anatomy of the radial artery and surrounding vessels in the forearms of 6 medical students. Measurements and ultrasonography images were taken at 3 key areas: A= ½ length between lateral epicondyle to styloid process of radius (SPR), B= ½ length between A and SPR and C at SPR. At these positions, the diameter of vessels, the distance between vessels, and the distance to skin (all in centimeters) were collected. In two patients the radial artery bifurcated between Points B and C creating the superficial radial artery. SUMMARY. In two patients the radial artery bifurcated between Points B and C creating the superficial radial artery. CONCLUSIONS. Palpating for the presence of a radial pulse and the use of bedside ultrasound guidance can function as a valuable adjunct for all healthcare professionals in minimizing the risk for iatrogenic injuries.

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Incorporating Ultrasound in an Integrated Medical Curriculum - Student Perspectives and Performance.

INTRODUCTION. Ultrasound is increasingly being used as a point-of-care tool as obstacles such as cost and portability are overcome. However, a user's lack of confidence with this tool may still present a barrier. This study investigates whether hands-on ultrasound sessions delivered as part of the anatomy curriculum can increase student confidence and performance in using ultrasound. METHODS. Students across the University of Washington SOM WWAMI region—which comprises six universities in Washington, Wyoming, Alaska, Montana, and Idaho—completed surveys to report their self-confidence at the beginning and end of an ultrasound session. Students also completed pre- and post-session content quizzes to assess learning. Data were analyzed using ANOVA. SUMMARY. Student responses differed between sites that had previously held an introductory ultrasound session as part of orientation—Wyoming, Alaska, and Montana—and those that had not—Seattle, Spokane, and Idaho. In pre-session surveys, students at sites with orientation ultrasound sessions reported higher confidence in their ability to orient and identify/locate structures using ultrasound; these students also reported more favorable views on their future use of ultrasound and on the importance of including it in the classroom phase of medical school. After the session, the confidence of all students was significantly increased and there was no longer a statistical difference between students with and without prior ultrasound experience. Post-session content quiz performance improved relative to pre-session performance for all students; however, those students with an orientation session performed better on both quizzes. CONCLUSIONS. Prior use correlates with higher student confidence and more positive perspectives on the utility of ultrasound. Prior use also correlates with improved performance on both pre- and post-session quizzes, highlighting the importance of repeated exposure for improved efficacy.

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Not Your Average Flashcards: 'Images of the Day' for Practice Testing of Head and Neck Anatomy.

INTRODUCTION. Active recall and practice testing activities promote learning and knowledge retention. Health professions students are introduced to a vast amount of anatomical information during foundational coursework. Anatomical knowledge must be learned and retained for theory and lab practical exams in the short-term and applied in clinical settings in the long-term. RESOURCES. A series of digital image flashcards of head and neck anatomy dubbed "Images of the Day" (IODs) were designed with varying levels of questions to test knowledge, comprehension and application (Bloom's levels 1-3). The goal of the IODs was to provide students with visually engaging, active recall and practice testing resources to prepare for the anatomy components of theory and lab practical exams in a first-year medical school course. DESCRIPTION. One to two representative images from each head and neck region were selected from photographs of prosected specimens, medical images, or illustrations capturing key views and relationships. Digital images were converted into formative assessment resources in PowerPoint by annotating with colorful arrows, outlines or

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symbols to ask questions related to identification of structures, functions, neurovascular supply, and clinical significance. Each IOD included 8-12 questions ranging from low to higher order difficulty and utilized active recall and practice testing methods. Immediate feedback was provided for formative assessment. IODs were posted to the online course learning management system in PDF format. SIGNIFICANCE. The IODs are low-cost, high-yield, and visually appealing resources which provide learners with multiple levels of questioning to promote learning and retention of anatomical information. The IODs are an interactive and engaging approach to practice testing of course material. Students have given positive feedback, rating them 3.66 out of 4 on a Likert scale for helpfulness in learning and understanding the course material.

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Anatomical Consideration of Latissimus Dorsi Myocutaneous Breast Reconstructive Surgery for Patients

INTRODUCTION. Increased interest in breast cancer survivors to seek reconstructive surgery exists due to the amplified number of diagnoses and public awareness of breast cancer. Numerous surgical techniques to perform breast reconstruction exist, each indicated for a specific patient presentation. The latissimus dorsi myocutaneous (LD) flap is one of several viable options for breast reconstruction that can tolerate surgical transition with minimal post-operative complications; these options grant the additional benefits of a natural appearance and sensation recovery. However, patient education materials with detailed anatomical illustrations are lacking. RESOURCES. An extensive review of literature was conducted to obtain a detailed anatomical description of the LD flap. DESCRIPTION. The LD flap is a useful graft for women with low BMI who wish to have a scar easily covered by undergarments. The LD flap is a skin, muscle, and fat flap supplied by the thoracodorsal artery and the thoracodorsal nerve. Variability exists but does not pose an issue to relocation of the flap through the tunnel created subcutaneously. The skin island is reattached in the area of the defect and can be cutaneously reinnervated via neurorrhaphy between the prominent intercostal nerves of the breast region. Women can have satisfactory results of the LD flap reconstruction, immediately or delayed. SIGNIFICANCE. Patients capable of immediate reconstruction have shown decreased satisfaction, potentially because of expectation for the breast to look exactly the same as the original breast. The recovery of sensation is vast, but will never return to the level before reconstruction. With increasing demands for surgeons to make a perfect breast, numerous techniques presented to the patient can be overwhelming. It is important to supply adequate information concerning the LD flap operation for the patient to be informed and to have realistic expectations of the reconstruction outcome.

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Characterization of HILPDA Dependent Lipid Droplet Abundance in a Mouse Model of Pancreatic Cancer.

INTRODUCTION. Due to their microenvironment, pancreatic cancers are under different stresses, such as oxidative stress, hypoxia and nutrient deprivation. Accumulation of lipid droplets (LDs), which are storage organelles for neutral lipids, has been observed in a variety of tumors. Hypoxic conditions have been shown to increase LD formation through induction of the hypoxia-inducible and lipid droplet associated protein (HILPDA). One of the mechanistic functions of HILPDA is inhibition of adipose triglyceride lipase (ATGL). METHODS. A cell line derived from LSL-KrasG12D/+;LSL-Trp53R172H/+;Pdx-1-Cre (KPC), a genetically engineered pancreatic cancer mouse model, was used to test the hypothesis that HILPDA regulates LD abundance and tumor growth. HILPDA knockout (KO) cells were created by CRISPR-Cas9 technology to characterize HILPDA's function in KPC cells. Triglycerides (TGs) were biochemically quantified under basal and fatty acid loaded conditions. Wild type (WT) and KO cells were injected subcutaneously into nu/nu mice to compare tumor growth rates and TG levels in tumors of different HILPDA status. SUMMARY. Fatty acid supplementation increased TG storage and LD formation in KPC cells in a HILPDA-dependent manner. Inhibition of ATGL with a specific small molecule inhibitor did not ameliorate TG abundance differences between HILPDA WT and KO cells, suggesting that deregulated ATGL is not responsible for the absence of LDs in KO cells. The growth rate of the tumors in the nu/nu mice was decreased by HILPDA deletion. The WT tumors had almost double the TGs compared to the KO tumors. CONCLUSIONS. HILPDA positively regulated model tumor growth of KPC cells. In vitro, HILPDA regulated LD abundance independently of ATGL activity. This suggests additional novel biological roles for HILPDA in LD turnover in pancreatic cancer (e.g. through the stimulation of TG synthesis rather than TG hydrolysis).

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Gross and Histological Analysis of Metastatic Uterine Leiomyosarcoma Involving the Liver.

INTRODUCTION. Uterine leiomyosarcomas are malignant gynecological mesenchymal tumors known to metastasize to other organs, primarily the lungs. The present study concerns a 57-year-old human female cadaver known to have uterine leiomyosarcoma. Upon dissection, we observed an enlarged uterus and tumor-ridden liver. The lungs appeared normal except for a single nodule. The objective of this study is to determine whether the liver and lung pathologies resulted from uterine leiomyosarcoma metastasis. METHODS. Photographs were taken of the uterus, lung, and liver gross dissections. Histological sections from each organ were stained with hematoxylin & eosin (H&E) to examine tissue and cell structures. Immunohistochemical stains for nuclear protein Ki67, smooth muscle myosin (SMM), and smooth muscle actin (SMA) were performed to determine cell proliferation and uterine leiomyosarcoma metastasis. SUMMARY. The uterus presented as a 10.5 cm spherical mass. Physical appearance of the liver tumors varied but were notably vascular, contained by the liver capsule, and primarily localized to segments II, III, IVb, and V. The left lung presented with a 2 cm nodule on the anterior periphery of the superior lobe. H&E staining exposed tissue structures, invasion borders, hypoxic regions, cell nuclei shapes and sizes, and mitotic figures. Ki67 staining showed active states of proliferation for 19.2%, 16.6%, and 36.6% of uterus, lung, and liver cells, respectively. SMM and SMA staining was positive in the uterus and liver tumors only. CONCLUSIONS. The histological analyses confirmed uterine leiomyosarcoma metastasis as cause of the liver tumors but not the lung nodule. Since the lung is generally the primary location for metastasis, more thorough analyses of the lung parenchyma will be performed. Illustrating gross presentation and histological analyses of these pathologies may help physicians diagnose uterine leiomyosarcomas and choose most-effective patient treatment options.

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New Dissection Method for Observation of the SMAS and the Facial Retaining Ligaments.

INTRODUCTION. The structures including SMAS and retaining ligaments that support the facial soft tissue have been clarified in recent years. However, these structures are very difficult to observe their entire images by the usual gross anatomical procedure, dissection from the superficial to the deep layers. Furthermore, it is hard to find accurate description of these structures in both anatomical and plastic surgery textbooks. For this reason, we have devised a new dissection method for observing these soft tissue structures of the face. METHODS. Ten facial soft tissues including the bone were used for this study. The tissues were sectioned at a width of 5 mm either on a horizontal plane or a frontal plane. The loose connective tissues and fat tissues were dissected under a surgical microscope after hyperextending the sections by pulling the skin outward. After these procedures, the fibrous structures of the face like SMAS and retaining ligaments can be observed clearly. SUMMARY. SMAS was observed as continuous layer in both horizontal and frontal planes. However, SMAS became thinner and recognized as only a deep border of the superficial fat pad in medial cheek area. The entire image of the retaining ligaments including zygomatic ligament, mandibular ligament, and masseteric ligaments were also able to observe clearly. Our dissection method is considered to be superior to observe the fibrous structure of the facial soft tissue. Different from radiological tomography like CT and MRI, the images obtained from this method have features of having three-dimensional depth, easy to recognize the surgical dissection plane by expanded loose connecting tissue layers, and clear observation of the fibrous structures due to removing the fat tissues. A dissector can also confirm the actual strength of the fibrous tissues during dissection. CONCLUSIONS. This method is useful to understand supporting structure of the facial soft tissue and the aging change of the face.

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Anatomical Landmarking of Cervical Nerves: 3D Modelling Study.

INTRODUCTION. Chronic headache/neck pain are usually managed with pharmacologic and interventional measures, including nerve block (NB)/radiofrequency ablation (RFA). NB/RFA require precise knowledge of the course of the greater (GON), lesser (LON), and third occipital nerves (3ON) and sensory innervation to cervical zygapophysial (ZP) joints relative to soft and bony tissue landmarks. No 3D studies investigating the relationships of these nerves were found. The purpose of the study was to capture and model in 3D the course of GON, LON, 3ON and sensory innervation to ZP joints to identify soft and bony tissue landmarks that could be used to locate the nerves with image-guidance systems. METHODS. In this pilot study, 1 formalin embalmed specimen (M/61) was used. GON, LON, and 3ON were identified, traced and digitized (Microscribe® G2X Digitizer). Articular branches of the posterior rami of C2-C7 were digitized to ZP joints, along with the skull and cervical vertebrae. The data were modelled in 3D (Autodesk® Maya®) and analyzed to determine the course of the nerves relative to soft and bony tissue landmarks. SUMMARY. The 3D models provided comprehensive visualization of the nerves. Anatomical landmarks that were identified included: 1) GON where it pierces semispinalis capitis just lateral to the nuchal ligament at level of posterior tubercle (C1); 2) LON just medial to the posterior border of the superior

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musculotendinous junction of sternocleidomastoid; and 3) two articular branches of 3ON and C4-C7 posterior rami where they pierce the medial part of the posterior cervical intertransversarius and coursed on the articular pillar. CONCLUSION. This proof of concept study demonstrated that the experimental protocol could provide novel 3D data of GON, LON, 3ON and the cervical sensory ZP innervation relative to soft and bony tissue landmarks. This methodology will be pursued, and the sample size increased to enable comparison of innervation patterns.

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The Osseous Anatomy of Palatal Tori Observed Utilizing Cone Beam Computed Tomography (CBCT).

INTRODUCTION. Edentulism is a common feature found in the elderly. As a means of regaining function, many patients utilize dentures which are a common prosthodontic device used to restore function to edentulous patients. Dental clinicians must observe the osseous anatomy of a patient's oral cavity and understand any potential anomalies that might complicate treatment planning. RESOURCES. Cone beam computed tomography (CBCT) was performed on a patient for dental evaluation. DESCRIPTION. CBCT was performed to evaluate recent dental implants. However, secondarily CBCT revealed a palatal torus in the midline of the patient's hard palate. SIGNIFICANCE. Dentures are held in place by seals created by close association of the denture to the mucosa. Palatal tori are bony protuberances of the palate that may have undercuts or other irregularities that prevent dentures from maintaining their tight seal to the oral mucosa. In rare instances, excess growth of the vomer bone can pierce the median palatine suture to form a palatal torus. Palatal tori may also restrict full movement of the tongue which may lead to speaking difficulties. Issues with breathing may also occur depending on the size and location of the torus. Palatal tori must be removed for a proper seal in denture treatment. CBCT help clinicians visualize the extent of the osseous anatomy of palatal tori as well as anomalous anatomical features which might cause complications during removal.

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A Case of Multiple Simultaneous Brachial Plexus Anomalies in One Specimen.

INTRODUCTION. In a typical brachial plexus, upper, middle, and lower trunks subdivide into anterior and posterior divisions reflecting flexor and extensor compartment innervation, respectively. Posterior divisions combine to form the posterior cord, anterior divisions combine to form medial and lateral cords, which give rise to terminal branches. In the present case, several reported and unreported variations were found within the same plexus of one cadaver. These configurations which have not been reported together in previous studies are clinically significant. RESOURCES. The variations of the brachial plexus were found during routine dissection of a 77-year-old female cadaver at PCOM GA Anatomy lab. Typical dissection techniques were utilized to expose the brachial plexus. DESCRIPTION. The following variations were found: 1) Posterior division coming from C8, instead of typical position from lower trunk. 2) Axillary nerve arising from posterior division of upper trunk without contributions from C7, C8, T1. 3) Contribution from C7 abnormally piercing pectoralis major. 4) Medial pectoral nerve absent. 5) Anterior division of middle trunk contributing to lateral cord absent. 6) Absent contribution from C7 to musculocutaneous nerve. 7) Anterior division of middle trunk directly contributing to lateral contribution of median nerve. 8) Posterior division of upper trunk contributing to posterior cord distal to emergence of thoracodorsal nerve. 9) Long thoracic nerve is missing a contribution from C7. SIGNIFICANCE. Although variations have been well documented, there have been few discoveries of multiple variations occurring in one extremity. Clinically, the present case would have exhibited atypical myotome and dermatome patterns on assessment. Knowledge of these variations of the brachial plexus are clinically crucial not only to physical therapists but to other medical professionals, especially in cases of thoracic outlet syndrome and brachial plexus nerve blocks.

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Intra and Extramuscular Innervation of Tibialis Anterior: Implication for Botulinum Toxin Injection.

INTRODUCTION. Lower limb post stroke spasticity can be treated using botulinum toxin (BTX-a) injections to improve function by chemodenervation. To optimize BTX-a injections, nerve entry-points and intramuscular innervation pattern must be defined. Tibialis anterior (TA) is commonly affected, resulting in impaired gait. Currently, a single TA injection site into the proximal third of the muscle belly is recommended. TA innervation patterns have not been studied volumetrically. The purpose is to determine the intramuscular innervation of TA in 3D to characterize potential sites to optimize BTX-a injection. METHODS. In 8 embalmed specimens (mean age 84 ±10.6yrs) the nerve entry points of the deep fibular nerve (DFN) were exposed, and each branch was traced in short segments and digitized (Microscribe® G2X Digitizer). The muscle volume, tibia and fibula were scanned (FARO ScanArm). Data were modelled in 3D (Autodesk® Maya®) to document and compare the innervation patterns of TA. A frequency map was used to propose potential BTX-a injection sites. SUMMARY. The DFN close to its bifurcation from the common fibular nerve gave off 2 main branches, superior (SB) and inferior (IB), and then coursed along the lateral margin of the TA giving off 5-13 motor branches. Both the SB and IB supplied the

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proximal and middle thirds of the muscle belly. SB supplied the region anterior to the central aponeurosis and IB the region posterior to it. Branches from the DFN entered the middle and distal thirds of TA. The location where both DFN and IB could be captured was in the middle third of TA deep to the aponeurosis. SB and IB could be captured in the central part of the proximal muscle belly. CONCLUSIONS. Intramuscular innervation of TA was from the SB, IB and DFN, each having a distinct area of innervation. These distinct areas could be targeted by BTX-a injection at two levels. Further study of injectate spread will be carried out to determine the extent of potential nerve capture.

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Triangulation of Modalities to Explain Ultrasonographic Appearance of Brachial Plexus.

INTRODUCTION. Correlation between ultrasound (US) appearance, gross anatomy features and histology of Brachial Plexus (BP) lacks in the literature. Utilizing cadavers, histological slides and using US, we sought to investigate the anatomy of roots, trunks, divisions and branches of BP. METHODS. Twenty preserved cadavers were investigated, and the ulnar nerve was traced towards its roots in the neck. US was used to evaluate nerve fibres in three cadavers. C8 /T1 roots, lower trunk, medical cord and ulnar nerves were excised for further histological analysis. RESULTS. On US, the roots of the BP look hypoechoic in the inter-scalene gap of the neck. BP appearance changes from a hypoechoic to a full hypoechoic nerve tissue with hyperechoic structure surrounding nerve bundles "Honeycomb appearance". Histology of the samples showed a stepwise transition of the presence of connective tissue septa between the nerve tissues, which explained the sonographic appearance of BP. CONCLUSIONS. The US allows a reliable examination of the brachial plexus, and it can be used in either as a guidance tool in anaesthesia or disease cases such as trauma and tumour. Giving the clear characteristic appearance of the nerve fibres and knowledge of anatomy, US can be used as an alternative and cheap tool to replace expensive imaging modalities such as MRI. This triangulation approach can be used and evaluated in medical education. We aim to perform further studies to evaluate the use of different modalities including US in more complex anatomical structures.

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Anatomical Donor Luncheon: A Transformational Experience for Medical Students.

INTRODUCTION. The University of Oklahoma Health Sciences Center hosts an annual Anatomical Donor Luncheon during student orientation week. The purpose of the luncheon is to provide an opportunity for families to share the life story of the anatomical donors with medical students assigned to their deceased family member prior to the start of the anatomy course. Students are advised to keep the conversation focused on the life stories of the deceased, and active listening strategies are demonstrated to facilitate this process. Upon completion of the anatomy course, students conduct a service of appreciation and submit a brief reflection paper regarding the impact of meeting the donor's family on their gross anatomy experience. The purpose of this qualitative study is to determine medical students' perceptions of donor family-student interaction on their anatomy learning experience. METHODS. Student reflection papers were retrieved via learner management system and were coded using the constant comparative method to saturation. Data was triangulated and themes developed by faculty investigators and doctoral students in an iterative review process. (IRB #10624). SUMMARY. A meta-theme of Positive Transformational Experiences was identified. Subthemes included Student Gratitude Regarding Experience, Donors as Student Motivators, and Contextual Influences Alter Student Attitudes. Anecdotally, faculty reported cessation of inappropriate student comments and behavior regarding the anatomical donors since the luncheon's inauguration. CONCLUSIONS. Though some initially expressed reservations about meeting donor families, upon reflection students recognized the value of learning the life stories of their "first patients." The overwhelmingly positive effects of donor family-student interaction on medical students may contribute to professional identity development and need to be considered when debating the ethics of the use of protected health information (PHI) of donors.

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Using Ultrasound to Investigate Variations of the Internal Jugular Vein and Common Carotid Artery.

INTRODUCTION. Central line catheter placement in the internal jugular vein can result in complications ranging from arterial injuries to pneumothoraces. Previous studies have looked at variations in positioning of the internal jugular in relation to the common carotid, but variations and relationships in geometric parameters have only been studied in paediatric populations. These studies have been proven useful to amend current practices in improving the success in delivering the procedure in children. The aim of this study was to establish possible anatomical variations and identify whether they could impact central line placement in the adult population. METHODS. 27 volunteers were imaged using ultrasound at 3 different neck levels on right and left sides and various

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parameters were measured. Demographic information was also collected and included in the data processing. Statistical analysis was conducted holistically in order to establish possible relationships between the measured parameters. A paired t-test was also conducted to compare the left and right side at each level. SUMMARY. Several anatomical variations were found between the internal jugular vein parameters, the common carotid parameters and demographics at more than one level. Significant differences were established in all parameters, at all levels, both for the common carotid and internal jugular. Particularly, significant difference in depths were encountered for both vessels at all levels. This provided evidence for the high anatomical variability found in clinical practice while performing central line catheterization. CONCLUSIONS. Anatomical variations were more common than anticipated and should be taken into account when performing central line catheterization in order to minimize post-procedure complications. Our recommendation is to unconditionally do this ultrasound guidance for every patient.

IVIE, Kenneth R. Jr., Katie E. BROWN, Natascha HEISE, Carolyn A. MEYER, and Tod R. CLAPP.
Distance Mentoring in Anatomical Case Based Learning.

INTRODUCTION: As demands on remote learning continue to evolve, models that promote mentoring may enhance the learning process for both the mentor and mentee. Involving university students in distance learning as a mentor provides a unique way to enhance their anatomy skills and further engages these students in the learning process. RESOURCES. We have collaborated with an anatomy course at a local high school in an effort to implement case-based learning. This specialized advanced anatomy course spanned one semester. High school students and mentors communicated via video conferencing technology for three, thirty-minute sessions over each two-week unit. DESCRIPTION. Undergraduate and graduate students served as mentors for small groups of high school students, each assigned a specific case study. Students received instructional support from the high school teacher but primarily worked with their assigned mentor to examine the anatomy of their case. At the start of the semester, high school students reported struggling primarily with recall of anatomical structures and with using anatomical knowledge to solve a problem. Preliminary data shows an improvement in anatomical recall following the unit case study. SIGNIFICANCE. Case based learning in anatomy increases student interest and engagement in anatomical sciences. Elevating these learning skills early in a student's anatomy education, will lay the groundwork for essential critical thinking skills. This mentoring opportunity for the university students provides a unique way for students at the undergraduate, graduate, or medical level to make a positive difference in their local community, or in any global location. Additionally, this model of distance mentoring provides the perfect platform to incorporate virtual reality as a teaching tool. The hardware and software for such a collaboration has been integrated by both groups and will further enhance the learning and mentoring experience.

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Anatomic Variation of Aortic Arch Branches: A Rare Case of Lusoria Artery with a Bicarotid Trunk.

INTRODUCTION. The right subclavian artery (RSA) is typically the first branch of the aortic arch; however, several variants have been described. One rare RSA variant emerges from the proximal descending aorta (Lusoria artery). RESOURCES. Lusoria artery was observed in an 84-year-old male cadaver who died of myocardial infarction. DESCRIPTION. The Lusoria artery emerged from the proximal descending aorta and coursed transversely across the posterior mediastinum deep to the esophagus. A bicarotid trunk was also observed originating from the aortic arch; these variations are rarely observed together. It is reported that 2/3 of the population having Lusoria artery are asymptomatic. The presence of symptoms likely depends on other variants (e.g., bicarotid trunk). Several hypotheses have been proposed to explain why some people are asymptomatic, but later become symptomatic. One is increasing esophageal rigidity with advancing age, leading to dysphagia caused by the retroesophageal course of the artery. Another is that the bicarotid trunk gives rise to right and left carotid arteries in close proximity, thus preventing the trachea and esophagus from bending forward where the Lusoria artery crosses. Calcification and aneurysm at the origin of Lusoria artery have been reported. We excised this region and found extensive calcification and a greatly thinned wall. This section of the artery appeared "folded upon itself", possibly preventing noticeable blood loss. SIGNIFICANCE. Patients with Lusoria artery may present with mild respiratory distress, dysphagia, and other less frequently observed symptoms. This anomaly is adequately common to demand the attention of vascular surgeons confronted with a superior mediastinal mass accompanied by symptoms of Lusoria artery. Awareness of diminished vascular wall thickness at the Lusoria artery origin (which could lead to aneurysm) is an important consideration when proceeding with treatment.

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Joint Ventures: Glycerin Fixation of Human Cadaveric Joints to Facilitate Integrated Learning.

INTRODUCTION. Joint complaints are in the top 5 reasons patients seek healthcare. Osteoarthritis (OA) is the leading cause of disability in older patients; CDC reports OA occurs in ~25% of the adult population with annual costs of $150 billion. In addition, rotator cuff tears occur in ~20% of the population and incidence increases with age. These statistics underlie the importance of teaching functional joint anatomy in medical education so healthcare providers are confident in diagnosing and treating joint disorders. Students consistently prefer cadaveric lab dissection over non-cadaveric methods to facilitate an understanding of anatomy. Yet, coverage of joint anatomy through student dissection often lacks both timeliness and time. RESOURCES. Joint specimens were prepared using glycerin fixation methodology. Specimens were fixed in formalin, dehydrated in acetone, and treated with glycerin. The process is simple and inexpensive. Joint specimens can be prepared to highlight healthy tissue as well as pathologies and arthroplasties. Samples and an accompanying digital lesson plan are used in an integrated curriculum to boost students' knowledge, confidence, and clinical application. DESCRIPTION. To apply a methodology to facilitate efficient and effective learning of functional and clinical joint anatomy in an integrated curriculum. SIGNIFICANCE. Glycerin fixation allows for anatomical specimens to be stored for long duration in a dry environment. This simple, inexpensive methodology addresses issues of plastination as samples retain flexibility. Specimens can be integrated to cover subject material that fast-paced anatomy curricula would otherwise be rushed to dissect. Specimens can be coupled with digital technology, independent and collaborative learning and as a complement to student dissection. In addition, specimens can be used in multiple settings and levels of training.

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Median Nerve Innervation of Flexor Digitorum Superficialis: Implications for Botulinum Toxin Therapy

INTRODUCTION. Post-stroke spasticity of flexor digitorum superficialis (FDS) limits functional capability. Botulinum toxin injections into FDS can reduce spasticity by blocking the presynaptic release of acetylcholine. Clinically it is recommended that FDS be injected at the mid-forearm level. In order to develop more effective injection strategies to target single bellies of FDS the intramuscular innervation of each belly must be elucidated, as current studies are scarce and 2-dimensional. The purpose of this study is to: 1) document and model in 3D the intramuscular innervation pattern of FDS and 2) to use the 3D models to propose strategies that could target the entire muscle or each belly. METHODS. The median nerve entry points and intramuscular branching patterns were serially dissected and digitized (MicroScribe®Digitizer) in 8 embalmed specimens (mean age 87.3 ? 6.3yrs). The data were reconstructed into 3D models (Autodesk®Maya®) that were used to visualize, document, and compare the innervation patterns of the median nerve within the bellies of FDS. Models were used to identify possible optimal injection sites. SUMMARY. The FDS was found to be innervated by two branches of the median nerve, proximal and distal. The entry points of both branches were located in the superior third of the muscle belly. The proximal branch was superficial and supplied the proximal FDS belly and then continued to branch intramuscularly into digital bellies 2, 4, and 5. The distal branch of the median nerve independently supplied the 3rd digital belly. It should be noted that the 3rd digital belly was located deep to the proximal head of FDS. CONCLUSIONS. The proximal and distal branch of the median nerve supply specific bellies of FDS. This suggests that botulinum toxin injection could be enhanced if each nerve territory was injected, including that of the third FDS belly. Injectate spread studies will be conducted to confirm nerve capture.

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The Recurrent Laryngeal Nerve and Its Vulnerability in Thyroid Surgeries.

INTRODUCTION. Although thyroid procedures are very common, research has shown that post-operative complications may dramatically affect the patient's quality of life. In order to decrease the rate of these occurrences, researchers have studied the branching patterns of the recurrent laryngeal nerve (RLN) to avoid its iatrogenic injury. Awareness of variations in the RLN's relationship with the inferior thyroid artery (ITA) is clinically significant to preserve the nerve and minimize associated postoperative symptoms. The normal course of the nerve was described as superior to the ITA and posterolateral to the ligament of Berry; however, it has been noted that the RLN's course can be different, and the identification of its different branches is important in thyroid surgeries. Failure to do so increases the possibility of iatrogenic injury, which can lead to hoarseness, loss of voice, or closure of the vocal cords during bilateral RLN damage. METHODS. In this study, 34 formalin-fixed cadavers were carefully dissected and examined, with the course of the RLN and ITA evaluated and documented bilaterally. Cadavers with anatomical variations were photographed and the data was analyzed quantitatively. SUMMARY. In our investigation, we found that out of 34 cadavers, 55.8% of the RLNs were related superiorly to the respective ITAs, and 44.11% were related inferiorly. Additionally, our findings indicate that 50% of the RLNs bifurcated, 41.17% trifurcated, and 8.82% had four branches. Altogether, the findings show a significant amount of variation in the relationship and branching pattern of the RLN and ITA. CONCLUSIONS. The different branching patterns of the RLN increases its vulnerability during ligation of the ITA in thyroid surgeries. Knowledge of these variable relationships is critical for identification and isolation of the neurovascular structures in order to preserve the nerve, prevent voice hoarseness, and minimize the risk of voice loss in thyroid surgeries.

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Does the Use of 3D Images Reformatted from an Anatomage Table Enhance Learning of Anatomy?

INTRODUCTION. Biomechanical assessment and treatment skills taught in the musculoskeletal courses for physical therapy (PT) students require an in-depth understanding of human anatomy. Traditionally, instructors have used images from anatomy textbooks to review the relevant body region of focus. The Anatomage Table is a fully segmented, real human, anatomy teaching system that many programs use to teach anatomy. Individual anatomic structures can be reconstructed in 3D. To date, use of the Anatomage Table to review the relevant anatomy within our PT courses has not been explored. The purpose of this study was to explore an innovative use of the Anatomage Table outside of the anatomy course in the PT program and to investigate whether students' use of 2D anatomy images translated to both 2D and 3D anatomical knowledge. METHODS. Thirty-nine PT students participated. Four separate anatomy tests, focusing on different body regions, were given (shoulder, elbow, cervical spine, and wrist and hand). Prior to each test, images from an anatomy textbook relevant to the body region to be studied were posted.Each student was asked to take two versions of the test: traditional paper test with10-12 labelled structures to be identified and a 3D video test where 10-12 short (20 sec) dynamic, labelled, video clips were presented to the class with students asked to identify labelled anatomy. The 3D test was always administered first. SUMMARY. Scores on the 3D tests were significantly lower than the traditional 2D test. For particular body region tests, statistically significant differences were found for the elbow and cervical spine. CONCLUSIONS. Findings suggests learning from static images may not carry over to being able to identify the same anatomic structures in 3D. Providing more 3D resources and integrating more 3D dynamic anatomy into courses where a strong appreciation for spatial relationships is needed may be an effective teaching practice.

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Assessment of Ultrasound-Guided Anteromedial and Posterolateral Rotator Interval Injections.

INTRODUCTION. Ultrasound guided intra-articular rotator interval (RI) injections are commonly used to treat adhesive capsulitis pain. Pain reduction has been reported to vary depending on the injection approach, however the approaches have not been investigated anatomically. The purpose was to determine, using anteromedial and posterolateral RI injections, the: 1.area/extent of intra-articular injection spread, 2.extracapsular structures that would be captured, and 3.efficacy of both approaches. METHODS. Ten lightly embalmed cadaveric specimens (mean age 87±11 yrs./8M,2F) were injected (n=5 anteromedial/n=5 posterolateral approach) with 5mL of methylene blue. The specimens were serially dissected to identify extracapsular structures that were captured. To determine intracapsular dye spread, an incision was made into the anterior aspects of the joint capsule and retracted to reveal the extent and area of intra-articular dye spread. Dye spread was compared between approaches. All specimens were photographed throughout the dissections. SUMMARY. Extracapsular ligaments (coracoacromial, coracohumeral, and transverse humeral) were completely stained in both approaches. Intra-articular injections in all 5 specimens using the posterolateral approach and 3/5 specimens using the anteromedial approach resulted in complete capture of the humeral head, glenoid fossa/labrum, tendon of long head of biceps in the joint cavity/intertubercular groove, and superior, middle, and inferior glenohumeral ligaments. In 2 specimens using the anteromedial approach, the dye spread was limited to the superior third of the anterior capsule. CONCLUSIONS. The posterolateral approach consistently captured the entire joint, whereas the anteromedial approach was not consistent. Our initial data provides preliminary evidence that the two approaches may not have the same clinical outcome. This pilot data will be used to calculate an appropriate sample size for each group, based on observed differences.

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An Anatomical and Histological Examination of the Abdominal Portion of the Right Phrenic Nerve.

INTRODUCTION. The phrenic nerve is a mixed nerve that arises from anterior primary rami of C3-C5 bilaterally and is the main motor supply to the diaphragm. The diaphragm muscle has a multifaceted impact on body functions- including breathing, visceral health, CSF flow, and emotional regulation. The phrenic nerve receives catecholaminergic fibers from the middle and lower cervical ganglia. However, previous studies reveal that both phrenic nerves lack the sympathetic component at the level of the diaphragm recovering it in the abdominal region supposedly from communication with a celiac plexus. Despite extensive research efforts, no clear understanding of the autonomic role of the phrenic nerve has been proposed. Thus, the aim of the current study along with investigating the branching pattern of the abdominal portion of the right phrenic nerve was to analyze the constitution of the branches, targeting the presence of sympathetic fibers. METHODS. Eight formalin-preserved adult human cadavers were dissected at the MSSU human dissection laboratory. The right phrenic nerve was microdissected from the point where it enters the abdominal cavity through the vena caval foramen to its terminal branches. The anatomical course of the supra and subdiaphragmatic portions of the right phrenic nerve was documented before obtaining tissue samples for histological examination. Samples were collected at

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the cervical, thoracic portions, and abdominal communicating branches. All sections were prepared using H&E and Luxol Fast Blue staining. Antibody staining for tyrosine hydroxylase was used to determine the presence of catecholaminergic fibers. SUMMARY. The presence of myelinated axons and expression of tyrosine hydroxylase was evaluated and the results were processed with ImageJ software for quantitative analysis. CONCLUSIONS. This study could provide a better understanding of the phrenic nerve anatomy and its autonomic function.

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Anomalous Origin of Middle Colic Artery from Celiac Trunk – A Case Report.

INTRODUCTION. Three main arteries supply gut: celiac trunk, superior mesenteric and inferior mesenteric arteries. Celiac trunk is the artery of the foregut, arising from the abdominal aorta at the T12 vertebral level. Normally it divides into three branches: left gastric, common hepatic, and splenic arteries. Superior mesenteric artery is the artery of the midgut, arising from the abdominal aorta at L1 vertebral level. It gives rise to the inferior pancreaticoduodenal, middle colic, right colic, ileocolic, jejunal and ileal arteries. Inferior mesenteric artery originates from abdominal aorta at L3 vertebral level and gives rise to left colic, sigmoidal and superior rectal arteries. RESOURCES. During routine dissection for MD students, we found a rare variation in the origin of middle colic artery. After opening the abdominal cavity, celiac trunk was identified and its branches were traced. SUMMARY. In addition to the normal branches of the celiac trunk, we found the middle colic artery originating from the celiac trunk instead of the superior mesenteric artery. After originating from celiac trunk it courses posterior to the portal vein behind pancreas, then entered transverse mesocolon to supply transverse colon. SIGNIFICANCE. The incidence of such an anomaly is low and there have been very few previous reports. These arterial variations are of great importance while performing surgery on abdominal cavity.

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Role of Sihler's Staining Technique in Teaching Innervation of Skeletal Muscles to Medical Students.

INTRODUCTION. Clinical anatomy teaching requires clinical experience and sound knowledge of anatomy. It may be challenging for a year-1 medical student to distinguish small nerve branches from adjacent structures in a formalin embalmed cadaver. Our aim was to study the extra-muscular and intra-muscular innervation pattern of skeletal muscles. METHODS. We studied innervation of skeletal muscles of the hand from six upper limbs using the modified Sihler's staining technique. After staining, specimens were soaked in glycerol and sealed in airtight acrylic jars for extended preservation. The location of the intramuscular nerves in relation to the surfaces of the muscle belly was documented. Once the staining process was complete, the superficial and deep surfaces of the muscles were photographed, using a back-light technique. SUMMARY. During the process of Shiner's staining, the entire neurovascular bundle (artery, vein & nerve) gets stained; but the nerve takes up the stain most deeply, the contrast is striking and clear. The stain binds to DNA due to the electrostatic attraction. Using this method, the entire nerve supply can be mapped without interruption as the integrity of the nerve branches including dense nerve plexuses are preserved. The precise intramuscular nerve branching and distribution patterns can be documented with the peripheral course, extra muscular branching and the entry point of a given nerve is seen clearly. Furthermore, neural organization within the structurally complex organs can be demonstrated even if it is innervated by two or more nerves. This staining technique renders muscle translucent and stains the myelin in the nerve as dark blue. CONCLUSIONS. The details of intramuscular nerves could be demonstrated without the need for meticulous dissection of individual nerve branches. The student would be decisive before placing a surgical incision to prevent inadvertent nerve injury and possible injury to adjoining neurovascular structures.

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Hiring a Research Consultant to Assist Anatomy Faculty Members in Expanding Scholarly Activities.

INTRODUCTION. At West Virginia University (WVU) School of Medicine, the Anatomy Division of the Pathology, Anatomy, and Laboratory Medicine (PALM) Department sought to improve scholarship, educational endeavors, and intra/interdepartmental collaborations. RESOURCES. We incorporated a consultant with the responsibilities that include the engagement of faculty, residents, and students to: 1) submit abstracts detailing their scholarly activities to present at national meetings; 2) publish their findings in peer-reviewed journals; 3) expand collaborations between anatomy teaching faculty and pathology clinical faculty; 4) apply for internal and external funding for research, outreach, and educational projects; 5) provide expertise in transitioning on-ground courses into online courses; and 6) help with implementation of novel educational methods. The consultant has also helps to further the research endeavors of the Director of the Anatomy Division when administrative duties are demanding attention. DESCRIPTION. Details of the two-year experience incorporating a consultant within the Department are provided. SIGNIFICANCE. Incorporating a consultant into a blended basic science/ clinical department can positively impact departmental scholarship, improve communication, and intra/interdepartmental relationships, as well as enrich the experiences of students and residents.

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Epistemological Analysis of the Concept of Pressure in Chiari Type I Malformation.

INTRODUCTION. In clinical anatomy, some systems of propositions are empirically accurate and are accepted without experimental confirmation. Such is the case of patients with Chiari type I malformation (CM). We agree that their symptoms result from the pressure exerted by the cerebellar tonsils (CT) on the structures of the posterior fossa (PF). Hence, the objective of the treatment is decompression. Despite such a secure link between cause and effect; the surgical alternatives range from craniectomy-laminectomy to manipulation of the meninges and even of the CT. This fact begs the question about the origin of the idea of decompression. We hypothesize that the roots of the concept are on non-experimental inferences. METHODS. We initially reviewed 136 influential papers on CM treatment (1936-2018). We searched for the justification of the surgical procedure. SUMMARY. Decompression of the PF is the universal goal mentioned or suggested in every paper, even when the PF volume is average, and the brain stem is not deformed. We traced back the concept of decompressive surgery to Penfield and Coburn, who in 1938 reported on a CMI patient whom they presumed had a cerebellar tumor. In the process of exploring the PF, Penfield performed an occipital craniectomy, a cervical laminectomy, and did not close the dura after determining that the patient had CM. The title of Penfield and Coburn paper states that they were describing the operative treatment for CM. What is remarkable in the article is that the authors present the clinical case through an extensive and compelling narrative. Among the description of their thought process, we know that the patient lost her job because of her deficits. CONCLUSIONS. The fundamentals of the current treatment for CM are rooted in a set of subjective propositions presented in narrative form. A convincing narrative style is a critical tool for deriving theories from empirical observations.

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Microanatomical Characteristic of Ventricular Myocardial Extensions to the Pulmonary Valve Sinuses.

INTRODUCTION. It is believed that ventricular myocardial extensions into the pulmonary valve sinuses are a substrate for certain ventricular arrhythmias. Catheter ablation is the first-choice treatment for arrhythmias arising from the pulmonary valve region. Nevertheless, little attention has been paid to the microanatomical characteristic of the pulmonary valve, especially to the possible heterogeneity within the pulmonary valve sinuses. METHODS. Sixty-five randomly selected autopsied human hearts (24.5% females, age=45.9±15.8 years) were examined. Selected morphometric parameters of the corresponding sagittal sections of each pulmonary valve sinuses were analyzed in Masson's trichrome stained paraffin sections. SUMMARY. Ventricular myocardial extensions were found in all studied pulmonary valves. They were observed in 87.5% of left anterior, 89.0% of right anterior, and 90.5% of posterior pulmonary valve sinuses ($p>0.05$) with a mean height of 4.1±1.8 mm, 3.7±1.5 mm and 4.3±1.7 mm, respectively ($p=0.137$). The percentage coverage of the sinus with the ventricular myocardium was the highest for posterior sinus (79.7±24.41%), followed by left anterior (73.8±17.90%) and right anterior (72.4±19.06%) sinuses, however the difference between groups was statistically insignificant ($p=0.279$). Also, no significant difference was observed for leaflet length ($p=0.877$), which was highest in the right anterior leaflet (13.8±2.4 mm), followed by the left anterior (13.7±2.6 mm) and posterior (13.5±2.4 mm). Leaflet length and myocardial height correlated strongly in left anterior ($r=0.52$; $p<0.001$) and in posterior sinuses ($r=0.51$; $p<0.001$), but not in right anterior sinus ($r=0.08$; $p=0.53$). CONCLUSIONS. Ventricular myocardial extensions into the pulmonary valve are observed in all hearts. No significant inter-sinus heterogeneity in terms of myocardial extensions presence, their length, and coverage of the sinus was observed.

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Course of the Greater Palatine Nerve and Artery: Implications for Palatal Tissue Graft Harvesting.

INTRODUCTION. Palatal soft tissue (PST) graft harvesting is a common procedure to treat gingival recession. To maximize dimensions of PST grafts, the 3D course of the branches of the greater palatine nerve (GPN) and artery (GPA) is essential. Previous studies are scarce and report results in 2D. The purpose of this pilot study was to document in 3D the distribution pattern of the GPN and GPA relative to landmarks used to harvest PST grafts. METHODS. Six embalmed specimens were used. The palate was digitized (Microscribe® G2X Digitizer) and mucosa removed to expose the greater palatine neurovascular bundle. A transverse incision was made posterior to the greater palatine foramen (GPF) to enable serial dissection and digitization of the branches of the GPN and GPA (Synca® HD Loupes 2.8x). Digitized data was reconstructed into 3D models (Autodesk® Maya®) and used determine the relationships, course, and extent of the branches of the GPN and GPA. SUMMARY. The GPN coursed superficial to the GPA with differing branching patterns. GPN had 4-6 medial branches coursing anteriorly and 1-2 lateral branches coursing to the premolar gingival margin. In all specimens, GPA split into superior, medial and lateral branches at the mesial of the first molar (mean 13mm anterior to the center of the GPF). Superior and medial branches coursed anteriorly, but not in the same branching

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pattern as the GPN. In one specimen, the GPA had two accessory lateral branches coursing towards the gingival margin of the first molar, 5mm and 15mm from the GPF. 3D frequency maps enabled documentation of possible compromised palatal neurovascular supply. CONCLUSIONS. The GPN and GPA demonstrate significant branching over the course of the palate, with the GPN residing superomedial to the GPA. The GPN demonstrated less branching towards PST graft sites, with the majority of branching occurring medial to the GPA. The GPA demonstrated unique branching patterns laterally that may infringe upon PST grafts.

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The Infraspinatus Muscle: Its Superior Bundle and the Effect on Shoulder Abduction.

INTRODUCTION. The infraspinatus muscle (ISM) is recognized as having two distinct muscle bellies that join a common tendon attaching to the greater tuberosity of the humerus. It has been suggested that the ISM may contribute to glenohumeral abduction as well as glenohumeral external rotation. RESOURCES. The shoulders of 16 embalmed cadaveric bodies (32 in total) were dissected to expose the ISM and posterior deltoid muscle (PDM). DESCRIPTION. Dissection was completed to the level of the intermuscular plane between the ISM and the PDM fibers. The attachment sites for the PDM (scapular spine) and superior belly of the ISM (inferior aspect of scapular spine) were identified, and the fibers were separated. Before reaching the scapular spine, a strong sheath of tendinous fibers from the PDM attaches to the superior belly of the ISM. The superior belly of the ISM origin was distinctly separate from the larger inferior belly in all dissections. Both bellies are joined in a common tendon reaching the posterior superior aspect of the greater tubercle of the humerus. SIGNIFICANCE. The study revealed that there may be a coupling action of the PDM in its attachment to the superior belly of the ISM. Based on the direction of these muscle fibers, the DM/ISM complex serves as a posterior stabilizer of the humeral head at the glenohumeral joint during the initiation of glenohumeral abduction.

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The Second Layer of the Foot: A Missing Link?

INTRODUCTION. The plantar fascia is considered a common source of foot pain. However, there are many anatomical sources of pain within the second layer of the foot that have the potential to reproduce concordant symptoms. RESOURCES. The feet of 21 embalmed cadavers (42 in total) were dissected with reflection of the plantar fascia and flexor digitorum brevis and subsequent visualization of the second layer of the foot. This included the quadratus plantae (QP), the flexor digitorum longus (FDL), the flexor hallucis longus (FHL), lumbricals, and the Master Knot of Henry (MKH). DESCRIPTION. The origin of the QP was consistently found to be the medial and lateral plantar surface of the calcaneus attaching medially on the FDL as well as extending to the body of the MKH. A strong fibrous retinaculum extended beyond the MKH to the plantar and lateral aspect of the first metatarsal in all 42 feet. SIGNIFICANCE. The attachment of the second layer of the foot, specifically via a fibrous retinaculum, to the first metatarsal was noted in all the dissected feet. This previously unreported fibrous retinaculum in the second layer of the foot, creating a direct link between calcaneus and first metatarsal, may play a role in foot pain mis-diagnosed as plantar fasciitis.

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What Lies Beneath: Ultrasound Imaging Brings Clinical Anatomy to Life for Physical Therapy Students.

INTRODUCTION. Many students find anatomy challenging to learn. While most learn via cadaver dissection, knowledge does not readily translate to gaining a clinical perspective or understanding the effects of dynamic musculoskeletal tasks on function. Consequently, it can be difficult for students to determine the contributions of deep musculature to various tasks since they cannot be palpated nor their function readily observed. METHODS. Thirty-three 2nd year doctor of physical therapy (DPT) students received 2-hours didactic ultrasound imaging (US) instruction focused on US physics, nomenclature and applications prior to 4-hours of labs. Labs consisted of a brief orientation to the US units with illustrated lab manual instructions on how to acquire static and dynamic cineloops for a selection of superficial and deep structures that included upper extremity, trunk, and lumbopelvic regions. Students completed an online survey to assess their experience. A 5-point Likert scale graded responses ranging from 5 (strongly agree) to 1 (strongly disagree) and 2 questions permitted free-text comments. SUMMARY. 100% of respondents (97% response rate) agreed that US was an innovative tool that allowed them to observe musculoskeletal components of dynamic movement. At least 94% agreed that US stimulated their interest, enhanced their assessment skills of all structures imaged and the US units were easy to us. Free text comments were extremely supportive of US with many sharing how US improved their understanding of clinical anatomy during dynamic tasks. Furthermore, students requested further integration of US throughout the curriculum with most interested in an elective course. CONCLUSIONS. US brings anatomy to life and underlines the clinical relevance of why students are learning it. Students embrace it, are actively engaged in the classroom and would like to integrate it into clinical practice. US is a powerful supplement to didactic and lab experiences for DPT students.

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Origin of the Deep Femoral and Circumflex Femoral Arteries: A Case Report.

INTRODUCTION. The femoral artery provides blood supply to most of the thigh through its branches. The femoral (FA), deep femoral (DFA), and the medial and lateral circumflex femoral arteries are commonly utilized in a wide range of clinical procedures including arterial catheterization, and coronary artery bypass grafting. Due to the variability in the branching pattern of these arteries, anatomical knowledge is crucial for clinicians to avoid iatrogenic injuries when performing these procedures. RESOURCES. In this case report, we describe a variant branching of the left femoral artery and its branches. This was found in a 63-years old Caucasian (female) body donor during routine dissection of the lower limbs. The cause of death was indicated as metastatic endometrial cancer. DESCRIPTION. During the exposure of the contents of the femoral triangle, the skin and the fascia of the thigh were incised and reflected. After the exposure of the FA and femoral vein, the DFA was found to originate at the beginning of the FA (deep to the midpoint of the inguinal ligament), on its anterior side. Its course could be traced inferomedially where it gave rise to three perforating branches. In most individuals, the DFA arises from the posterolateral side of the FA, about 4cm below the midpoint of the inguinal ligament. An anterior origin is a very rare finding. The lateral and medial circumflex femoral arteries were found to arise from the posterolateral and posteromedial sides of the FA respectively, about 4cm below the inguinal ligament. In most individuals, the two circumflex femoral arteries are branches of the DFA. SIGNIFICANCE. The FA, DFA and the medial and lateral circumflex femoral arteries are used in a diverse number of clinical procedures giving their normal and variant anatomy a high degree of clinical significance. Radiographic assessment of the vessel's anatomy prior to surgical procedures highly recommended in order to decrease the risk of iatrogenic injuries.

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Teaching Functional Neuroanatomy Using Computer-Aided Learning at Weill Cornell Medicine - Qatar.

INTRODUCTION. Neuroanatomy course is intimidating to most students because it involves learning of a complex spatial structure of the brain. Sectional anatomy, where anatomy of the brain and spinal cord is viewed in 2D planar sections, forms a key component of the neuroanatomy learning. RESOURCES. Neuroanatomy course at WCMQ is organized into system-based modules taught through lectures and small group tutorials. Tutorials are run using a computer-aided functional neuroanatomy resource (FNAR) developed by the functional neuroanatomy faculty at Weill Cornell Medicine in New York. Each module has a section on laboratory notes, interactive images, tutorial outline, clinical cases and a set of self-assessment questions. Interactive images include gross brain specimens, unstained and stained brain sections cut at different planes. A combined team of neuroanatomy faculty and neurologists facilitate the tutorials, with the neuroanatomist leading the structural and functional concepts discussion and the neurologist facilitating the clinical case discussion. DESCRIPTION. Course evaluation reports for the last two academic years, shows that 42 (47%) students out of 90 responded to the evaluation survey. The following components of the course were viewed to be more useful and helpful: Interactive nature of the tutorials (76%), clinical case discussion (85.4%) and tracing pathways (71%). One of the challenges encountered by students was the difficulty in the "mental construction" of 3D structures from 2D histological slides. Modification of the self-assessment questions to multiple choice questions was one of the recommendations for improvement. SIGNIFICANCE. A combined team of neuroanatomy faculty and neurologist has been effective in the facilitation of the tutorials because each brings a different perspective and experience. Weill Cornell Medicine in New York, in collaboration with WCM-Q are currently reviewing the FNAR to address some of the suggestions and recommendations.

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Analysis of Ambiguous Terminology of Anatomical "Olfactory" Spaces Adjacent to the Cribriform Plate.

INTRODUCTION. A precise nomenclature is the foundation of communication in anatomy and related biomedical subjects. The olfactory bulbs and nerves lie above and below the cribriform plate (CP). Numerous anatomic landmarks in this region have descriptive names using "olfactory" as a qualifier for structures serving olfaction. Inaccurate use of several of these anatomic "olfactory" terms is common. We performed a publication database analysis to determine the frequency of misuse of names for five anatomic spaces close to the CP and nasal cavity. We provide a pictorial review of these structures and examples of their mislabeling. METHODS. We searched publications in PubMed having the keyword "olfactory" in the title or abstract, plus one of 5 other keywords: "groove", "fossa", "recess", "vestibule", or "cleft". We reviewed all abstracts for accuracy of these terms relative to accepted standards. SUMMARY. We found these keywords in 1162 articles. "Groove" (depression in the CP supporting each olfactory bulb)—of 397 articles, 374 were useful, and 3 (0.8%) used this term incorrectly. "Fossa" (depression in the anterior cranial fossa whose floor is the CP)—of 270 articles, 57 were useful, and 18 (31.6%) used this term incorrectly. "Recess" (space in the nasal cavity roof between the

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nasal septum and vertical lamella of the middle turbinate)—of 133 articles, 13 were useful, and 4 (34.6%) used this term incorrectly. "Vestibule" (lower subdivision of the "cleft" below the recess)—of 52 articles, all were spurious and related to the "nasal vestibule". "Cleft" (olfactory nose is comprised of two medial clefts, each made of vestibule plus recess)—of 310 articles, 104 were useful, and 4 (3.8%) used this term incorrectly. CONCLUSIONS. Terms used to describe "olfactory" spaces are often ambiguous or inaccurate. The terms olfactory "fossa" and "recess" are particularly misused. We make a plea for uniform nomenclature leading to greater clarity in use of anatomic "olfactory" terms.

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Massa Intermedia of the Thalamus: MRI Spatial Topography Relevant to Hydrocephalus Predisposition.

INTRODUCTION. The thalamic massa intermedia (MI) differs in size and location between individuals. Computational fluid dynamic models suggest that MI locations can affect patterns of CSF pressure distribution within the third ventricle (3rdV)—MIs closer to the posterior 3rdV cause higher resistance to flow toward the aqueduct, thus potentially contributing to development of hydrocephalus. We hypothesized that normal subjects with larger or posteriorly placed MIs may have higher values of ventricular Evans' index (EI), suggesting possibly a higher baseline predisposition to ventriculomegaly. METHODS. We analyzed midsagittal MR images of 35 normal subjects and measured dimensions of MIs and 3rdVs, and categorized MI locations by dividing the 3rdV into 4 quadrants relative to the bicommissural line. We then statistically correlated findings with EIs (ratios of maximal width of frontal horns of the lateral ventricles to maximal internal diameter of the skull on axial images). SUMMARY. Subjects were F:M=19:16, mean age: 48.5 yr, and with normal EIs (<0.3). MIs were present in 23 (66%) subjects. Three MIs were in one 3rdV quadrant, 17 were in 2 quadrants, and 3 were central in all 4 quadrants. Anterior and posterior halves of 3rdVs contained portions of 26 and 23 MIs, respectively. The mean MI and 3rdV areas were 15.2mm2 and 497mm2, respectively (mean ratio 3.1%). The mean EI in presence or absence of MIs were 0.248 and 0.245, respectively ($p>0.5$). The mean EI when MIs were in both superior quadrants, both anterior quadrants, and centrally were 0.246, 0.276, and 0.239, respectively ($p>0.5$). The mean EI when MI/3rdV ratio was >3.1% or <3.1% were 0.247 and 0.245, respectively ($p>0.5$). CONCLUSIONS. In normal subjects, there is no significant correlation between MI size/location and baseline normal ranges of lateral ventricle width. We will conduct future studies in hydrocephalic patients to ascertain if there is any role of MI morphology in development of CSF flow disorders.

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An Examination of Students' Religious Beliefs and Decisions about Cadaver Naming.

INTRODUCTION. Religious diversity is rarely considered in medical curricula, including anatomy courses; thus, this study explores how students' religious beliefs influence their interactions with their cadavers. Although the spiritual significance of the human body in its entirety has been widely considered, there are limited studies on the religious implications in using human tissue for educational purposes. However, the Liaison Committee on Medical Education Standards advocate the inclusion of cultural competence in belief systems in medical curricula. There are spiritual conflicts between cadaveric dissection and Jewish and certain Native American religious practices to name a few. This evidence suggests that medical students' interactions with anatomical donors may be impacted by their religious beliefs and practices. METHODS. At the University of Arkansas for Medical Sciences, 151 first-year medical students completed a paper-based survey inquiring about their preferences for naming or not naming their cadavers and the rationale for their choice as part of an IRB-exempt study. The survey was administered after the students completed their gross anatomy module. SUMMARY. Many students chose to name their cadaver because a name humanized their donor. However, religious considerations had limited impact on their naming considerations. Students' self-reported religious affiliations will be analyzed to determine other ways in which their religious or secular beliefs and practices influenced their interactions with their cadaver. CONCLUSIONS. While the use of human tissue in medical education is important to the educational enterprise, the use of human tissues is contrary to some religious values. Lack of consideration regarding cultural sensitivity, especially related to religious beliefs, may adversely desensitize students to the religious value they ascribed to the human body prior to the dissection course.

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Morphology of the Lumbar Plexus with Application for Lateral Lumbar Interbody Fusion: A Pilot Study.

INTRODUCTION. Lateral lumbar interbody fusion (LLIF) is an emerging technique utilized to treat diseases of the lumbar spine and is becoming a preferred treatment modality to meet the increasing demands for corrective procedures. LLIF procedures permit the use of wider interbody cages, which are associated with lower rates of subsidence and better clinical outcomes; however, iatrogenic injury to the lumbar plexus remains a concern. This pilot study aims to demonstrate the efficacy of using landmark morphometric techniques to characterize vulnerable components of the lumbar plexus encountered during a LLIF. METHODS. Dissection techniques were used to access the posterior abdominal wall on 29 formalin-fixed whole-body donors (mean age=79 years). A Microscribe® G2X Digitizer was used to register the location of 34, 3D landmarks. Landmarks include points along intervertebral discs commonly targeted in the procedure, as well as the femoral nerve (FN), obturator nerve (ON), and genitofemoral nerve (GFN). Wireframe graphs were created to illustrate nerve trajectory parallel to the spine. Data were analyzed with geometric morphometric techniques in MorphoJ v1.07a. SUMMARY. The FN and ON concomitantly take a modest ventral course with gradual divergence in the coronal plane; their proximity to surgical targets increasing caudally. The GFN emerged from the L1 and/or L2 ventral rami assuming a dramatic angle through the psoas major muscle before exiting through its ventral surface. The mean landmark configuration revealed significant intersection of the GFN with surgical targets at the level of the L3/L4 intervertebral disc. CONCLUSIONS. The trajectory of the FN and ON place them at the greatest risk of injury at lower intervertebral disc levels, specifically the L3/L4 and L4/L5 disc levels. The GFN is placed at very high risk when performing discectomy at the level of the L3/L4 disc. These results may influence preoperative planning, leading to improved clinical outcomes.

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Flipped Classroom Method: Medical Students' Perceptions of the Learning Experiences for Embryology.

INTRODUCTION. Medical students consider embryology to be a difficult subject to learn and apply in clinical practice. We developed a flipped classroom model for teaching embryology of the central nervous system (CNS) during the 2nd year of medical school. The objective of the present study was to assess students' perceptions of the quality of resources provided by our model to learn the embryology of the CNS. METHODS. The flipped classroom model was comprised of out-of-class (OOC) and in-class (IC) activities. During the OOC activity, students watched four videos on the embryology of CNS, took online quizzes and read relevant clinical documents. In the faculty-guided IC activity, students participated in solving clinical vignettes using Poll Everywhere. Faculty then commented on both the correct and incorrect answer choices. Finally, students completed a voluntary online evaluation survey regarding their flipped-classroom experience. SUMMARY. The survey response rate for the academic years 2019 and 2018 were 23% and 20%, respectively. In 2019 and 2018, the students' responses to the content and quality of the videos (that included narration, annotations, animations etc.) averaged 3.9 and 4.45 (out of 5), respectively. 59% (2019) and 91.43% (2018) of students considered the videos to be just the right length; 75% (2019) and 68.57% (2018) of students stated that the interactive quizzes reinforced the content learned in the videos. The four questions regarding the effectiveness of the OOC activity on the IC activity and the effectiveness of both activities on the overall learning experience averaged 3.4 (2019) and 4.23 (2018), respectively. CONCLUSIONS. Our flipped classroom model significantly enhanced students' learning experience; This positive feedback suggests that the model may be successfully applied to enhance students' learning of other topics covered in the 2nd year of medical education.

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The Role of Technology Blended Anatomy Teaching in Doctor of Chiropractic Curriculum.

INTRODUCTION. Technology blended, for example, the use of virtual [VR] and the augmented reality [AR] platforms as tools allow human anatomy learning through simulation. This study investigates whether the technology blended anatomy teaching (along with the classical approach involving cadaver dissection) has potential to positively influence the student learning experience and impacts such areas as academic achievement and (entry point) professional career. METHODS. A survey based study is being conducted at the Cleveland University Kansas City where selected Doctor of Chiropractic (DC) students are being observed through different trimesters and in selected courses of their curriculum; their course performance (exam and laboratory grades), and their performance in clinics are being analyzed. All data are being analyzed using ANOVA. SUMMARY. Preliminary analysis indicates technology blended anatomy teaching leading to better understanding and mastering different structures and processes among all student groups (reflected by their lecture and laboratory grades), subsequently incorporating an effective clinical correlation (reflected by their internship performance). Additionally, the first-time anatomy course takers were found to demonstrate higher degree of improvement (percent increase wise) than the student population having undergraduate anatomy and physiology course-work. CONCLUSIONS.

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Technology blended teaching facilitate active learning strategies, and drive students toward more integrative, innovative and application-based learning outcomes. Early trend indicating improving self-efficacy of the first-time anatomy course takers.

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Anatomical Predictors for Difficult Airway and Evaluation of Cadavers in Airway Training.

INTRODUCTION. A difficult airway is one in which the operator has a less than optimal view which can lead to hypoxia during intubation. Do external measurements predict a higher likelihood of encountering abnormally sized internal features during intubation? We measured cadaveric airways to correlate external and internal features that have previously been shown to make intubation or ventilation more challenging. Training for difficult intubation remains a challenge as manikins lack realism. Given limited reports of using formalin fixed cadavers for difficult airway training, we evaluated cadaver suitability as a training model. METHODS. Using 44 formalin fixed cadavers external measurements were taken of the neck and correlated to internal measurements by dissection and CT of the airway. We attempted to obtain glottic view with MAC and glidescope blades. SUMMARY. There is correlation between several external and internal measures notably between height and tracheal diameters as well as neck circumference and tongue length. Only 18% the cadavers could accept a glidescope blade. There were significant external measurements related to the ability to obtain a glottic view. CONCLUSIONS. There is value to obtaining external neck measurements to predict abnormal internal features. Small stature is correlated with narrowed trachea which could impede ventilation. Increased neck circumference is associated with increased tongue length which could create a difficult intubation. Data is limited by having been studied on cadavers and would need to be evaluated in live patients for more applicable clinical outcomes. Obtaining glottic view was challenging on cadavers, likely related to rigidity. Despite external measurements associated with ability to obtain glottic view, given low frequency with which cadavers are possible to intubate, we conclude they are not an appropriate resource for difficult airway training.

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Implementation and Perceptions of a Thanksgiving Reflection Activity in Cadaveric Anatomy Courses.

INTRODUCTION. In addition to invaluable educational experiences, human cadaveric dissection provides opportunities to improve teamwork skills and opportunities for students to consider principles of death, donation, empathy and gratitude. To encourage students to explore these principles, a Thanksgiving Reflection activity was implemented in two human cadaveric gross anatomy courses at UT Health San Antonio. METHODS. 219 medical and 106 dental students were assigned a Thanksgiving Reflection exercise. Students were instructed to reflect on the privilege and gift of body donation. The Thanksgiving Reflection exercise was flexible; students could write a letter to their body donor or their family, a poem, an essay, or create an artistic piece. Upon completion of the courses, 208 medical students and 76 dental students completed a survey on their perceptions of the assignment. SUMMARY. In general, student submissions of the Thanksgiving Reflection demonstrated thoughtful and heartfelt feelings toward their donor and their family. Student submissions included letters, poems, drawings, paintings, sculptures, and the creation of jewelry and blankets. Results from the course evaluation show that 90.38% of medical and 84.21% of dental students “Strongly Agreed” or “Agreed” with the statement “The Reflection activity during the Thanksgiving break was useful to promote empathy, reflection, and professionalism”. Student-provided feedback of the activity was generally positive. Students felt the Thanksgiving Reflection: “pushed students to emotionally grasp the magnitude of the gift they’ve been given”, “was a good way to appreciate what an honor and privilege it was to dissect a cadaver”, and was a “sweet sentiment”. CONCLUSIONS. The meaningful submissions and positive feedback indicate the Thanksgiving Reflection activity served as a valuable assignment that enabled students to reflect on their experience and express their gratitude to their body donors.

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Analysis of the Positional Relationship of the Long Thoracic Nerve Considering Clinical Treatment.

INTRODUCTION. The long thoracic nerve (LTN) is a structure that has a risk of damaging in chest surgery and should be considered to perform anesthesia such as serratus anterior plane block (SAPB). We aimed to reveal the relationship between landmarks, the fourth to ninth ICS at the midaxillary line (MAL), where the distal part of the LTN passes through, and the LTN. METHODS. Twenty-five specimens from 17 embalmed Korean cadavers were used in this study. The MAL, rib level and ICS, and regions 5 cm anteroposterior to the MAL (aMAL/pMAL) were established to measure the position of the LTN crossing the MAL, pathway of the LTN, and entering points of the LTN to the SA. SUMMARY. The LTN crossed the MAL by 76% or entered the SA in aMAL before reaching the MAL by 24% of the specimens. The LTN crossed the MAL by 70.8% within the fifth to sixth rib level. The LTN entered the SA by 74.5% in aMAL within the fourth to sixth ICS, but no branches were found in pMAL within these levels. The fifth ICS was

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the most frequent region in aMAL; in contrast, no branches were found in pMAL. CONCLUSIONS. We settled the danger zone as the fourth to sixth ICS in aMAL for thoracotomy. In addition, we proposed the fifth ICS in aMAL at the superficial plane as the alternative injection point for SAPB when blocking the LTN, and the fifth ICS in pMAL at the deep plane to prevent blocking the LTN. (This study was supported by a faculty research grant of Yonsei University College of Medicine for 6-2019-0181.)

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Bilateral Variation of Superficial Ulnar Artery, Common Interosseous Artery, and Palmaris Longus.

INTRODUCTION. Through anatomical dissection, variations of the human body can be identified and categorized. Here, we report a rare case of a bilateral vascular variation in the upper limb and propose a potential connection to the absence of the palmaris longus muscle. RESOURCES. Dissection of the upper limb of a 99-year-old female donor revealed bilateral superficial ulnar artery with atypical branching of the common interosseous artery and absence of palmaris longus muscle. DESCRIPTION. All described anatomical variations were symmetric and bilateral in this individual. The superficial ulnar artery was found to branch from the brachial artery in the cubital fossa and replaced the typical ulnar artery. Further, the common interosseous artery was found to originate from the radial artery. Finally, the palmaris longus muscle was absent. SIGNIFICANCE. A present superficial ulnar artery is at risk for iatrogenic injury during surgical procedures or venipuncture. Currently, there is no clinical test to detect its presence. However, the clinical tests for palmaris longus muscle presence are largely reliable and are a possible avenue for aiding in identifying a superficial ulnar artery before procedures begin. Further studies are needed to determine the validity of this connection.

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The Posterior Meniscofemoral Ligament and Its Anatomical Significance.

INTRODUCTION. The meniscofemoral ligament consists of two divisions - anterior (aMFL) and posterior (pMFL). Many questions regarding them remain unanswered. In this research we aimed to conduct a meta-analysis to summarize the anatomy and prevalence of posterior (pMFL) meniscofemoral ligament. METHODS. Major medical databases including (PubMed, Embase, Scopus, ScienceDirect, Web of Science, SciELO, BIOSIS) were examined by two independent reviewers. The reference lists of the studies were also searched. The data were extracted and statistically analyzed. PRISMA guidelines were strictly followed during all stages of the study. SUMMARY. Incidence of pMFL was assessed by 52 studies (n=5070 lower limbs). Mean pooled prevalence of pMFL was 71.0% (95% confidence interval [CI]: 64.3-77.2), and it was more frequent in cadaveric than MRI or arthroscopic studies and was 74.6% (95%CI 68.1-80.6), 69.5% (95%CI56.4-81.1) and 65.1% (95%CI 0.0-100.0) respectively. pMFL was more common among females (81.1% vs. 76.7%) and more prevalent in Asian 74.8% (95%CI55.8-90.1) than in South American 74.8% (95%CI55.8-90.1), European 69.9% (95%CI 61.8-77.4) and North American 50.5% (95%CI 39.4-61.6) populations. Mean length was 27.4 mm (95%CI 27.1-27.7) and thickness 2.5 mm (95%CI2.4-2.5). CONCLUSIONS. pMFL has been revealed in our analysis to be highly prevalent and present in almost seven of ten people. Moreover, it's a structure of substantial size. To our knowledge this is the first such a detail meta-analysis of prevalence and morphometrics of pMFL.

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The Anatomical Characteristics and Clinical Relevance of the Persistent Median Artery.

INTRODUCTION. Median artery is present during human foetal development and frequently degenerate on 8th week of gestation. Nonetheless, it may not regress and is called persistent median artery (PMA). It might develop to be the main blood supply of median nerve and contiguous structures of the forearm. PMA is specifically important for orthopaedic surgeon as a consequence of greater risk of damage during operations performed on the carpal tunnel. The aim of this study was to evaluate the anatomical characteristics and clinical relevance of the persistent median artery. METHODS. Two independent researchers conducted comprehensive search through major medical databases (PubMed, Embase, ScienceDirect, Web of Science, SciELO, BIOSIS, Current Content Connect, Korean Journal Database and Russian Citation index). Subsequently, performed the articles quality assessment using AQUA rules and data extraction. There were no date or language-based exclusions applied. Statistical analysis was performed with usage of MetaXL 5.0 software. SUMMARY. The study involved 71 articles (total of 12 082 limbs). The general pooled prevalence equaled 9.4% (95%

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confidence interval [CI]: 7.2 - 12.0). The PMA was more likely to find in cadaveric studies compared to radiologic and ultrasonographic studies and equaled (9.2%; 95% CI: 6.9 - 11.8), (6.7% 95% CI: 3.7 - 10.6), (7.2%; 95% CI: 3.7 - 11.7) respectively. Moreover, in 3 papers evaluating infants the prevalence was 34.6% (95% CI: 5.5 - 70.7), significantly higher than among adults (8.6% (95% CI: 6.6 - 10.8). CONCLUSIONS. PMA is a very common structure in general population and the highest in infants. The clinical significance of this data and high risk of complications combined with artery injury, it should always be kept in mind while performing surgeries on the carpal tunnel.

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The Anterior Meniscofemoral Ligament and Its Anatomical Significance.

INTRODUCTION. The meniscofemoral ligament consists of two divisions - anterior (aMFL) and posterior (pMFL). Many questions regarding them remain unanswered. In this research we We conducted a meta-analysis to assess anatomic features and prevalence of anterior (aMFL) meniscofemoral ligament. METHODS. Major medical databases including (PubMed, Embase, Scopus, ScienceDirect, Web of Science, SciELO, BIOSIS) were examined by two independent reviewers. The reference lists of the studies were also searched. The data were extracted and statistically analyzed. PRISMA guidelines were strictly followed during all stages of the study. SUMMARY. Incidence of aMFL was assessed by 46 studies (n=4380 limbs). Mean pooled prevalence of aMFL was 56.2% (95% confidence interval [CI]: 46.7-65.4), and it was the more frequent in arthroscopic than cadaveric or MRI studies and equaled 82.3% (95%CI 36.6-100.0), 59.0% (95%CI 46.9-70.6) and 59.0% (95%CI 46.9-70.6) respectively. aMFL was more common among males (37.2% vs. 29.1%) and more prevalent in South America than in Europe 68.7% (95%CI55.8-80.4), North America 56.8% (95%CI45.1-68.1), or Asia 30.1% (95%CI 16.4-45.8). Mean length was 23.0 mm (95%CI 22.8-23.5) and thickness 1.7 mm (95%CI 1.6-1.8). CONCLUSIONS. aMFL have been revealed in our analysis to be highly prevalent structure. It occurs in over half of overall population i of extraordinary size. To our knowledge this is the first such a detail meta-analysis of prevalence and morphometrics of aMFL.

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Heterotaxy in a Pediatric Cardiac Patient: A Case Report of Complex Congenital Heart Defects.

INTRODUCTION. Heterotaxy syndrome, or situs ambiguous, is a multitude of thoracoabdominal congenital irregularities involving organ rearrangements across the body axis. The array of symptoms can be subdivided into either left or right isomerism, which conventionally refers to the anatomy of the designated side presenting bilaterally. While there have been numerous published case reports on heterotaxy syndrome, no case report has documented the combination of symptoms seen in our patient, who presents with defects characteristic of both left and right isomerism. RESOURCES. N/A. DESCRIPTION. A male infant was delivered early at gestational age 37 weeks and 3 days, due to poor fetal growth. Fetal echocardiogram had been performed prior to delivery and was indicative of complex congenital heart defects, specifically heterotaxy syndrome with dextrocardia, double-outlet right ventricle with transposed great arteries, a complete atrioventricular canal defect, a large ventricular septal defect and a large common atrium. The suspected defects were confirmed after delivery via echocardiography and cardiac catheterization. Given that heterotaxy can occur by itself or as a secondary feature of another genetic disorder, karyotyping via chromosomal array and chromosomal analysis were performed; however, no chromosomal or genetic abnormalities were identified. SIGNIFICANCE. This form of heterotaxy syndrome partially matches both right and left atrial isomerism. Double-outlet right ventricle, malposition of the great vessels, and pulmonary and subpulmonary stenosis are typical of right atrial isomerism. In contrast, the common atrioventricular canal defect, bilateral superior vena cava, and anomalous drainage of the inferior vena cava hint at left atrial isomerism. This anatomical case reports highlights the complexity of heart development and highlights the complexity of surgical and long-term clinical management of heterotaxy syndrome.

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Graduate Students' Use and Perceptions of Learning Resources Provided in a Human Anatomy Course.

INTRODUCTION. Implementing curricular improvements to a graduate interdisciplinary anatomy course requires consideration and input of multiple stakeholders, including students. This study examined students' use and perceptions of anatomy resources integrated into the course. METHODS. Upon completion of an anatomy course, 4 cohorts of graduate health sciences students were invited to complete an online survey on frequency of resource use (never, rarely, occasionally, often) and perception of how influential the resource was to learning (1=not influential at all, 4=extremely influential). Resources were categorized as passive (websites, atlas, lab computers, filmed lectures, textbook), active (prosections, models, open lab), and collaborative (peers, teaching assistants, tutors, faculty). Descriptive statistics summarized respondents' use (frequency) and perceptions (mean±sd). SUMMARY. Respondents were 242 students (male=69, 28.5%; age=25.6±4.1 years). The most used passive resources were atlases (77.0%, n=184/239) and textbooks (53.8%, n=128/241) while lab computers were never used by 44% of students (n=57/129). Models (86.7%, n=208/240) and prosections (83.0%, n=200/241) were the most often used active resource followed by open lab attendance (67%, n=160/143). Learning with peers (86.6%, n=207/239) was the most often used collaborative resource; university tutoring (63.7%, n=142/223) and individual meetings with faculty (46.1%, n=105/228) were rarely used. All of the most frequently used resources were perceived as moderately to extremely influential on learning. Active learning with prosections (3.9±0.3, n=206/242) and models (3.8±0.5, n=241/242) were perceived to be most influential on learning. CONCLUSIONS. Students reported the most helpful passive and active learning resources were models, prosections, atlases and open lab hours. Educators may incorporate these resources when developing collaborative team-based lessons to further enhance peer-to-peer learning.

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Unique Doubled Psoas Quartus Muscle Variation.

INTRODUCTION. Psoas quartus has been described with proximal attachments to quadratus lumborum and transverse process of L3 and distally to the lesser trochanter with the iliopsoas tendon. The current variation presented with multiple bellies, altered proximal attachments, and an entrapment site involving L3 ventral rami. RESOURCES. Typical dissection of the inguinal and pelvic regions of an embalmed 83-year-old, Caucasian female during the Physical Therapy anatomy course revealed the anomalous psoas quartus muscle on the left side. DESCRIPTION. The key discovery was a double bellied psoas quartus muscle that attached distally to the lesser trochanter with the combined tendon of the iliopsoas. Proximal attachments for the medial belly were from the mammillary processes and transverse processes of the lumbar vertebrae, L3- L4 and for the lateral belly from the pelvic surface of the iliac crest and the quadratus lumborum. The ventral rami of L3 passed through the medial belly via a tendinous tunnel created by the muscle. The muscle bellies joined 14 cm distal to the L3 attachment point and extended together another 13 cm in an infero-lateral direction spanning the iliac fossa before joining with the iliopsoas tendon. The muscle's width measured 31 mm from medial to lateral at its central point. The variant psoas quartus was positioned antero-medial to the iliacus muscle, and posterior to the psoas major muscle. Distally, the muscle belly gave way to a slender tendon that coursed between the tendons of the iliacus and psoas major muscles, delaying the typical conjoining of the iliacus and psoas major tendons. SIGNIFICANCE. The variation in the present case could have many clinical implications including entrapment of lumbar nerve root L3, altered abdominal imaging, altered hip function, along with possible disc herniation or back pain due to increased tension on transverse processes of L3 and L4.

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Can Anatomical Structures on a Bisected Cadaver Donor Head Indicate a History of OSA?

INTRODUCTION. According to the SleepFoundation.org, more than 18 million adults have obstructive sleep apnea (OSA), a disorder that can result in daytime fatigue, hypoxia, hypertension, arrhythmias, et al. Previous studies in live patients have suggested a correlation between OSA and uvular length (>15mm) and width (>10mm). We describe a possible correlation that can be seen in the gross lab setting. RESOURCES. Causes of death are often provided for donors in a gross lab setting. Recently, comorbidities have been included which enhances the potential for clinical correlations. In this case, 2 Caucasian female cadaver donors, ages 87 and 88, had documented OSA. For comparison, 2 Caucasian females, ages 87 and 90, of similar anthropometry were also studied. DESCRIPTION. OSA is most problematic when the patient is supine. The donors in our lab, like in most labs, were embalmed in the supine position. In an effort to document anthropometry, we measured donor height and specimens ranged from 151.1 to 162.6 centimeters. Because obesity has been implicated in OSA, we measured the distance from the dissection table to the anterior surface of the abdomen and specimens ranged from 193.7 to 304.8 millimeters. The heads and necks were then bisected in order to measure

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the distance between the epiglottis and uvula, width of the uvula, distance between the tongue and pharynx, and the distance from the nose to the inion. SIGNIFICANCE. Most anatomy faculty are not clinicians, yet they desire to share clinical correlations when appropriate. In our small study, we describe gross observations on 2 OSA versus 2 non-OSA donor cadavers. The most striking difference was the distance between the epiglottis and the uvula. In the OSA donors, the distance was 7.8 and 10.3 millimeters. In the non-OSA patients, the distance was considerably greater at 21.7 and 20.1 millimeters. When instructing on a bisected head, a short space between the uvula and epiglottis may be indicative of OSA.

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Mandibular Nerve Variation Involving an Accessory Inferior Alveolar Nerve: A Case Report.

INTRODUCTION. Variations of the mandibular nerve in the infratemporal fossa are of great interest to dental and medical clinicians and have been well documented. RESOURCES. In this case study, standard dissection of the infratemporal fossa on the right side of an anatomic donor revealed a unique variation of the inferior alveolar nerve (IAN). DESCRIPTION. The variation involves an accessory IAN in the infratemporal fossa that is formed by branching contributions from the auriculotemporal nerve and the posterior division of the mandibular nerve. The converging branches form a loop around an unnamed maxillary artery branch. Distally, the accessory IAN bifurcates; one branch converges with the inferior alveolar nerve and the other continues separately into the mandibular foramen. SIGNIFICANCE. Awareness of IAN variants is clinically important for understanding potential complications in the effectiveness of intraoral anesthesia by clinicians working in the head and neck region.

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Ankle Brachial Pressure Index: Critical Appraisal of Landmarks Using Pulsed Wave Doppler Ultrasound.

INTRODUCTION. Peripheral arterial disease (PAD) is a prevalent, often undiagnosed, clinical condition affecting 202 million people globally. Evidence suggests that the Ankle Brachial Index (ABI) is a useful, inexpensive and non-invasive tool for diagnosing PAD. Current literature shows physicians and residents are inadequately trained to perform the test correctly, and early integration of ABI in medical education is recommended. One reason for the inadequate performance of the ABI is the extensive intraoperative variability in selecting the appropriate anatomical landmarks. This study both identifies and compiles published landmarks for ABI related arteries and assesses the feasibility of using ultrasound as a teaching tool for ABI. METHODS. A literature review, of ultrasound and cadaveric studies, was conducted to analyze anatomical landmarks for the brachial, dorsalis pedis, anterior and posterior tibial arteries. Two healthy volunteers were recruited for our team of medical students to apply the findings and perform the ABI using ultrasound. SUMMARY. Our preliminary data demonstrated there are limited studies on arterial landmarks for ABI. In performing the ABI, the brachial artery was identified 2 cm medially from the center of the cubital fossa at the elbow crease. The posterior tibial artery identified between the lateral edge of the medial malleolus and calcaneus. The anterior tibial artery was identified 3 cm proximal and 1 cm medial to the lateral malleolus. The dorsalis pedis artery was located distal to the prominence of the navicular bone. Based on our findings, landmarks of ABI arteries are consistent with the available literature. Calculations for the ABI using ultrasound should use the brachial, and anterior tibial or posterior tibial artery. CONCLUSIONS. This study provides an overview of the landmarks and demonstrates the feasibility of integrating ABI in medical education. We recommend future studies to implement ABI teaching in medical education.

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Online Anatomy Self-Assessment: Valuable Tools for Enhancing Engagement and Improving Performance.

INTRODUCTION. Self-assessment and self-directed learning are becoming essential components of effective and successful medical school curricula. It has been proven that millennial learners' comprehension and performance are enhanced with formative assessment and regular feedback. The new integrated basic sciences curriculum implemented at Weill Cornell Medicine-Qatar in 2016 necessitated a thorough evaluation of educational resources. In anatomy, new measures have been introduced with the aim of facilitating students' understanding and performance. METHODS. A set of online self-assessment questions have been incorporated as weekly practice quizzes through Canvas platform to first year medical students. Anatomy questions were of the USMLE Step 1 format; and, as item-recognition in relevant regional anatomy images. Students were allowed multiple attempts and received scores at the end of each attempt. Feedback was in the form of an explanation of the correct answer only, in addition to scores. Performance was monitored and compared to students' weekly course quiz grades. SUMMARY. Students who took the practice quizzes did better

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in anatomy. The more often students did the quizzes the better their actual quiz scores were. The online survey showed that the majority of students were satisfied with the self-assessment modules. Our observation supports the concept that self-assessment does enhance students' performance and satisfaction. CONCLUSIONS. The self-assessment quiz questions made a noticeable contribution to improving students' engagement and performance in anatomy. The advantage of embedding questions into Canvas platform allowed a closer follow up and feedback. Having an explanation of the correct answer only may have a limited benefit compared to explaining all item choices. We plan to assess the long-term impact of this measure. Self-assessment, if well-designed, can significantly improve students' motivation and interest to learn. IRB approval:1499001-1

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Computer Active Learning Integrates Histology and Pathology in a Condensed Medical Curriculum.

INTRODUCTION. Medical school basic science curricula have become more condensed with stand-alone histology courses replaced by incorporation into systems-based courses. LCME accreditation requirements place emphasis on student-directed active learning and clinically relevant teaching. In preparation for transition to a condensed combined medical gross anatomy/histology course, we developed a set of virtual microscopy diagnostic exercises that integrated normal histology with pathology. METHODS. Students were academically sorted into groups and required to find and describe pathological features on a set of selected specimens. Students were provided with feedback and allowed multiple attempts. They were then required to describe and diagnose unidentified pathological specimens. The specimens corresponded with tissues/organs covered in normal histology lectures and labs. We created a website where students could view and label specimens, enter text and share comments with group members and faculty. Student participation was enforced through software restrictions. SUMMARY. Students resisted applying pre-assigned normal histology material to the exercises. They preferred to use web resources to search for all known diseases of a tissue/organ and compare to the assigned specimen and they diagnosed without labeling features. Revision of the exercises placed emphasis on pathological feature recognition. The allowance of multiple attempts and faculty feedback and guidance encouraged more student "educated guessing" making the exercises a stepwise active learning process. CONCLUSIONS. The exercises greatly increased student interaction and teamwork and facilitated student recognition of key pathological features, giving them the necessary framework to hypothesize tentative specimen diagnoses. We are currently developing similar introductory normal histology interactive exercises to facilitate student application of normal histology to abnormal.

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From Concept to Creation: 3D Printed Anatomical Structures without Modeling Expertise.

INTRODUCTION. Plastic models are frequently used to supplement anatomical education, particularly when cadaveric tissue is inappropriate or unavailable; however, these products are often associated with high costs, lack of detail and realism, and are often too rigid for students to manipulate. Comparatively, three-dimensional (3D) printed anatomical models are cost effective, can replicate variation and pathology, and can be made from flexible plastics. A potential limitation to 3D printed models in anatomy is the inherent belief they require advanced knowledge to create. This project's aim is to demonstrate the ease for anatomists to design 3D printed structures without modeling experience. RESOURCES. Anatomy faculty conceptualized and created new anatomic models using commercially available software (NextEngine [NextEngine, Santa Monica, CA] and MeshMixer [Autodesk, San Rafael, CA]) and a 3D printer (Stratasys Mojo printer, Eden Prarie, MN) available at the university library. Faculty received no formal instruction or training on the software or process. DESCRIPTION. Three common Adachi variations of the internal iliac artery were built using standard modeling clay. Scaling was determined based on the dimensions of pelvis bone models available to students. Once dry, clay models were scanned using NextEngine then exported to MeshMixer for gap-filling to ensure the model would print successfully. The final standard tessellation language (STL) files were printed using a flexible filament to allow student manipulation and finished in an acid-wash bath by university library staff. SIGNIFICANCE. Creating novel 3D anatomical models is an affordable solution that allows for representation of diverse and clinically relevant anatomical variations. The successful creation of unique models such as these demonstrates how educators are capable of designing their own models with little-to-no advanced 3D modeling training. (Sponsored by Grant No. 501-661, A.T. Still University)

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Barriers to Ischemic Stroke Care in Patients from a NYC Suburb: A Pilot Study.

INTRODUCTION. Stroke is the leading cause of disability in the US and ischemic stroke (IS) is the most common type. A barrier is operationally defined as a cause that prevents continuity of care; continuity is a physician-led, team-oriented process for delivering medical services. Many IS patients lack post-stroke care because of barriers such as language, physical ability, transportation, and cost/access to medicines. These barriers contribute to high morbidity and mortality. The purpose of this exploratory pilot study was to identify which variables (barriers) prevent IS patients from receiving post-stroke care. METHODS. IRB approval was granted. An instrument was distributed to IS patients (N=14) during their post-stroke visits to a university-hospital stroke clinic (convenience sample) in Staten Island, NY. Patients must have been 18 years or older and diagnosed with IS. An instrument adapted from the valid and reliable SASC-19 survey was used to identify the following barriers: medicine non-compliance, transportation to and from clinic, physical/emotional support, physical rehabilitation, language, and understanding treatment plan. Data analyzed with IBM SPSS Version 24 (Armonk, NY). SUMMARY. Respondent demographics: sex (F:43%, M:57%), age (79% were 50 or greater) and ethnicity (79% White, 14% Hispanic, 7% Asian). 29% missed taking post-stroke medicine due to forgetfulness, 7% missed because they perceived they didn't need it anymore, and 7% missed because they had trouble obtaining the medicine. 14% felt their provider did not educate them on their treatment plans, nor did they receive clear discharge instructions on who to follow-up with. CONCLUSIONS. Based on these data, access to post-stroke medicine and provider follow-up instructions are important variables (barriers) that will be investigated in a future study. Our data can help clinicians create better discharge plans and ensure their patients have access to post-stroke medicine.

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Integration of Virtual Microscopy Podcasts in Histology Discipline: Learning Outcomes.

INTRODUCTION. Virtual microscopy podcasts comprise an innovative Histology laboratory manual. The study evaluates the outcomes of integrating narrative podcasts of virtual Histology Slides into teaching Histology discipline to medical students. The hypothesis is that the inclusion of the podcasts would positively influence the students' perception and their academic performance. METHODS. Seventy short podcasts of digital slides were used as supplementary resources of Histology during the first and second years of the medical curriculum. Since the podcasts were introduced in 2017, classes of 2020 and 2021 could access these resources in some but not all the courses and the class of 2022 used them in all the courses. A voluntary and anonymous survey was administered to all three classes using a Likert-scale based questionnaire regarding the students' perception of the virtual microscopy podcasts. The Examsoft reports of all the classes were analyzed to find differences among the cohorts. SUMMARY. The survey yielded an overall response rate of 49%. All of the respondents rated the quality of podcasts as excellent or good. The majority indicated that the podcasts enabled more efficient study time and improved their confidence in the Histology content on examinations. The differences among the study groups indicated a positive association between podcast viewing and efficient utilization of study time and confidence about the Histology content and the class performance. This summary of students' feedback and academic performance will help us understand the significance of integrating multimedia with Histology teaching. CONCLUSIONS. The virtual microscopy podcasts were found to be beneficial by the students and they were often used as pre-exam review material. Based on the survey and examination report analysis, the inclusion of podcasts in Histology teaching enhances Histology learning. The study will also facilitate planning a curricular modification when needed.

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Lemmel Syndrome VP Shunt IOL Sphincter Implants in 4 Cadavers – Surgical Anatomy Blended HD Videos.

INTRODUCTION. Cadaver dissections are still considered the gold standard for anatomy learning, recent digital technologies notwithstanding. However, with the paucity of morbid anatomy in standard cadaver dissection labs, leveraging unique pathology findings render anatomy learning more relevant. RESOURCES. Cadavers are prosected from scalp to sole every semester by the principle author who is also a surgeon. Close attention is paid to pathology, anatomical variations, prostheses and evidence of any other surgeries on the bodies. All findings are recorded by Samsung Galaxy® S8 12/8 MP forward/rear-viewing cameras

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and integrated with gross anatomy teaching of MD students. DESCRIPTION. One cadaver had a large periampullary duodenal diverticulum, which can produce obstructive jaundice in life, typically described as Lemmel syndrome. A second cadaver had a ventriculoperitoneal shunt from occipital horn of right ventricle. The pump was implanted under the scalp. The outflow tube was tunneled subcutaneously across right neck and chest and inserted into the right subcostal peritoneal cavity. Reason for the shunt was indecipherable. A third cadaver had aphakic posterior chamber intraocular lens implant. A fourth cadaver had an artificial urethral sphincter. Tubes from the balloon reservoir in left lower rectus abdominis were tunneled subcutaneously into the left scrotum, which housed the valvular pump. The inflatable artificial sphincter cuff was wrapped around the root of corpus spongiosum. SIGNIFICANCE. Multi-disciplinary correlation of duodenal, biliary, cerebral, ocular and genito-urinary pathology and surgeries with their normal anatomy was the cornerstone of these four dissections. Apart from actually visualizing the morbid anatomy itself, students also saw the intricacies of surgical procedures that were employed. High definition videos of relevant pathology and surgery greatly supplemented anatomy learning and clinical relevance, not to mention students' enthusiasm.

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Beyond Head and Neck Dissection: What I Learned from Fourth-Year Anatomy Teaching Clinical Elective.

INTRODUCTION. As a 4th-year medical student of Weill Cornell Medicine-Qatar who chose otolaryngology-head and neck (H&N) surgery for residency training, I enrolled in a 2-week 'Anatomy Teaching Clinical Elective: H&N Dissection' to reinforce my anatomy and practice my dissection skills. The course's syllabus included: cadaveric dissection, tutorial of 1st-year medical students, utilization of medical imaging technology, and preparation of review materials as a presentation and online quizzes. RESOURCES. I prepared for anatomy lab sessions by reviewing the anatomy lecture material and dissecting the oral cavity, paranasal sinuses and larynx. The cadaveric specimens combined with images from radiology and 3D imaging were used to teach 1st-year medical students' anatomy. After lab, clinically relevant anatomy questions prepared as modules were posted on Canvas, and I presented interactive PowerPoint anatomy review sessions. DESCRIPTION. This was an intense 2-week clinical elective that required me to self-directly solidify my anatomy knowledge, prepare for the laboratory dissection sessions, and tutor medical students about the clinical relevance of anatomy. Stepping into the role of an instructor demanded a deeper level of engagement; my H&N anatomy knowledge was enriched especially during the preparation for student online self-assessments and review presentations. SIGNIFICANCE. This hands-on experience surpassed my objectives of merely revisiting my H&N anatomy and refining my manual dexterity as a future surgical resident. Ending this elective, I gained more confidence upon imparting knowledge to students and building my strong anatomical comprehension. I had a deeper appreciation of the H&N and was able to spark the interest of first-year medical students for otolaryngology-H&N surgery. Presenting and tutoring cultivated my communication skills, professional values and self-directed learning which are crucial in delivering patient care at a teaching hospital.

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Dissection and Analysis of a Complex Cadaveric Hand Dysmorphology.

INTRODUCTION. Embryonic hand development occurs in approximately week 5 of gestation. The normal course of limb development can be affected by environmental or genetic factors leading to various anomalies. The variability and severity of the anomalies could lead to significant functional deficits. The present study aimed to investigate the anatomical make-up of a cadaveric limb presenting with a complex congenital hand malformation. RESOURCES. Plain film x-rays and CT scans were obtained prior to dissection of the hand. The forearm and hand dissections were completed, while preserving the musculoskeletal and neurovascular structures. DESCRIPTION. Imaging results revealed normal development of the carpal bones with the exception of the trapezoid, which appeared to be hypertrophied. Thumb development appeared normal. The 2nd and 4th digits appeared to each have a metacarpal with primitive development of a phalange. The 3rd digit had an incomplete development of the metacarpal and no associated phalanges. Interestingly, the 5th digit presented with clinodactyly. Examination of the flexor and extensor musculature revealed an abnormal distribution pattern as well. The associated flexor and extensor tendons of the 1st and 5th digits appeared relatively normal in their distribution patterns. The extensors of the 2-4th digits attached to the base of the metacarpals. The distribution of the flexor digitorum superficialis and profundus had highly altered distribution pattern, with some digits lacking all or some of the tendons. SIGNIFICANCE. The congenital hand malformation has several classifications of obvious hand dysmorphologies, including brachydactyly, clinodactyly, and syndactyly of the soft tissues. However, the flexor and extensor muscles were not atrophied suggesting some functionality of the hand remained.

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Gross and Histological Examination of Tracheoesophageal Constriction from a Circumflex Aortic Arch.

INTRODUCTION. Circumflex aortic arches are rare developmental anomalies of the aortic arch. One variant, called circumflex retroesophageal right aortic arch (CReRAA), results in the aortic arch developing over the opposite (right) primary bronchus and coursing left across the midline behind to the esophagus prior to a normal descent. As a result, the ligamentum arteriosum can create a vascular ring around the trachea and esophagus and cause tracheoesophageal constriction (TEC). The present study involves a 57-year-old human female cadaver who was discovered to have a CReRAA and vascular ring. The objective of this study is to investigate the extent and effect of TEC along the trachea and esophagus. METHODS. The CReRAA was dissected and photographed. The TEC was dissected, sectioned, imaged, and stained with hematoxylin & eosin (H&E). Trachea and esophagus luminal areas were measured in triplicate along with the angles of tracheal descent and bifurcation using ImageJ software. SUMMARY. The proximal trachea lumen (105.2 ± 6.4 mm^2) gradually narrowed to the maximum TEC (61.6 mm^2), while the esophagus lumen (12.0 ± 2.4 mm^2) was consistent along its length aside from a sizable dilation (42.5 mm^2) just proximal to the maximum TEC. The CReRAA induced multidirectional tracheal angulation, resulting in a steeper vertical angle to the left primary bronchus (139.6°) than the right (125.2°). Histological examination revealed decreased structural integrity in the longitudinal layer of muscularis externa and trachealis muscle at the location of maximum TEC. CONCLUSIONS. TEC altered trachea and esophagus gross presentations, affected tissue integrity, narrowed the trachea lumen, and dilated the esophageal lumen proximally. Grossly and histologically examining TEC from a CreRAA patient may help physicians understand CReRAA-related respiratory distress and esophageal dysphagia. Additional analyses are planned to fully understand the implications of CReRAA-related TEC.

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Review of Musculoskeletal Ultrasound Shear Wave Elastography: Past, Present, and Future.

INTRODUCTION. Ultrasound shear wave elastography (US-SWE) is a relatively new advancement in medical imaging that is commonly used to assess soft tissues, such as the liver, thyroid, and breast. Musculoskeletal (MSK) applications of this technology, in particular, are in their early stages. US-SWE measures the speed of shear wave propagation through a tissue, yielding quantitative and/or qualitative estimates of tissue stiffness and elasticity. In this study, we conducted a scoping review of the current MSK US-SWE literature to evaluate the evolving status of the field and to identify gaps for future research. METHODS. We searched for primary, peer-reviewed literature in two databases (MEDLINE and EMBASE), resulting in a total of 587 articles dated 1995 to 2020 for initial analysis. Screening included language of publication (English), species (human), age (adult), tissue(s) of interest (contractile tissues of skeletal muscles), and elastography modality (shear wave). SUMMARY. 163 studies were included in the final analysis. We identified several broad categories of application for MSK US-SWE: a) normative tissue properties (N=61); b) pathology or injury, including assessment and treatment (N=44); c) muscle activity/force (N=16); d) aging (N=7); and e) exercise/stretching (N=35). The majority of studies evaluated feasibility and/or reliability of US-SWE in some capacity, reporting widely variable levels of success. The most commonly discussed limitation of MSK US-SWE was the anisotropic nature of MSK tissue—a challenge that has begun to be addressed using custom-built phantoms and animal models. CONCLUSIONS. MSK US-SWE is an emerging field with a diverse range of applications in both research and clinical settings. Future research should focus on optimizing and standardizing protocols, establishing consistent normative ranges of muscle stiffness, and improving the fidelity of anisotropic tissue measurement. (Supported by a CIHR Vanier Canada Graduate Scholarship).

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Ultrasound Assessment of Morphological Features of Sections of the Anterolateral Abdominal Muscles.

INTRODUCTION. Ultrasonography is a non-invasive and useful means of evaluating abdominal muscle function, especially a contraction of the transversus abdominis. Evaluation of the function of the anterolateral abdominal muscles includes measuring thickness of the transversus abdominis and internal oblique muscles and changes in length of the aponeuroses of the lateral abdominal muscles. In this study, we performed ultrasonography to investigate the gross anatomical morphological features of the anterolateral muscles. METHODS. All layers of the anterior and lateral abdominal walls were extracted from formalin-preserved cadavers for investigation in this study. The abdominal wall from the xiphoid process to the pubic symphysis was divided into 10 horizontal specimens. The relationships between, and lengths of each muscle and aponeurosis, were assessed. SUMMARY. The findings of this study differed from descriptions of the abdominal wall in major textbooks of anatomy. In this study, the cranial to the umbilicus was divided into 6 horizontal specimens (including the level of the xiphoid process), more sections were found that the transversus abdominis muscle was located in the deep part of the rectus abdominis muscle. In such textbooks, attention is usually paid to the relationship between the rectus abdominis muscle and rectus sheath in cross-sectional views of the anterior and lateral abdominal muscles. Two or three sections of the abdominal wall are usually shown: cranial to the umbilicus (or arcuate line), at the

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level of the umbilicus, and caudal to the umbilicus (or arcuate line). We examined more sections cranial to the umbilicus and found that the descriptions in most textbooks are insufficient. CONCLUSIONS. More detailed anatomical characteristics of the abdominal wall are necessary for accurate ultrasound diagnosis. We plan to further develop ultrasonography of the lateral abdominal muscles by adding dynamic assessment of their function.

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The Clinical Anatomy of the Hallucal Sesamoids.

INTRODUCTION. The hallucal sesamoids are vital in the biomechanics of the foot, and are regularly targeted during surgery, especially hallux valgus (HV) surgery, in which soft tissue releases (STR) are utilised to encourage realignment of the sesamoids. STRs are suggested to target specific attachments to the sesamoids, but this is not based upon reliable anatomical data. There has yet to be an accurate description of these attachments and how they can be safely targeted, nor what critical nearby structures are at risk. METHODS. Unembalmed (n = 5) and Genelyn embalmed (n = 30) cadaveric feet were used for a number of diverse methodologies, such as: fascicular micro-dissection, microscribe digitisation, arterial perfusion with a contrast mix, CT and micro-CT scanning, sectional data from 1-2mm sections and histology. SUMMARY. The data from this research shows that the anatomy around the hallucal sesamoids is complex and understudied. However, these data clearly demonstrate significant attachments to the medial and lateral sesamoids that were previously refuted, or not even considered. The course of essential nutrient vessels for each sesamoid was mapped and related to surrounding tissues; the various imaging modalities enabled high-resolution visualisation of many of these structures for the first time. CONCLUSIONS. These detailed anatomical descriptions of hallucal sesamoid attachments and vascularity have contradicted or built upon much of the reviewed literature. This thorough understanding of sesamoid anatomy will inform more considered and evidence-based surgical decisions in podiatric surgery and may reduce complications and improve functional outcomes.

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Case Report: Incidental Finding of a Circumaortic Left Renal Vein.

INTRODUCTION. Renal vein anomalies are considered to be relatively rare; however are becoming more frequently diagnosed due to the increased utilization of medical imaging. They can be classified into three main categories: multiple renal veins, a retro-aortic left renal vein (RLRV), and a circumaortic left renal vein (CLRV). A circumaortic left renal vein occurs due to the persistence of both the ventral and dorsal limbs of the renal collar. RESOURCES. A series of MRI lumbar spine images without contrast was obtained and reviewed. DESCRIPTION. We present a case of a 26-year-old Caucasian female who underwent investigation for lumbar radiculopathy. An MRI incidentally revealed the presence of a circumaortic left renal vein. The ventral branch of the left renal vein ran anterior to the aorta whereas the dorsal branch ran between the aorta and the vertebral body. Reanastomosis of the two branches was evident prior to insertion into the inferior vena cava. The result was a venous ring that encased the aorta. SIGNIFICANCE. This anomaly is usually asymptomatic, but has been shown to be associated with intermittent hematuria due to increased pressure within the left renal vein. In cases of hematuria, the presence of a circumaortic left renal vein should be considered in the differential. Its occurrence also has significant implications regarding retroperitoneal surgery. Failure to identify the existence of a retro-aortic renal vein intra-operatively could lead to massive hemorrhage. Its presence is also a relative contraindication to donor nephrectomy at some institutions. Therefore, it is crucial that the presence of a circumaortic left renal vein is identified with the assistance of pre-operative imaging to prevent adverse outcomes.

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Fibrous Structures Connecting the Buccinators and the Dermis in the Deep Medial Cheek Fat Pad.

INTRODUCTION. The deep medial cheek fat pad (DMCFP) is surrounded by the zygomaticus major superiorly, the body of the mandible inferiorly, the orbicularis oris anteriorly, the buccal fat pad posteriorly, the buccinators deeply, and the SMAS superficially. Furthermore, this fat pad, as well as the malar fat pad, are considered to be involved in the aging changes of the face. However, the exact mechanisms by which this fat pad controls facial aging changes remains unclear. Furthermore, the branches of the facial nerve, facial artery, and facial vein run intricately in the deep medial cheek fat pad, and its detailed anatomy is very important for facial surgeons. METHODS. Twenty sides of 10 formalin-preserved cadavers were used for this study. Five sides were used for creating frontal sections, five sides for horizontal sections, and ten sides for layer-to-layer dissection. For creating sections, the tissues were cut at a width of 5 mm either on a horizontal plane or a frontal plane. The loose connective tissues and fat tissues were dissected under a surgical microscope, with hyperextension of the sections by pulling the skin outwards. Each structure in the sections was carefully confirmed in gross anatomical dissection. The direction and distribution of the fibrous tissue in the medial cheek region

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were observed in a magnified view. SUMMARY. In all cases, the fibrous tissues connected the lining of the buccal mucosa and SMAS passing through the buccinator and the DMCFP. The fibers united to create the fascia at the superficial surface of the buccinator. As the SMAS is thin and unclear in this area, the fibers entering the deep medial cheek fat pad intermingled with the honeycomb-shaped fibers in the malar fat. CONCLUSIONS. This fibrous structure likely plays a role similar to a retaining ligament of the face, and may contribute to creating the cheek dimple. These detailed anatomical findings of this unique structure are also important for improving facial surgeries.

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Relationship of PFOs to Sex and Fossa Ovalis Diameter.

INTRODUCTION. During development, the atria start as a common chamber, ultimately divided by the combination of the septum primum and septum secundum, forming the interatrial septum. Prior to birth, communication between the atria is via the foramen ovale. When the lungs inflate after birth, a pressure increase in the left atrium and decrease in the right ventricle induce closure of the foramen ovale, forming the fossa ovalis. In approximately 25% of the general population, the foramen ovale does not close and is termed a patent foramen ovale (PFO). We identified associations between the presence of PFOs and sex and fossa ovalis diameter. METHODS. Forty-one hearts were obtained between 2018 and 2019 from cadavers in our lab. Data was collected with respect to PFO tunnel diameter, PFO tunnel length, fossa ovalis diameter, age, sex, and cause of death. SUMMARY. A statistically significant difference exists between the fossa ovalis diameter of hearts with PFOs and hearts without PFOs determined by one-way ANOVA $F(1,39)=4.897$, $p=.033$. Hearts with a larger fossa ovalis diameter were more likely to have a PFO. A chi-square test of independence was performed to examine the relationship between sex and the presence of a PFO. These variables were significantly different, $?2(1, N=41)=4.7$, $p=.031$. Men were more likely than women to have a PFO. CONCLUSION. The results suggest two relationships that may be of clinical importance. The association between increased fossa ovalis diameter and the failure of the foramen ovale to close, and the relationship between male sex and the failure of the foramen ovale to close. These factors will be helpful in identifying patients at higher risk for conditions associated with PFOs who would benefit from corrective measures.

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The Tendon of Latissimus Dorsi as an Alternative Landmark for Distal Border of the Axillary Artery.

INTRODUCTION. Nearly all dissectors and gross anatomy textbooks refer to the first, second and third segments of the axillary artery, and their corresponding branches, based on specific anatomic landmarks. Most often, the distal end of the axillary artery (and hence the beginning of the named brachial artery) is marked by the distal border of the teres major tendon. In our years of dissection experience, we have noted that perhaps an easier landmark for this axillary/brachial artery boundary would be the distal edge of the latissimus dorsi tendon. Both tendons have insertions within millimeters at or near the intertubercular groove of the humerus. RESOURCES. 38 axillary dissections were reviewed. DESCRIPTION. Following exposure of the tendons for both latissimus dorsi and teres major, we have noted that the distal edge of the latissimus major tendon aligns nearly perfectly with the distal edge of the teres major. Also, the final branch of the axillary artery (posterior circumflex humeral artery; PCH) occurs with regularity proximal to the latissimus tendon, with one noted bilaterally anomalous specimen. SIGNIFICANCE. Since most cadaveric dissections of the axillary artery are performed with an anterior approach, the more superficial latissimus tendon proves an easier landmark to demarcate the boundary between the axillary and brachial arteries. We would argue that this landmark change is supported by the fact that the blood supply to latissimus (thoracodorsal branch of subscapular artery), the most distal shoulder muscle, is from the axillary artery. In the one specimen with bilateral anomalous branching of PHC distal to teres major, the suggested landmark change would still include PCH as a branch of the axillary artery. Moreover, this suggested change is clinically applicable, since the latissimus is more readily palpable than the teres, providing the clinician a better idea of the axillary artery location in the patient.

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Google Image as a Resource in the Anatomy Laboratory.

INTRODUCTION. In anatomy laboratories equipped with internet-enabled computers, faculty often observe medical students using Google Image searches to view anatomical structures as opposed to hard copy or computer-based official course resources (e.g., atlases). This study investigates the educational quality of images resulting from these searches. METHODS. We performed a Google Image search of 3-5 “high yield” anatomical structures, groups of structures, or relationships per unit of the first-year anatomy course and analyzed the top ten search results for each term to 1) report the type of image and the name and type of website publishing the image and 2) assess the relevance or educational quality of the image using a four-point Likert-type scale. SUMMARY. A total of 24 Google Image search terms yielded 240 results. Most of these were atlas-style illustrations or schematics; only 3 of the 240 images were cadaveric photographs. Of the 240 images, 40% were from student or clinician education sites (including anatomy tutoring sites), 17.5% were from patient or public education sites (e.g., hospital and provider webpages), 15.4% were from Wikipedia, 14.2%

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were from academic reference sites, and 12.9% came from social media or other sites. The search term was depicted in 95.4% (229) of the results; these images were defined as "relevant." Of the relevant images, 42 (18.3%) were considered to adequately depict all key components and relationships of the searched structure. While the relevant images were largely accurate, many of the images were incomplete (e.g., not all components depicted or labeled) or missing important context or anatomical relationships that would aid students in identifying the structure in question. CONCLUSIONS. Google Image results for commonly-searched anatomical structures can be reliable and useful resources in the anatomy laboratory; however, students must exercise caution by first considering the source and context of the image.

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Macro- and Microscopic Distributions of the Dorsal Nerve of the Penis in Human Glans Penis.

INTRODUCTION. This study aimed to elucidate the macro- and microscopic distributions of the dorsal nerve of the penis (DNP) that provides the greatest sensitivity over the glans penis. METHODS. The macro- and microscopic distributions of the DNP were investigated in the glands of 23 penises of formalin-embalmed cadavers using whole-mount Sihler's staining and histologic sectioning. Superficial regions of the mid-glans were reconstructed in three dimensions to define the microstructure of terminal branches of the DNP toward the skin surface. SUMMARY. A mean of 6.7 bundles of the DNP consisting of several nerve fibers converged linearly toward the distal end of the penis, rather than diverging laterally on their course. Lateral branches of the DNP linearly extended to the distal end with ramifications, while dorsomedial branches of the DNP gave off nerve fibers to the dorsum of the mid-glans and corona. The intrastromal ramification of the DNP is more developed in the distal half of the glans penis than in the proximal glans containing the corpus cavernosum. They gave rise to radial nerve fibers that projected toward the skin surface to form a plexiform network of terminal branches in the dermis. CONCLUSIONS. Linear projections of the main branches of the DNP throughout the glans and fine networks of terminal branches in the dermis were distinctly visualized in the human penis.

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Reproducibility of Ultrasound in Identifying Possible Landmarks of Inferior Parathyroid Gland.

INTRODUCTION. Accurate localization of the parathyroid glands during surgical neck exploration is a challenging, time-consuming and imprecise procedure. Accidental removal of normal parathyroid tissue during neck surgery is common and usually results in higher morbidity. The purpose of this study is to evaluate ultrasonography as a method to localize inferior parathyroid gland tissues. METHODS. 51 healthy individuals were examined using a standard ultrasound GE Logic machine fitted with a 12L-RS transducer. Longitudinal and horizontal scans of the left and right inferior poles of the thyroid gland were performed to localize the inferior parathyroid glands. The lobes of thyroid gland, trachea, common carotid arteries, and jugular veins were identified as anatomical landmarks for potential parathyroid tissues using ultrasonography. Seven fixed adult human cadavers were used for the exploration of potential inferior parathyroid tissues using the anatomical landmarks mentioned previously. SUMMARY. Using ultrasonography, 43.14% of potential inferior parathyroid tissues were identified in 102 expected inferior parathyroids (n=51). Four types (Type I, II, III and IV) of potential inferior parathyroid tissues were characterized according to their location to surrounding anatomical landmarks with a prevalence of 36.36%, 14.29%, 27.27% and 18.18% respectively. In cadaveric studies, four potential inferior parathyroid glands were identified using the same anatomical landmarks. CONCLUSIONS. Ultrasonography can be considered as a sensitive technique for identifying the inferior parathyroid glands in healthy individuals. Clinically, ultrasonography can be useful in preoperative planning to reduce the morbidity of accidental parathyroid gland removal during neck surgery. Additional cadaveric studies would support the use of these landmarks in identifying the location of the inferior parathyroid glands.

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