ANZACA2022

Theme: Learning from each other

December 7th- 9th, 2022

The University of Queensland, Australia
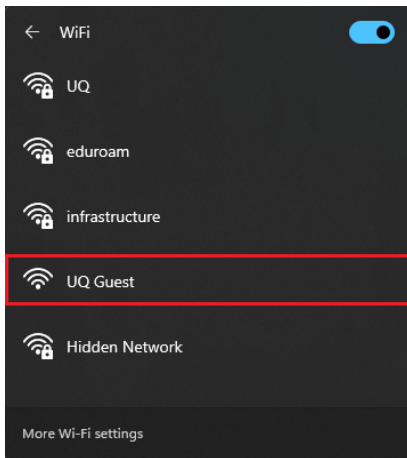
Contents

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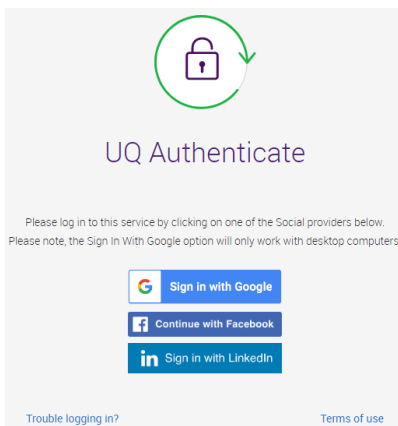
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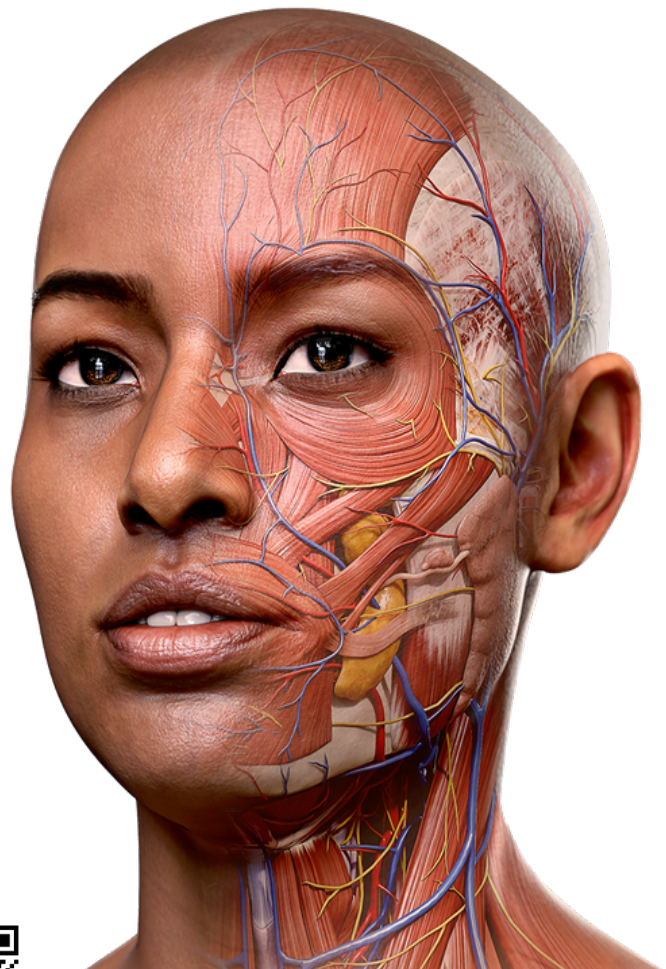
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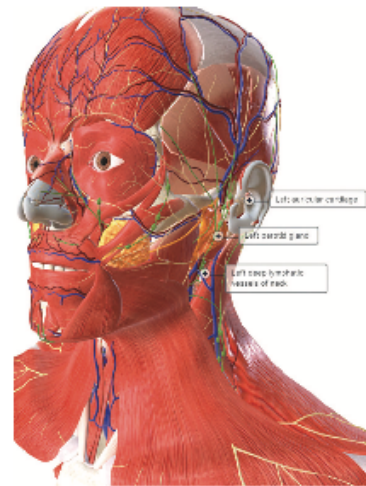**ANZACA2022 Program**

Venue: The University of Queensland (UQ) Brisbane, Australia

> **Note: The conference is being held at two venues of UQ. Please give yourself ample travel time and know the venue for days 1, 2 and 3. If you have any queries, please email conference secretary**

All times shown here are Australian Eastern Standard Time (AEST). Australian Eastern Standard Time (AEST) is 10 hours (UTC +10:00) ahead of Coordinated Universal Time (UTC)
Please synchronize your clocks accordingly. You can check time difference here.
Times are expressed in military time

For online delegates please check your local time

This schedule is correct and updated at the time of printing this booklet. We expect minor changes on Day 1 (7th of December). If these changes occur, we will update the delegates
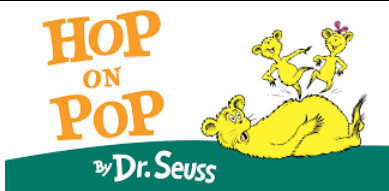
> **Important note**
> **All oral presentations will be 13 minutes long with 10 min talk time and 3 minutes for questions.**
> **All poster pitches will be 2 minutes long. Poster presenters are required to finish 10s before the allocated time to allow change to the next presenter**
> **All abstracts are arranged in alphabetical order**

Day 1: Wednesday 7th December 2022 Venue: ModWest Building (Bldg., 11A), St Lucia Campus, UQ			
1030- 1100	Socialise and meet with sponsors	Pre-conference registration opens and morning tea, Registrations will be open all day from 1030- 1400	
1100- 1200 (60min; runtime 45min question time 15min)		**AIAS and ANZACA panel and debate: Anatomical Sciences Research- Is there an image problem?** Chair: Professor Mark Midwinter Panel: A/Professor Quentin Fogg, A/Professor S Woodley, Ms Susie Kerby, Mr Wes Fisk Access via this zoom link: https://uqz.zoom.us/j/83979466089	
1200- 1300	Welcome BBQ available from 1200- 1400hrs		
1300- 1400		**Workshop 1:** Skeletisation with A/Prof Carl Stephan (multiple sessions between 1300-1400hrs, Max# allowed= 50)	**Workshop 2:** Advanced dissection for research, prosection and teaching with A/Prof Quentin Fogg (multiple sessions between 1300-1400 hrs, Max# allowed= 50)
1400- 1530		**Workshop 3:** Digital Anatomy with Dr Junhua Xiao et al (Single session, also available online) Access via this zoom link: https://uqz.zoom.us/j/83979466089	
1530- 1600		ANZACA Gold Sponsor Session with 3D Organon (Live and online) Access via this zoom link: https://uqz.zoom.us/j/83979466089	
1600- 1630	Wes Fisk available for UQ Gross Anatomy Facility guided visits ANZACA delegates		
1630- 1830	Welcome Cocktails St Lucia Campus, MacGregor Building (64), Level 1 Foyer		

	Day 2: Thursday 8th December 2022 Venue: Mary Mayne Emelia Room, Level 4, Mayne Medical School, Herston campus, UQ
0830- 0900 (30min)	8:30- 8.40 Welcome President- A/Professor Quentin Fogg and Local organizing committee chair- Professor Mark Midwinter 8:40- 8:50 Welcome to Country **Nunukul Yuggera Aboriginal Dance Company** 8:50- 9:00 Welcome to SBMS, UQ
0900- 0935 (35min (30+5))	**Keynote speaker: A/Professor Julie Mundy** **Keynote title: A career in surgery and changes in applied anatomy**
	Oral presentations- Session 1a Session Chairs: A/Professor Julie Mundy and Professor Mark Midwinter Spots available: 5, Duration: 65min
0935- 0948 (13min)	**Agrawal D**, Mishra S, Ghatak S, Singh P, Garg PK **Developing a reference chart for fetal biometry in Indian population to predict growth and development of fetus**
0948- 1001 (13min)	**Barry, C** **Active, engaged collaborative learning of complex pelvic anatomy is facilitated by an online module combining virtual dissection and sculting**
1001- 1014 (13min)	**Blyth P**, Schwer E, Taylor D, Hewitt J, Grant J **Translation and rotation at the distal radioulnar joint after sectioning**
1014- 1027 (13min)	**Blythe CB**, Reynolds MS, Gregory LS **Calcaneal quantitative ultrasound: Investigating the impact of tissue interference**
1027- 1040 (13min)	**Burlakoti A,** Kumaratilake J, Taylor J and Henneberg M **The importance of early screening for detection of cerebral aneurysms**
1040-1105 (25min)	Morning tea & Poster viewing
	Oral presentations- Session 1b Session Chairs: A/Professor Julie Mundy and Professor Mark Midwinter Spots available: 5, Duration: 65min
1105- 1118 (13min)	**Dolodolotawake M,** Bird R, Flack NAMS **Me Tu Dei: An investigation into deep posterior leg muscle size in Pacifica**
1118- 1131 (13min)	**Duncombe PG**, Izatt MT, **Pivonka P**, **Claus** A, Little JP, Tucker K **Quantifying muscle size (a)symmetry in adolescent idiopathic scoliosis using three-dimensional magnetic resonance imaging**
1131- 1144 (13min)	**Fogg QA** and Bruechert GK **Influence of body donor preparation on dynamic carpal motion testing**
1144- 1157 (13min)	**Gharib M** and Mirjalili SA **Ultrasound visualization of the spinal accessory nerve in patients with lymphadenopathy**
1157-1210 (13min)	**Hayes JA** and Temple-Smith MJ **Where to next for anatomical variation?**
1210- 1245 (35min)	Lunch
1245- 1320 **(35min (30+5))**	**Keynote speaker: A/Professor Craig Hacking** **Keynote title: Radiographic anatomy teaching in 2020s (Radiopaedia)**
1320- 1335 (15min)	**Member spotlight 1** **Aland RC**, Cai B, Erdelyi I, Sonya FJ **Tutors from non-Australian backgrounds bring tangible benefits to histology teaching**
1335- 1350 (15min)	**Member spotlight 2** **Meyer AJ** **Phoenix rising: The history of anatomy at The University of Western Australia**
1350-1400 (10min)	Break

	Poster Pitches – Session 1a Session Chair: Danijel Tosovic Spots available: 10, Duration: 20min
1400- 1402 (2min)	**1.** **Aggio-Bruce R**, Valter K, Webb AL **Movers and Shakers – A model for small group-based interactive learning in Anatomy**
1402- 1404 (2min)	**2.** **Boulton M**, Kwa F and Al-Rubaie A **Digital 3D imaging of cribriform plate for pre-operative assessments**
1404- 1406 (2min)	**3.** **Aravazhi S,** Flack NAMS, Nicholson HD, Smith-Han K **Reaching beyond your threshold: a new way of looking into cadaveric dissections as a holistic educational resource**
1406- 1408 (2min)	**4.** **Aziz JN,** Thorogood J, Yang L **Introducing multimodal objective structural practical exam to assess anatomy competency, and to improve student's ability in medical imaging practice**
1408- 1410 (2min)	**5.** **Brzegowy K,** Musiał A, Brzegowy P, Walocha JA **Artery of Percheron infarction: A diagnostic challenge posed by an anatomical variant**
1410- 1412 (2min)	**6.** **Fellner LH**, King SM, Barry CM **'Pet things' and 'penny drops': factors influencing clinicians' teaching of pelvic anatomy**
1412- 1414 (2min)	**7.** **Gilmour, SM** **Life drawing in death: The introduction of life drawing in cadaveric anatomy studies to improve learning outcomes**
1414- 1416 (2min)	**8.** **Hampshire LC**, Havellas W, Shokri S, Beverdam A, Corvalan-Diaz C **Collaboration and co-creation: developing a state-of-the-art digital anatomy laboratory for the Sydney medical programme in Dubbo**
1416- 1418 (2min)	**9.** **Harrison AC**, Bruechert GK and Fogg QA **Normal morphology and soft tissue relations of the triquetrum**
1418- 1420 (2min)	**10.** **Hona TWPT** and Stephan CN **Cephalometric landmark standards and recent trends in craniofacial identification (2018-22): Avoiding imposters by describing variant landmarks as supplemental**
1420- 1430 (10 min)	Break
	Poster Pitches – Session 1b Session Chair: Tracey Langfield Spots available: 10, Duration: 20min
1430- 1432 (2min)	**11.** **Kenway LC** and Karaksha A **The journey of an electronic learning tool: from humble beginnings and serendipitous timing to online learning amidst a pandemic**
1432- 1434 (2min)	**12.** **Killoran C** and de Costa A **Anatomy of surgical exposure- Cadaveric based teaching for the surgically inclined**
1434- 1436 (2min)	**13.** **Kimmorley AL**, Reynolds MS, Gregory LS **Mapping paediatric growth of the corpus callosum**
1436- 1438 (2min)	**14.** **Ko RH**, Bruechert GK and Fogg QA **Developing an advanced protocol for bone 3D modelling under direct observation with a digital microscribe**
1438- 1440 (2min)	**15.** **Kriener K** and Midwinter M **How hard can it be: assessing the shore hardness of cadaveric tissues**
1440- 1442 (2min)	**16.** **Potu BK**, Al-Khamis, FH, Taher HH, Abdulreheim A **Occurrence of the ossification of petrosphenoid Ligament: A retrospective radiologic study from computed tomographic Images**
1442- 1444 (2min)	**17.** **Marchese B,** McDonald A and McGowan H **Vascular anomalies located within the tarsal tunnel**
1444- 1446 (2min)	**18.** **Naidu L,** Sibiya LA, Aladeyelu OS, Rennie CO **A computed tomography analysis of the olfactory fossa**
1446- 1448 (2min)	**19.** **Nalla S**, Llidó S, Sanchis Gimeno JA **Arcuate foramen prevalence in Sotho, Xhosa and Zulu subjects**
1448- 1450 (2min)	**20.** **Nasr El-Din WA**, Atwa H, Potu BK, Deifalla A, Fadel RA-R **Checklist-based active learning in anatomy demonstration sessions during the COVID-19 pandemic: Perception of medical students**
1450- 1500 (10min)	Break

1500- 1530 (30min)	Afternoon tea & Poster viewing
1530-1605 (35min (30+5))	**Keynote speaker: Associate Professor Ali Mirjalili** **Keynote title: Visiting paediatric anatomy using modern imaging modalities**
	Poster Pitches- Session 1c Session Chair: TBC Spots available: 10, Duration: 20min
1605- 1607 (2min)	**21. <u>Nie A</u>**, Bruechert GK and Fogg QA **Surgically relevant soft tissue attachments to the trapezium**
1607- 1609 (2min)	**22. <u>Omotoso BR</u>**, Anirudh EE, Harrichandparsad, R and Lazarus L **Radiological anatomy of the vertebrobasilar artery in a select South African cohort of patients**
1609- 1611 (2min)	**23. <u>Price D</u>,** Ginn KA, Halaki M, Reed D **Latissimus dorsi has a limited contribution to trunk movement and control. A systematic review and meta-analysis**
1611- 1613 (2min)	**24. <u>Ritchie HE</u>,** Croker S, Ollerenshaw S, Hegedus E **Which learning outcomes are best served by online anatomy teaching?**
1613- 1615 (2min)	**25. <u>Waller CP</u>,** Hale LA, Lamb P, Kuys S, Calder A, Carman A, Meikle G, Woodley SJ **Morphological comparison of the paretic knee in people with stroke: An exploratory magnetic resonance imaging (MRI) study**
1615- 1617 (2min)	**26. <u>Webb AL</u>**, Lynch JT, Pickering MR, Perriman DM **Shape modelling of the oropharynx detects associations with body morphometry**
1617-1619 (2min)	**27. <u>Willoughby B</u>**, Flack NAMS, Bird R, Woodley SJ **Motivation to learn in university students studying anatomy: A mixed methods analysis of what drives learning**
1619- 1621 (2min)	**28. <u>Wilson JGR</u> and** Flack NAMS **The use of microscribe for digitizing soft tissue structures; a scoping review**
1621- 1623 (2min)	**<u>29.</u>**
1623-1625 (2min)	**<u>30.</u>**
1625- 1627 (2min)	**<u>31.</u>**
1627- 1635 (8min)	Break
1635- 1700 (25min)	Poster viewing and Q&A
1800- 2130	**ANZACA Annual Dinner** Venue: Customs House, 399 Queen Street, Brisbane QLD 4000 Attire: Smart casual How to get there: It is preferred that you download Translink app on your device and this will help commute around Brisbane. We have added an itinerary (Dated 7th of October 2022). **Please check again closer to the date as this is subject to change.** Start: Mayne Medical School walk 124m® Bramston Tce at Weightman Street, Stop 9, Herston take Route 364 Bus (Herston, Kelvin Grove, Fortitude Valley, City) ® Hop off on Ann Street Stop 5 at Orient Hotel® Brisbane City Walk 611m to Customs House Queen Street, Brisbane.

Day 3: Friday 9th December 2022 Venue: Mary Mayne Emelia Room, Level 4, Mayne Medical School, Herston campus, UQ	
0930- 1100 (90min)	**ANZACA2022 AGM**
1100-1135 (35min (30+5))	**Keynote Address: Dr Natalia Bilton** **Keynote title: An alternative pedagogy for the teaching of anatomy and physiology**
1135- 1148 (13min)	<u>Bruechert G</u>, Thorpe-Lowis CG, Edwards WHB, Fogg QA **Releasing the tarsal tunnel; a new surgical technique based on anatomical evidence**
1148- 1201 (13min)	TBC
1201-1245 (44min)	**Lunch+ Poster viewing and Q&A** **At the completion of this session all posters <u>MUST</u> be removed by the authors**
Oral Presentations – Session 2a Session Chairs: Dr Natalia Bilton Spots available: 5, Duration: 65min	
1245- 1258 (13min)	<u>Homes R</u>, Gordon R, Hubbard R, Francis F, Giddins F and Midwinter M **The relationship between microcirculatory measures and frailty index scores in potential renal transplant recipients**
1258- 1311 (13min)	<u>House CT</u>, Reynolds MS, O'Brien K, Gregory LS **The benefits of 360-degree videos in donor-based learning**
1311- 1324 (13min)	<u>Lala R</u>, Homes R, Pratt S, Goodwin W, Midwinter M **Comparison of porcine and human sublingual microcirculatory parameters: validation of a pre-clinical model**
1324- 1337 (13min)	<u>Lawrenson PR</u>, Woodley SJ, Hansen R, Semciw A **Hip adductor muscle size in young people with and without hip and groin pain**
1337- 1350 (13min)	<u>Lee CJH</u>, Perriman, DM, Webb AL **Image-based morphology of the healthy oropharynx: A systematic review and meta-analysis**
1350-1400 (10min)	Break
1400- 1435 (35min (35+5))	**Keynote speaker: A/Professor Kelly Matthews** **Keynote title: Courageous collaboration: Learning at the boundaries of comfort and discipline**
Oral Presentations- Session 2b Session Chair: A/Professor Kelly Matthews Spots available: 3, Duration: 39min	
1435- 1448 (13min)	<u>Lush R,</u> Sellberg K, Shepherd, N **Speculative Pathology: Learning from interdisciplinary voices**
1448- 1501 (13min)	<u>Naidu L</u>, Sibiya LA, Aladeyelu OS, Rennie CO **Morphological variations of the frontal sinus drainage pathway: a computed tomography analysis**
1501- 1514 (13min)	<u>Sonya F</u> and Shamim KM **Feelings, experiences opinions and abilities of the participating anatomists regarding different aspects of 'principle-oriented' versus 'information-oriented approach' towards teaching-learning of histology**
1514- 1600 (45min)	**Elsevier speaker of the day** **Invited speaker: Professor Nalini Pather** **Duration: 30min (25+5)** and Afternoon tea
Oral Presentations- Session 2c Session Chair: TBC Spots available: 3, Duration: 39min	
1600- 1613 (13min)	<u>**Stephan CN**</u> and <u>**Fisk W**</u> **Anatomy Tours (and Tourists)**
1613- 1626 (13min)	<u>Swart T</u>, Alston-Knox C, Blau S, Rowbotham, S, Lottering N **Morphological assessment of knee ossification: Development and validation of an ordinal scoring protocol using computed tomography**
1626- 1639 (13min)	<u>Yong A</u>, Mills A, Govier-Cole A, Murray SS, Gonsalvez DG **Re-thinking the dynamics of white matter growth in the human**
1639- 1700	Prize Presentation and Conference close

	(21min)	

<div align="center">**Poster only**</div>

32. **Aland RC**, Sonya FJ, Erdelyi I, Sullivan N, Pratiwi W, Pitcher M, Cai B, Cluderay C	Veterinary medicine, scientific research and near-peer tutors break down professional learning silos in histology and promote interprofessional learning
33. **Babri AS** and Midwinter M	Image repositories a potential new norm for anatomy education. A collaborative pilot
34. **Beresford TD,** Glen C and Stephan C	How good are 3D optical scanners and photogrammetry for scientific analysis of human bone anatomy?
35. **Bruechert GK**, Lowis CGT, Edwards WHB and Fogg Q	The flexor digiti minimi muscle and the complex relations of plantar fourth and fifth rays
36. **Cook D,** Aland RC, Midwinter M, Bennett M	The anatomical relationships of intrinsic plantar foot compartments are relevant to the radical treatment of acute foot compartment syndrome
37. **Healy S** and **Stephan CN**	Estimating subject-to-camera distance from anatomy recorded in facial images
38. **Hunt WJ** and Johnson I	A unique coincidence of multiple musculotendinous variations of the forearm and hand
39. **Hur MS**, Kim SK, Park JS	Comparison between real color sectioned images and corresponding ultrasound images for palmar wrist anatomy
40. **Kim H**, Han SH, Hur MS	An anatomical study of connections between the orbicularis oculi and levator labii superioris alaeque nasi
41. **Prasad, K,** Hartman, C, Penkala, S, Thyer, L, Dayal MR	Evolution of anatomy education: Functional 3D printed foot model
42. **Thidar AM**, Nyunt MK, Yee MM	Effectiveness of peer discussion during gross anatomy teaching
43. **Dam J**, Tekumalla S, Tran A, Bruechert GK and Fogg QA	The distal interactions of the quadratus plantae muscle
44. **Trollope AF**	Dissecting cadavers at the molecular level

Workshops

Skeletisation workshop
(F2F only, not available online)
Associate Professor Carl Stephan and team

In this workshop delegates will learn the dubious origins and nature of traditional medical teaching skeletons and why newly produced unmingled anatomical skeletons of consenting body donors holds a key role for ethical, present-day, anatomical study. Attendees will be afforded the opportunity to compare and contrast the anatomy of both kinds of skeletons to observe the limitations of the former and the benefits of the latter. Skeletisation infrastructure and processes, including *Dermestes Maculatus* for periosteal removal, will be reviewed.

This observation-based workshop is open to bona fide anatomy technicians and academic anatomists with a genuine interest in skeletal processing methods and ethical teaching / research of skeletal anatomy. Intending attendees are required to provide job title, institutional affiliation, and motivation for attending this workshop prior to arrival for the workshop. All participants are required to: 1. abide by the Transplantation and Anatomy Act, 1979 (QLD); 2. Adhere to the SBMS Code of Conduct for use of Human Tissues; and 3. wear appropriate attire (e.g., closed footwear, long hair tied back). Gloves, isolation gowns and safety glasses will be provided. Per Qld regulatory requirements, electronic recording devices, in any form, are not permitted. Phones are required to be turned off and left at the door.

Advanced dissection for research, prosection and teaching
(F2F only, not available online)
Associate Professor Quentin Fogg

The dissection workshop is designed to make you think about how you dissect and how you might augment your current practice. There are, of course, many ways to dissect and many ways to reach the same outcome in dissection. This workshop draws on select parts of two separate one-day workshops that Quentin runs: "Teaching Dissection" and "Dissection for ProSections and Research". These are always evolving, but the core of both have been run internationally for more than 10 years. As students (because, aren't we all?) and teachers of students, you'll gain insight into data and rationale that has informed the development of Quentin's approach, experience what it is like try new techniques (which is harder the more experienced you are) and deploy the most common tips, corrections and guidance Quentin has used in bringing this approach to more than 5,000 students. We'll also explore some approaches taken to increase the predictability and reproducibility of dissection: essential in both the production of ProSections and the conduct of dissection-based research. We'll explore some tissue-specific techniques, instrument selection and discuss some important technique modifications that contrast with things like surgical technique. This is very much a hands-on workshop, so you will be dissecting for as much of the session as possible.

Please note these workshops have limited spaces and is restricted to those whose primary employment is anatomy lab-based (both academic and technical).

Please also note as with all anatomy labs, safe attire is required. Please ensure that you wear shoes with closed toes that suitably encase the foot (including the heel) and wear clothing suitable for the area. Gowns, gloves and other PPE will be provided, along with instruments.

Digital anatomy workshop
(F2F and online via zoom)
Associate Professor Junhua Xiao and team

Interdisciplinary partnerships facilitate the creation of an integrated online interactive histology and histopathology learning resource

Aland, CR, , Hawkins NJ[2], Dowdell S[3], Collien D[4], Tsai M-Y[4]
[1] The University of Queensland, School of Biomedical Sciences, Brisbane, Australia
[2] University of New South Wales Sydney
[3] BEST Network
[4] Open Learning
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Ethics reference number: not supplied

Introduction: Interdisciplinarity integrates and synthesises the approaches of two or more disciplines to generate meaning from complex phenomena. Biological processes are not artificially separated by disciplines, and their understanding is best served through engagement with multiple disciplinary viewpoints. Interdisciplinarity promotes critical thinking and creates engaging experiences, fostering meaningful connections between disciplines.

Developing an integrated teaching resource requires a partnership of each discipline's particular qualities. The cognate disciplines of histology and histopathology are traditionally siloed. Technological affordances are rarely considered fully in creating teaching resources.

We describe an interdisciplinary approach to creating an integrated online histology and histopathology learning resource.

Materials and Methods: We formed a partnership between histology, histopathology and technology, using a modified 'negotiation by experts' framework. Partners worked iteratively through content, using technological affordances to develop the resource organically.

Discipline content was treated separately, with negotiation to create integration between normal and abnormal. The pedagogical requirements both guided technological approach, and were informed by affordances of the technology.

Results: We created an online atlas that supports users within constructivist approaches to biomedical education. Learners interact with slides while mastering content. The use of virtual microscopy provides authentic learning experiences. Non-linear navigation supports a student-centred self-directed approach, with learners moving seamlessly between normal and abnormal.

Conclusion/s: Adopting an interdisciplinary partnership has enriched collaboration between all three partners. This resource supports the pedagogical approach of our program and drives pedagogical change for interactive online learning.

Integrating technology-enhanced learning in anatomy curricula*

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Corresponding author: Krisztina.valter-kocsi@anu.edu.au
Ethice reference number: not applicable

Generation Z has been dubbed 'digital natives', surrounded by digital technologies in every aspect of their lives from childhood. Consequently, they expect the presence of technology in their classroom too. Institutions also welcome digital technologies, as they can support remote learning and reduce the cost of program delivery. For anatomy educators, it provides opportunities to visually demonstrate and explain complex anatomical structures and concepts to students in ways that were not possible in the past. But are students really that tech savvy or reliant on technology for their learning? Are all institutions ready to support the purchase of ready-made anatomy tools? Can digital technology replace traditional resources or we should consider it an additional, powerful resource that aids anatomy teaching and learning?

Due to financial limitations, our team could not obtain and use commercial digital anatomy tools and we had to be creative in our approach to introduce digital resources. We developed a number of resources through small institutional educational grants and student projects. We evaluated their effectiveness in student learning outcomes and experience. We identified a number of factors that need to be considered during the design and effective implementation of digital resources for anatomy education.

This presentation will demonstrate a variety of digital resources we have used in our teaching. We will discuss how we implemented them in our hybrid anatomy learning environment including limitations and caveats. We will offer suggestions about the integration of such resources into anatomy curricula.

Teaching in concurrent online and face-to-face practical classes: positives and pitfalls

Tentrisanna M, Heath McGowan H, Whitburn L, Marchese B, Cassar S, **McDonald A**
La Trobe University, Australia
Corresponding author: m.tentrisanna@latrobe.edu.au
Ethics reference number: not supplied

As higher education moves to more flexible learning environments, educators must adapt to innovations in teaching delivery. This evolution has accelerated due to the global COVID pandemic, and the introduction of digital teaching resources has been a necessity. La Trobe University has implemented StudyFlex, an initiative where students select between either a blended (face-to-face practicals) or online (online practicals) mode. In

2022, approximately 25% of students across four anatomy subjects (courses), over three year levels, opted the online mode to study anatomy.

In this presentation we will discuss previous research and our experiences of the positives and pitfalls encountered when redesigning anatomy subjects to adopt a more flexible learning environment. We hope to help subject coordinators develop subjects capable of running successfully across both teaching modes.

We will discuss the importance of developing learning materials, such as study manuals, demonstrator notes and Learning Management System sites, that complement both modes. We will show why different delivery modes will require some different/additional teaching resources and how teacher communication, willingness and ability are key to a positive student experience. We will present approaches to promote student interactions and suggest areas to be aware of. We will also identify the importance of promoting socialisation across both learning environments.

The StudyFlex model is expected to stay, with preliminary data indicating many students prefer this flexibility when studying. It is our responsibility as educators to be adaptable and accepting of new teaching modes, and to create the most equitable learning experience possible for our students.

Multimodal digital teaching of regional anatomy

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[2]La Trobe University, Australia
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Ethics reference number: not supplied

Introduction: Anatomy is shifting towards a greater focus on adopting digital delivery. The key question here is how digital modalities can be effectively adopted to best suit advanced anatomy course design and promote authentic experiential learning.

Materials and Methods: A flipped digital anatomy classroom AR and VR technologies was designed and successfully implemented in visceral anatomy and neuroanatomy curricula, with the aim to equip student with both discipline and professional skills. A five-point Likert scale learning and teaching survey was conducted for students between academic year 2021 and 2022 to evaluate their perception of the flipped classroom model and digital resources.

Results: Approximately 80% of participants strongly agreed or agreed that the flipped classroom model helped their independent learning and understanding of difficult anatomy concepts. The response showed students consistently enjoyed their experience of using multimodal digital anatomy resources. Over 90% students strongly agreed or agreed that digital tools are very valuable and interactive for studying anatomy. Most students strongly agreed or agreed that digital anatomy tools increased their learning experience and confidence. In summary, multimodal digital anatomy teaching together with a flipped classroom strategy exerted positive impact upon student experience of learning advanced anatomy content such as regional anatomy.

Conclusion/s: We conclude that this flipped digital anatomy teaching model facilitates active learning that supports study experience of learners, which will advance future anatomy curriculum development, pertinent to post-pandemic education.

Abstracts– Member spotlight and Oral presentations

Tutors from non-Australian backgrounds bring tangible benefits to histology teaching

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Introduction: Histology is taught in the medical programme at UQ by a diverse group of tutors, many of whom have non-Australian educational, research and clinical backgrounds or experiences. This diversity brings many benefits to students, and staff, but it also brings significant challenges. We describe our experiences in using their diverse skills and knowledge, and propose ways to address the challenges.
Materials and methods: We critically reflect on the benefits that a diverse tutor pool brings to staff and students, and identify challenges faced by those tutors, and staff and students, within an Australian higher education setting.
Results: Tutors from non-Australia backgrounds experience the different educational paradigm as a significant challenge. Tutors may have experience with instructivism previously, and now must adapt to a constructivist paradigm, emphasising student-centred learning, rather than teaching. Language, terminology and technology also differ.
Tutors bring international experience and perspective to histology. This avoids disciplinary silos and teaching within a 'bubble'. Diverse tutors reflect diverse students and facilitates belonging.
Working together, tutors model inter-professional behaviour, by respecting strengths and weaknesses. This reflects the future reality for students, who will work in multidisciplinary, multicultural and multi-linguistic teams. Training tutors in local pedagogical norms, technology, and making explicit to students the benefits these tutors bring to their learning help address the challenges.
Conclusion/s: Tutor diversity can contribute to the development of cultural sensitivity, where medical students respect and empathise with experts from diverse backgrounds, and extend this from histology to settings including patients and providers.

Phoenix rising: The history of anatomy at The University of Western Australia

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Introduction: The University of Western Australia (UWA) was opened in Perth in 1911. The Anatomy Act of Western Australia was passed in 1930, yet the School of Anatomy at UWA opened in 1957. Why did it take 46 years after UWA opened, and 27 years after the Anatomy Act of Western Australia was passed, to establish the first School of Anatomy?
Material and methods: Public information posted in Australian newspapers was searched using Trove (https://trove.nla.gov.au/).
Results: Four hundred and ten articles were retrieved dated between 1880 and 1959. Circular arguments and tensions between UWA Vice Chancellors, the State Government, and the WA branch of the British Medical Associations over 'who should pay?', and a mysterious fire that burned down the building allocated to be the anatomy school contributed to the 27-year delay. World War II exacerbated the problem, as eastern state universities increased their enrolments but preferenced local applicants and ex-servicemen over UWA students.
Conclusion/s: These obstructions increased the financial burden on families of dentistry and medical students who had to travel east to complete their anatomy studies and could have resulted in a loss of scholars who could have had significant contributions to anatomy at UWA. It also led to the School of Anatomy being established outside of the School of Medicine which continues to cause perturbation 65 years later.
Conclusion/s: From our traumatic birth, Anatomy at UWA has continued to grow and evolve and has been ranked in the top 1% of universities worldwide.

Developing a reference chart for fetal biometry in Indian population to predict growth and development of fetus

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Introduction: The objective of the study was to develop reference charts for fetal abdominal circumference and femur length in normal singleton pregnancies. The modality used in the study was by means of ultrasonography which is easily available and safe during the pregnancy.

Materials and methods: In this study, we conducted ultrasonography examination in 300 singleton pregnant women coming for routine checkups. Out of various fetal biometric parameters abdominal circumference (AC) and femur length (FL) were measured and reference charts (10th, 50th, 90th and 95th centiles) for each parameter corresponding to its gestational age were developed.

Results: Age distribution of pregnant women was uniform (p=0.87). Both parameters i.e. AC and FL were found to be in linear correlation with the corresponding gestational age in weeks. Therefore, their use in determining development and age of the fetus is reliable. We compared our reference charts with other studies conducted in European and Chinese population. From which, it is obvious that the data found in Indian population is different from studies conducted in other ethnic population.

Conclusion/s: Reference charts derived in this study can be used to determine growth and development of fetus depending upon Indian standards. Because ethnicity, race, nutritional and environmental factors are known to impact the fetal development. Most of the health care set ups are using data from the studies conducted in western population. Which may cause misrepresentation of data in diagnosis. Thus can lead to unnecessary medical intervention which may cause burden in limited resources in developing nations like India.

Active, engaged collaborative learning of complex pelvic anatomy is facilitated by an online module combining virtual dissection and sculting

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Introduction: Pelvic anatomy knowledge is essential for good practice in many clinical fields, but medical students and junior doctors find it challenging. Barriers to learning include the three-dimensional complexity of pelvic and reproductive organs, high hysterectomy rates amongst body donors and socio-cultural sensitivities. Previous studies show sculpting anatomical models improves structure recognition and three-dimensional spatial knowledge. Therefore, this project employed a constructionist approach, aiming to improve clinically oriented, pelvic anatomy learning.

Materials and methods: We developed an online learning module that integrated virtual dissection software with anatomical sculpting. The module guided students to create scaled, three-dimensional models of female pelvic organs and apply these to mimic common variations (e.g. retroverted uterus) and consider clinical implications (e.g. cervical screening, pelvic floor function).

Results: Over 550 medical students have accessed the module over three years, including remote learning during enforced university closure and in-laboratory classes. Feedback is over 95% positive. Students report a positive, multisensory learning experience that helps them recognise gaps in their knowledge and provides scaffolding to understand important concepts. Educators observed high engagement including online collaboration through social media.

Conclusion: Our observations support previous studies showing anatomical sculpting facilitates active, engaged, collaborative learning. Multimodal learning, including linguistic, visuospatial and haptic domains, enhances cognitive capacity regarding complex material. In the context of pelvic anatomy, anatomical sculpting using readily accessible materials may also reduce sociocultural barriers to learning. Combining low-cost modelling materials with advanced technologies can promote student engagement with a broad range of learning strategies and enable enjoyable sensorimotor learning experiences that effectively target learning outcomes.

Translation and rotation at the distal radioulnar joint after sectioning

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Introduction: Injuries to the distal radioulnar joint (DRUJ) can cause it to become symptomatically unstable. Soft tissue stability is provided by the triangular fibrocartilage complex (TFCC) consisting of the ulnar collateral ligament, dorsal radioulnar ligament, palmar radioulnar ligament and the ulnocarpal ligaments. The aim of this study was to investigate the contribution of the individual ligaments to stability.

Materials and methods: Image analysis of translation at the DRUJ after randomised sequential sectioning of the TFCC components of 30 cadaveric forearms was undertaken. The forearms were stabilised in a custom rig, with 20N forces applied in two directions with 3 repeats between each sectioning. Translation and rotational stability were then measured in a further 30 forearms, with a similar protocol.

Results: A total of 2784 images were acquired. Experiment one demonstrated complete sectioning of the TFCC caused a mean additional translation of 6.09(±3) mm compared to the intact joint. Sectioning the palmar radioulnar ligament caused the most translation.

Experiment two demonstrated mean rotation of 18 (± 6) degrees. The dorsal radioulnar ligament had the largest effect on rotational stability. Similar translation was observed.

Conclusion/s: Sectioning of the palmar radioulnar ligament caused the greatest degree of translation. Injury to this structure would result in a greater degree of translation instability in the sagittal plane.

Sectioning the ligaments sequentially also causes rotational instability while the dorsal radioulnar ligament was intact. This suggests that an intact dorsal ligament can act as a hinge and could cause pathologic rotation of the DRUJ if the other ligaments are compromised.

Calcaneal quantitative ultrasound: Investigating the impact of tissue interference

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Introduction: Accurate assessment of bone properties using calcaneal quantitative ultrasound can help identify individuals at risk of fractures or conditions including osteoporosis. However, there is concern that overlying soft tissues may influence quantitative measurements and therefore the accuracy of bone assessment. Investigation on the influence of independent soft tissue layers on frequency-dependent attenuation (FDA) derived bone status measurements is limited. Therefore, there is a need for improved understanding on how individual tissue layers influence FDA measurements.

Materials and methods: Fifteen fresh-frozen donor feet aged 59 to 94 years of age with varying degrees of superficial fascia were serially dissected at the Medical Engineering Research Facility. For each tissue/dissection layer the following parameters were collected: frequency-dependent attenuation (dB/MHz), and soft tissue thickness (mm) and weight (g). Bone cores were collected from each donor and the mechanical integrity was assessed using MicroCT and compression testing.

Results: Calcaneal frequency-dependent attenuation (FDA) (dB/MHz) measurements were not significantly influenced by the thickness (mm) or weight (g) of overlying soft tissue layers including the deep fascia, superficial fascia, and skin ($p > 0.05$). Foot intact FDA measurements were strongly correlated with both microCT parameters and mechanical stiffness.

Conclusion/s: This study demonstrates that overlying soft tissues and their thicknesses and weights have no significant influence on frequency-dependent attenuation measurements, especially superficial fascia which is the most variable between individuals and most likely to change with age. This knowledge demonstrates that assessment of bone properties can be performed accurately at the tarsus regardless of an individual's adiposity level.

Releasing the tarsal tunnel; a new surgical technique based on anatomical evidence

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Introduction: It is predicated that, by 2035, a lower limb amputation will occur every 30 seconds globally from diabetes alone. Complications associated with the diabetic foot may lead to an increase in tarsal tunnel syndromes, and ultimately, amputation. The tarsal tunnel is the primary conduit for the neurovasculature of the plantar foot, but the current standard technique used to treat tarsal tunnel syndrome (TTS) has low success rates. This may be due to the tarsal tunnel most commonly being considered a single space that can be surgically released by a single cut. Recent data has suggested that the tarsal tunnel is divided into at least four separate spaces. Based on these data, the aim of this study was to develop a clear protocol for treating TTS.

Materials and methods: Genelyn-embalmed feet (n=35; mean age=81.9±11.5 years; female=18, male=17) were investigated. Fifteen were dissected, with each structure individually modelled in virtual 3D space using a digital microscribe prior to removal. Ten underwent cross-sectional analysis and a further 10 were used to simulate a revised surgical approach.

Results: Four distinct intra-tunnel spaces were confirmed. The revised surgical approach visualised and successfully sectioned the lateral surface of each space through a single skin incision.

Conclusion/s: This novel technique considers all of the surrounding tissues that may impact the tarsal tunnel neurovascular bundle. Treating TTS with this approach may reduce the number of secondary procedures. With a greater understanding of this space, earlier interventions may reduce the progression of the diabetic foot to amputation.

The importance of early screening for detection of cerebral aneurysms

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Introduction: Cerebral aneurysms usually remain asymptomatic for some years. They may present with mass effect symptoms, such as ptosis, but most frequently they present when they rupture, with catastrophic results. The aim of this study is to investigate patients of different age-groups affected with cerebral aneurysms at various locations and their implications for screening processes.

Materials and methods: The diameter of cerebral basal arterial network (CBAN) components was measured in Computed Tomography Angiography images and the CBAN variation indices (CVI) were calculated in each of 83 male and 90 female patients, (mean age=60 years, SD=15.72) with (n=102) or without (n=71) aneurysms. The standard deviation of the standardized size of arterial components of CBAN is called the CVI. Relationships between the occurrence of aneurysms in various age groups and CVI were evaluated using SPSSv27 (t-test, curvilinear and logistic regressions).

Results: Aneurysms were observed over a broad age range, (18-100 years), (median 62 years) with peak prevalence at 40-60 years ($p<0.005$). The average CVI in patients with aneurysms (mean=0.48, SD ± 0.13) was larger compared to patients without (mean = 0.40, SD ± 0.14) aneurysms ($p<0.001$). In logistic regression, the occurrence of aneurysms was related to the CIV (specificity 78.5%, $p<0.001$).

Conclusion/s: The arterial variations in the components of the CBAN are associated with increased incidences of aneurysms in all age groups and are a causative factor of aneurysms due to poorly dampened peaks in pressure. Screening for vessel variations is potentially useful as an aneurysm predictor, especially in high-risk groups.

Me Tu Dei: An investigation into deep posterior leg muscle size in Pacifica

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Introduction: The deep posterior leg muscles (tibialis posterior (TP), flexor digitorum longus (FDL), and flexor hallucis longus (FHL)) play an important role in walking and standing. Dysfunction results in various painful pathologies including adult-acquired flat foot, tendinopathies, and compartment syndrome. Anthropological differences exist between ethnicities; no existing data are available for Pacifica. By obtaining Pacifica-specific data, rehabilitation programs and surgical procedures can be adjusted appropriately to Pacifica. This study

aims to investigate, muscle parameters (volume and length) of TP, FDL and FHL in two groups (Pacifica, Kai Valagi-NZ European) using ultrasound (US).

Materials and methods: Five Pacifica, and five age- and gender-matched Kai Valagi volunteered for this study. TP, FDL and FHL were US scanned by a novice, and an experienced sonographer. Transverse scans taken at even intervals along the muscles' lengths determined cross-sectional area for muscle volume estimation. Longitudinal scans captured muscle length. ImageJ measured muscle parameters, and differences between groups were determined using a paired Student's t-test. Intraclass correlation coefficient (ICC) evaluated inter-scanner reliability.

Results: Pacifica muscle volume was larger (TP=142.1 ± 37.2cm^3; FDL=35.3 ± 10.5cm^3; FHL=61.6 ± 11.7cm^3) than Kai Valagi for all three muscles (TP=89.1 ± 33.2cm^3; FDL=26.6 ± 14.0cm^3; FHL=49.6 ± 9.4 cm^3), however, only TP was statistically significant (p=0.04). Muscle length was the same between groups (p=0.1-0.5). ICC values ranged 0.74-0.99, showing good reliability between US scanners.

Conclusion/s: This study is the first of its kind, providing important foundational data specific to Pacifica. Differences in TP muscle volume indicates there may be differences in muscle parameters specific to Pacifica, warranting future investigations.

Quantifying muscle size (a)symmetry in adolescent idiopathic scoliosis using three-dimensional magnetic resonance imaging

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Introduction: Adolescent Idiopathic Scoliosis (AIS) is a three-dimensional spine deformity that progresses between 10 to 18 years. Asymmetry in paraspinal muscle size and, therefore, asymmetrical force-generation capacity may contribute to asymmetrical forces being applied; facilitating asymmetrical vertebral growth. We aimed to i) quantify muscle volume asymmetry in AIS and ii) determine if asymmetry magnitude is associated with skeletal maturity, disease severity, and/or age.

Materials and methods: 3T Magnetic resonance images (MRIs) were performed on 25 female adolescents with right thoracic scoliotic curves and 22 age and height-matched controls. Superficial and deep paraspinal muscle volumes over a vertebral segment were determined by multiplying the muscle cross-sectional areas by the MRI slice thickness (0.5mm). Muscle volume asymmetry index [Ln(concave/convex volume)], was determined for the curve apex and lower-end vertebral (LEV: the most tilted vertebra below the apex) of the scoliotic curve, and the matched levels for the control group.

Results: The deep paraspinal muscle volume at the curve apex was 16±20% greater on the concave than the convex side of the curve in the AIS group (p<0.05) and significantly larger (p<0.05) than observed in the control group -6±12%. The AIS asymmetry index was positively correlated with Risser grade (r=0.50, p<0.05) and curve Cobb angle (r=0.45, p<0.05), but not age (r=0.34, p>0.05).

Conclusion/s: The AIS participants' deep paraspinal muscle volume asymmetry lies outside the typical asymmetry range observed in adolescents with symmetrical spines, highlighting the need for further exploratory work into the potential role of paraspinal musculature as a pathological driver of AIS progression.

Influence of Body Donor preparation on dynamic carpal motion testing

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Introduction: Understanding wrist kinematics requires detailed knowledge of carpal bone morphology and ligamentous supports. The current gold standard for identification of distinct carpal ligaments is dissection but combining detailed dissection with subsequent motion analyses on the same Donor presents numerous logistical challenges, not least tissue degradation over time when using unembalmed Donors. All reviewed motion studies utilised unembalmed Donors. This study aimed to determine whether Body Donor preparations other than unembalmed Donors could be used in such studies.

Materials and methods: Body Donor hands were dissected (n = 8 Genelyn embalmed, n = 6 unembalmed; mean age = 85 years). Fascicular dissection was used to determine the precise radiocarpal and intercarpal

ligaments present. Each hand was then mounted and filmed being moved through the maximum range of radial and ulnar deviation possible.

Results: The unembalmed wrists demonstrated greater fluidity of motion, but only a marginally greater range. This difference may partly be attributed to individual differences. The range of motion of unembalmed wrists also increased over time at a greater rate than the embalmed wrists. Ranges of radial and ulnar deviation were demonstrable in both groups.

Conclusion/s: Motion analyses seem more accurate to casual observation, but in an elderly population of wrists Genelyn embalmed Donors were able to be moved through a full range of motion. This suggests that the more detailed dissection studies possible with embalmed Donors can still be applied to motion studies. Combination studies should therefore be conducted to determine a clearer correlation between wrist anatomy and kinematics.

Ultrasound visualization of the spinal accessory nerve in patients with lymphadenopathy

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Introduction: Injury to the spinal accessory nerve (SAN) during surgical procedures is a significant source of morbidity. Injury is often due to the highly variable course of the SAN in the posterior triangle and therefore surface anatomy inherently unreliable. We hypothesized that ultrasound can be used to accurately map the course of the spinal accessory nerve in patients with lymphadenopathy and should be utilized preoperatively to minimize iatrogenic injury.

Materials and methods: Nine subjects with lymphadenopathy (six bilaterally) were analyzed using ultrasound. The caliber, course and distribution of the SAN in the posterior triangle were recorded along with the number and size of adjacent lymph nodes.

Results: The nerve was visualized running across the posterior triangle with either a tortuous (82%) or straight course (18%). It exited the posterior border of sternocleidomastoid at a mean distance of 5.69cm (3.07-8.25) below the mastoid process and 0.95cm (0.29-1.9) above the great auricular point and penetrated the anterior border of the trapezius 6.34cm (3.3-9.5) above the clavicle. The spinal accessory nerve always ran superficial to the lymph nodes and there were on average 6.36 (1-18) lymph nodes adjacent to the nerve.

Conclusion/s: The spinal accessory nerve can be consistently and reliably detected by ultrasound in patients with lymphadenopathy. Due to the extremely variable course of the spinal accessory nerve and unreliable surface anatomy, ultrasound has an important role to play in preoperative mapping of the nerve to reduce the risk of iatrogenic injury.

Where to next for anatomical variation?

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Introduction: In anatomy, normality embraces a range of morphologies including those that are most common, as well as others called variations which appear less frequently but are not considered abnormal. Current trends in anatomy education have reduced exposure to dissection and prosected specimens and thereby diminished this traditional mode of student encounter with variation.

Materials and methods: A series of thirty-one semi structured interviews was undertaken with Australian anatomy teachers to identify barriers and facilitators for teaching anatomical variation to contemporary student cohorts.

Results: All participants agreed that anatomical variation was an important and time-honoured component of anatomy education. There were, however, many different terms used by participants to define the same anatomical concept and different approaches to introducing it. Very few participants provided a working definition to students or covered the concept in lectures, with most participants waiting for the discovery of examples to prompt discussion in a human tissue laboratory setting. Many participants only covered variations

with later years students, especially medical students, citing content load and student negativity as reasons not to cover variation with less experienced or non-professional student groups.

Conclusion/s: Educators need to cultivate a mindset in their students that accepts variation. A simple one version account of the human body may be easier to teach, understand and remember but simplicity is not an alternative to accuracy and anatomists should not act as apologists for their discipline.

The relationship between microcirculatory measures and frailty index scores in potential renal transplant recipients

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Introduction: Frail individuals have a decreased physiological reserve, and an increased likelihood of institutionalisation, hospitalisation, and morbidity. An adequate microcirculatory supply to the tissues is required to maintain healthy tissue parenchyma. It is hypothesised that dysregulation of the microcirculation is the underlying cause of the physiological reserve loss in frail individuals. To examine this, the relationship between frailty index scores (score of impaired functions associated with frailty) and sublingual microcirculatory health in a population of potential renal transplant candidates.

Materials and methods: This study was performed in 44 individuals (male: n=22, female: n=22, age range: 46-64) attending the Queensland Kidney Transplant Service's Transplant Assessment Clinic in Brisbane, Australia. Microcirculatory measures were obtained using the AVA MicroScan system. Parameters included total vessel density (TVD), perfused vessel density (PVD), portion of perfused vessels (PPV), and microcirculatory flow index (MFI). The frailty index (FI) was assessed using a short-form questionnaire. Univariate analysis was performed between FI scores with microcirculatory parameters and age.

Results: Significant associations were shown between FI with all microcirculatory parameters: TVD ($p<0.001$, r=-0.64), PVD ($p=0.0005$, r= -0.50), PPV (p-0.0014, r=-0.47) and MFI ($p=0.0141$, r=-0.37). No associations were found between age and any of the investigated microcirculatory parameters ($p>0.05$).

Conclusion/s: In conclusion, microcirculatory heath was related to a person's biological age (i.e., FI) rather than their chronological age. Understanding the relationship between frailty and microcirculatory health gives us more insight into the underlying physiological reserve loss in renal disease patients.

The benefits of 360-degree videos in donor-based learning

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Despite the known benefits of human donor material, anatomy students have limited access to hands-on exploration of donor specimens. Extended reality has the potential to blend the virtual with laboratory-based learning, allowing for flexible ongoing student engagement. This study aimed to investigate the effectiveness of 360-degree videos in student learning of complex anatomical concepts to complement on-campus laboratories. A series of narrated 360-degree videos of a range of human donor prosections were created and shared with Queensland University of Technology 3rd year Biomedical Science students. The videos were designed to complement scheduled classes of whole donor dissection and examination of anatomical variation. Before accessing the video series, students were surveyed using MentiMeter and assessed again two weeks later after having the opportunity to view the narrated videos and complete the scheduled laboratory activities. Surveys assessed student knowledge and perceptions of the effectiveness of the videos in learning anatomy. Students that had watched two or more videos demonstrated a significant improvement in procedural dissection and anatomical variation knowledge ($p = 0.027$) between the pre- and post-survey (n=24). Students valued having more time to explore the donor material (72.8% agreed or strongly agreed) and 75% of students felt more prepared for assessment having viewed the videos. The use of 360-degree videos of donor prosections to complement physical laboratory classes was found to strengthen student understanding of advanced anatomical concepts. Future research aims to further investigate the effectiveness of these videos in a range of anatomical contexts.

Comparison of porcine and human sublingual microcirculatory parameters: validation of a pre-clinical model

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Introduction: The microcirculation is the site of tissue oxygenation and metabolic exchange, and its function is of significant interest in critical care research. To study the dynamic changes of the microcirculation in trauma and resuscitation, large animal models (pig and sheep) are commonly reported in the preclinical literature. Similarities between porcine and human macrolevel cardiovascular function have been previously documented, however the pig remains to be validated as an appropriate model of human microcirculatory function.

Materials and methods: Sublingual microcirculatory images were collected using sidestream darkfield videomicroscopy (Microscan, Microvision Medical) from anaesthetised pigs and unanaesthetised adult humans. Images were analysed according to consensus protocols to generate total vessel density (TVD) and perfused vessel density (PVD). The mean and standard deviation for the two groups were qualitatively compared.

Results: To date, microcirculatory clips from six pigs and four human subjects have been analysed. The PVD was similar between the species (pig 16.07 ± 2.08 mm. mm^{-2}, human 13.99 ± 1.77 mm. mm^{-2}). The TVD was also similar between species (pig 16.84 ± 1.73 mm. mm^{-2}, human 14.56 ± 1.91 mm. mm^{-2}).

Conclusion/s: At this early stage, microcirculatory parameters related to vessel density and microvascular flow appear to be similar in anaesthetised pigs and healthy adults. This work is ongoing and further data collection will increase sample size sufficiently to include formalised equivalency testing by the time of presentation. This will inform the utility or otherwise of the porcine model in the study of human microcirculatory responses to trauma and resuscitation.

Hip adductor muscle size in young people with and without hip and groin pain

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Introduction: Hip and groin pain is common in young active adults and is associated with early onset hip osteoarthritis. Adductor muscle impairments (e.g., strength) in hip and groin pain may impact hip joint forces, contributing to symptoms and joint degeneration. Muscle size can influence capacity to generate force, but little is known about adductor muscle size in this population. This study investigated hip adductor size in young active adults with and without hip and groin pain.

Materials and methods: Adductor muscle volume was measured in 25 active adults with hip and groin pain (22 male, 3 female; mean age 29 ± 6 years) and 25 controls (13 male, 12 female; mean age 27 ± 4 years). Manual muscle tracings of adductor magnus, longus and brevis, pectineus and gracilis were taken from axial MRI slices to calculate cross-sectional area (CSA). Muscle CSA from each slice was combined to determine volume. Inter-rater reliability was calculated using intraclass correlation coefficients.

Results: When normalised for weight, participants with hip and groin pain had significantly larger adductor brevis (1.40 ± 0.24 vs. 1.22 ± 0.21 cm^{3}kg^{-1}, $p < 0.01$), adductor longus (1.00 ± 0.16 vs. 0.78 ± 0.20 cm^{3}kg^{-1}, $p < 0.01$) and pectineus (1.05 ± 0.24 vs. 0.87 ± 0.16 cm^{3}kg^{-1} *p<0.01*) muscles compared to asymptomatic controls. Inter-rater reliability was excellent for all muscles (0.92, 95% CI; 0.41-0.99 - 1.0, 95% CI; 0.99-1.0.

Conclusion: Hip adductor hypertrophy is present in muscles which have dual roles as hip adductors and flexors in people with hip and groin pain. This may impact forces experienced through the hip and pelvis by young active adults.

Image-based morphology of the healthy oropharynx: A systematic review and meta-analysis.

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Introduction: The oropharynx is an airway space implicated in multiple conditions, including obstructive sleep apnoea and whiplash. However, there are currently no established reference measurements for the 'normal' oropharynx, preventing accurate clinical interpretation of the disease risk, progression or management. Thus, the aim of the study was to estimate the volume and minimum cross-sectional area (mCSA) of the normal healthy adult oropharynx from published datasets of morphology derived from 2-dimensional and 3-dimensional imaging modalities.
Materials and methods: Electronic searches were undertaken for this systematic review. Screening and quality assessment, using a modified Anatomical Quality Assessment (AQUA) tool, were performed by two independent examiners. A quality effects model was used to determine the pooled mean estimates and 95% confidence intervals for volume and mCSA measurements. Volume data were categorised into three broad groups, according to their defined limits.
Results: A total of 116 articles met the inclusion/exclusion criteria and 13 were included for meta-analysis. Estimated weighted means for two volumes based on anatomical limits were 12,138 (95%CI 6187,18089) and 6,099 (95%CI -4469,16666) mm^3, respectively. The mean estimate for mCSA was 144 (95%CI 75,214) mm^2. There was substantial heterogeneity in all the meta-analyses undertaken.
Conclusion/s: This study was the first to describe mean estimates for normal oropharyngeal measurements. However, the heterogeneity of the data suggests that a narrower definition of normal may be required for more precise estimates. Further research is planned to examine the effect of scanning positions, participant age, and sex.

Speculative Pathology: Learning from interdisciplinary voices

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In May 2022, The University of Queensland's Integrated Pathology Learning Centre (IPLC) collaborated with the School of Historical and Philosophical Inquiry and Academy for Medical Education to run its first interdisciplinary event. Titled 'Speculative Pathology' the event focused on object-based learning as a way to encourage interdisciplinary perspectives. The aim was to create a learning environment where advanced humanities and medical students could work together and unpack the narratives behind the IPLC's collection. This was achieved through workstations with specimens grouped together under umbrella topics and themes. Due to its success and level of engagement, a second event was planned for October 2022. This time, advanced humanities students organised the event around the broad topic of ethics. Both events offered students the opportunity to consider new perspectives and engage with students from different disciplinary backgrounds to challenge and expand their way of thinking.
This paper will explore the value of including interdisciplinary voices when studying anatomy and pathology. Not only the value for students studying across different disciplines but the value it has for a museum's collection. Being able to tell stories is at the core of a museum's mission and events such as these allow for more engagement and more enriching educational outcomes.

Morphological variations of the frontal sinus drainage pathway: a computed tomography analysis

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Introduction: Successful surgical management of frontal sinus pathologies requires detailed knowledge of the radiological anatomy of the frontal sinus drainage pathway. The narrow confines and variable anatomy of

the region contribute significantly to the complexity of surgical procedures. The present study aimed to explore the anatomical basis of morphological variations of the frontal sinus drainage pathway within a South African population.

Materials and methods: The study assessed 86 drainage pathways, through bilateral analysis of 43 computed tomography scans. Variations of frontal sinus drainage patterns, superior attachments of the uncinate process, and frontal recess pneumatisation patterns (prevalence of different frontal recess cells according to the International Frontal Sinus Anatomy Classification system) were analysed.

Result/s and Conclusion/s: Drainage patterns: Anteromedial to the uncinate process and into the middle meatus in 52.3% of cases, and posterolateral to the uncinate process and into the ethmoidal infundibulum in 47.7% of cases. Superior attachments: The lamina papyracea in 52.3% of cases, the skull base in 38.4% of cases, and the middle turbinate in 9.3% of cases. Pneumatisation patterns: The agger nasi and supra bulla cells were the most frequently observed cell types (95.3% and 57%, respectively), while the supraorbital ethmoid cell was the least frequent cell type observed (15.1% of cases).

Feelings, experiences opinions and abilities of the participating anatomists regarding different aspects of 'Principle-oriented' versus 'Information-oriented approach' towards teaching-learning of histology

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Introduction: Histology is often considered difficult because it requires development of three-dimensional mental images of microstructure. Many students use rote memorisation rather than understanding, preventing them applying information in clinical practice. In Bangladesh, anatomists often prioritise detailed, disconnected information in their teaching, rather than principles that can be generalised across topics. Students' learning may be facilitated by learning structured around such generalisable 'principles' (principle-oriented) rather than rote memorisation (information-oriented).

This study collected information on anatomists attitudes and abilities towards principle- and information-oriented histology teaching, to better support implementation of this new method of teaching.

Materials and methods: This study was conducted via three linked surveys of anatomists at Bangladeshi medical schools (n=23). General demographics and attitudes towards principle- vs information-oriented teaching were surveyed. Respondents abilities to identify and categorise teaching materials, and create materials in these approaches was assessed. Continuous data was analysed with SPSS.

Results: Respondents were primarily assistant or associate professors within governmental and non-governmental medical schools, with an average of 10 years experience. Most respondents agreed that principle-oriented teaching could be beneficial to students learning. However, they were concerned by how to implement this. More than half of respondents could distinguish the approaches in presented teaching material (57.97% ± 42.9 %), although with much individual variation. Most respondents could generate principle-oriented statements from information-oriented examples (77.72 ± 11.35%).

Conclusion/s: While there was general understanding, some anatomists could not implement the principle-oriented approach. This demonstrates the need for effective teacher education before changing teaching approach.

Anatomy Tours (and Tourists)

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Given the heightened ethical standards of today, so-called *tour* requests for university operated cadaver laboratories are odd, though strangely commonplace. This especially applies to exclusively pre-consenting body donor programs, where a *tour* (for a look's sake) falls outside the usual bounds of consents for medical and scientific study purposes and enshrined anatomy legislation that prohibits public display.

The distinction between *tours* and *visits* should not be one that is dismissed simply as 'pedantic semantics' since it resonates to the very core of ethical anatomical practice, namely, the valid use of donors under consent processes. This especially applies to anatomy laboratories operating exclusively pre-consenting body donor

programs and where consents do not explicitly include a *tour* disclosure to donor registrants, or their next-of-kin, as a use for the body. The very common within-discipline (legacy) practice of describing *legitimate site visits* as *tours* is also not helpful and should be curtailed.

In this presentation, we draw a spotlight to this little discussed or mentioned issue and provide reasoned criteria to differentiate between the two activities clearly and explicitly in the interests of enhancing even further best practices in the human anatomy domain. The relevance of this distinction will increase in the future as the world-wide trend toward exclusively pre-consenting body donation programs grows and moves even further away from the use of unclaimed bodies.

Morphological assessment of knee ossification: Development and validation of an ordinal scoring protocol using computed tomography

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Introduction: Comprehensive understanding of the timing and morphological development of the bones of the knee has forensic applications in subadult age estimation, as well as in clinical growth assessment of paediatric patients. This study aims to document knee ossification in subadults using computed tomography, to improve skeletal age estimation in Australian forensic and clinical practice.

Materials and methods: As part of a large investigation on knee skeletal development, multi-slice computed tomography (CT) Digital Imaging Communication in Medicine (DICOM) datasets of the knee region (n=478) were retrospectively accessed from the New Mexico Decedent Image Database (US) of subadults who underwent post-mortem scanning between 2010 and 2017. Based on 11 knee maturity indicators previously presented in published literature, a new stage-based ordinal scoring protocol was developed. The protocol was then applied to 30 randomly selected DICOM sets following multiplanar and volumetric reconstruction in Amira3D. Intra-rater reliability was quantified using intraclass correlation coefficients (ICC).

Results: Intra-rater reliability was good-to-excellent for all 11 indicators: distal femoral epiphysis proximal projection (ICC 0.98), lateral capping (ICC 1.0) and medial capping (0.98), lateral corner of proximal tibia epiphysis (0.99), medial corner of proximal tibia epiphysis (ICC 0.98), development of the tibial apophysis (ICC 0.96), tibial tubercle (ICC 0.89), styloid process of fibula (ICC 0.99) and epiphyseal appearance-and-fusion of the distal femur (ICC 0.99), proximal tibia (ICC 0.98) and fibula (ICC 0.99).

Conclusion/s: This study introduces a reproducible morphological assessment protocol for knee skeletal development on modern CT data, for application in forensic and clinical paediatric age estimation.

Re-thinking the dynamics of white matter growth in the human

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Introduction: Our understanding of the growth dynamics of human white matter comes largely from isotope 14 Carbon birth dating of oligodendrocytes in the human corpus callosum. This work suggests that peak oligodendrocyte number in the corpus callosum is reached at around 5 years of age. So, after early childhood, all physical changes to white matter are not thorough the addition of new cells. This is intriguing for two reasons: 1) there is good evidence that changes in white matter composition is required for types of motor learning; and 2) The peak in human corpus callosum white matter volume is only reached around 25 years of age. Current modelling has assumed that there is no relationship between total cell number and total tissue volume in human white matter, despite never being directly measured. We hypothesised that white matter volume and cell number are related.

Materials and methods: To address this hypothesis, we acquired whole human brains from the University of Melbourne donor program (n=3). We performed design-based stereology to, for the first time, determine the absolute number of total cells, and oligodendrocytes, in the human corpus callosum.

Result/s and Conclusion/s: We observed a strong significant correlation between total cell number and total tissue volume (Pearson's $R2 > 0.9$, $p<0.001$) in the corpus callosum. Our data makes it not plausible for oligodendrocyte production in the human corpus callosum to be complete by the age of 5 years. This makes us re-think the developmental window for cellular genesis in the corpus callosum, which has implications the window in which white matter neural plasticity can take place in humans.

Abstracts– Poster pitches

Movers and Shakers – A model for small group-based interactive learning in Anatomy

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Students enter a postgraduate medical program from diverse academic backgrounds and consequently their medical science knowledge varies from novice to expert. To bridge this gap, the ANU medical school first introduces students to essential foundational knowledge and skills in an initial introductory block. This block covers 17 different disciplines over 17-weeks using traditional formats (lectures, practicals, tutorials, online resources, problem-based learning (PBL)). However, students often find integrating knowledge from multiple disciplines to gain a holistic understanding of the human body challenging. This was particularly pertinent in the Anatomy curriculum where content was peppered amongst other topics across the block. This structure led students to feel like the Anatomy content was disjointed and to difficulties in comprehension of the intensive load. To address some of these issues we aimed to create an integrated blended learning module that enhances small group-based interactive learning using effective learning strategies.

The "Movers and Shakers" was designed as 3 full-day modules of intensive face-to-face sessions. These modules facilitated teaching and learning of the content through two key components; 1) Morning session involving formal interactive presentations and 2) Afternoon sessions with small group problem-solving activities, either gamified (e.g. movement charades) or clinical based cases.

These immersive sessions enabled us to deliver the content in 30% less hours than the previous model. These modules reduced the staff-student ratio ensuring that all students had consistent support. Students reflected that they enjoyed the modules and left the practical sessions with confidence in their ability to understand and use the content.

Digital 3D imaging of cribriform plate for pre-operative assessments

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This study showcases the clinical benefits of using 3D imaging techniques on smaller structures within the anterior cerebral fossa, giving the clinical implication of identifying the variations in the structures of the cribriform plate, olfactory foramina, and the crista galli that may to assist clinicians in their pre-operative assessments. The 3D scanners used in this study accurately traced the patient samples, providing precise measurements on the surface area of the cribriform plate and the crista galli. 3D imaging provides substantial benefits to the measurement capabilities of researchers when measuring fine details on structures such as the cribriform plate, which have generally been measured using 2D imaging and CT scans. The findings also suggest that a positive correlation between the length of the crista galli and that of the cribriform plate in order to support the cribriform plate and olfactory bulb during trauma. The 3D imaging techniques used in this study may allow for measurements of features which are not feasible with 2D imaging or 2D CT scan cuts; thus, allowing a range of new datasets to be created from the cribriform plate. This could include measurements on the additional curvature of the cribriform plate which may impact bone stability of the bone and risk of trauma-related fracture. This information could assist clinicians in their pre-operative assessments in determining the risk of trauma to the cribriform plate in at-risk individuals to lessen complications which may arise from the fracture.

Reaching beyond your threshold: a new way of looking into cadaveric dissections as a holistic educational resource

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The majority of students find human cadaveric dissection an indispensable tool to learn anatomy. However, some face difficulties in effectively using this educational resource. Identifying why some students struggle,

while others do not, could assist approaches to teaching and learning using dissection to ensure everyone benefits. This study uses the threshold concept (TC) framework to explore different dimensions of students' anatomy learning using cadaveric dissection, aiming to identify potential threshold concepts in dissection-based anatomy learning. Students enrolled in two courses that use human dissection (science, dentistry) were invited to participate in two online-surveys (one at the beginning of semester, one at the end). Semi-structured interviews and focus groups were also conducted. Interview, focus group transcripts, and qualitative survey data were thematically analysed using an general inductive theory approach. Data revealed many attributes of the TC framework are involved when learning from dissection, including transformative, discursive, integrative, counter-intuitive, and reconstitutive aspects. For example, students identified challenges learning real-life anatomical structures compared to the presentation in textbooks (counter-intuitive). With time students realized the benefits of hands-on anatomy learning, and the learning from labs that could be applied to other subjects (transformative). Differences were observed between science and dental students. By identifying TCs specific to learning anatomy through dissection, educators may be better equipped to support students through their learning journeys. Similarly, by knowing areas of learning that may require certain approaches or strategies, students may feel more confident and capable to engage and learn from dissection.

Introducing Multimodal Objective Structural Practical Exam (OSPE) to assess anatomy competency, and to improve student's ability in medical imaging practice

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Introduction: An essential part of medical imaging education is based on learning the student's skills needed in their practice. Teaching anatomy to medical imaging students **focuses on building a three-dimensional picture to** examine and comprehend CT images. OSPE is an assessment tool used to enhance competence at all medical education levels. This study was designed to evaluate the feasibility and efficacy of OSPE as an assessment tool for medical imaging students.

Materials and methods: Sixty students were included in this study; 32 from 1st year and 38 from 2nd year. In OSPE model 1, students were given ten short case scenarios and asked to identify 5-8 structures on CT images related to each case. In OSPE model 2, students were rotated through ten stations. At each station, students had to identify four structures on the anatomical models and correlate them with the corresponding radiographic images. The students were given an anonyms questionnaire to complete at the end of the exam.

Results: Most students (89%) strongly agreed that the OSPE improved their anatomy learning ability and understanding of practical skills more effectively. Also, most students (82%) emphasised that OSPE is a well-organised assessment tool. Moreover, 90 % strongly agreed that OSPE was well structured, relevant and uniform, and 88% strongly agreed that OSPE was consistent with the learning objectives of the course contents.

Conclusion/s: OSPE is a feasible and reliable assessment tool in anatomy to medical imaging. By implementing OSPE, we have effectively improved the student's practical skills in future practice.

Artery of Percheron infarction: A diagnostic challenge posed by an anatomical variant

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Purpose: Artery of Percheron (AOP) is an anatomical variant of the paramedian artery, in which a single trunk arising from only one of the P1 segments of posterior cerebral arteries (PCAs) supplies paramedian regions of both thalami. We describe a case of a patient with bilateral thalamic infarct due to AOP occlusion. The diagnosis was hindered by the presence of anatomical variants of both PCAs.

Materials and methods: Case report.

Results: A 50-year-old male presented to the emergency room with vision loss accompanied by altered mental status. An initial head CT showed no signs of any intracranial pathologies. A CT angiography revealed anatomical variations of patient's cerebral arteries: vertebral artery (VA) asymmetry, with a prominent right VA and hypoplastic left VA, bilateral fetal PCAs, and a hypoplastic A1 segment of right anterior cerebral artery. CTA was also suspicious of a small aneurysm of the tip of basilar artery. Due to unclear clinical picture the patient underwent head MRI. The scan showed symmetrical bilateral thalamic lesions at the level of third

ventricle with restriction of proton diffusion on FLAIR and T2W sequences. Diagnosis of ischemic stroke was made. The location of ischemic changes was corresponding to the area supplied by the AOP.

Conclusions: Our case demonstrates an especially challenging diagnosis of AOP infarct. Initial misdiagnosis of AOP infarct was most likely due to the presence of bilateral fetal PCAs. Detailed knowledge of anatomical variants of cerebral vessels is crucial for timely diagnosis and successful treatment of ischemic stroke.

'Pet things' and 'penny drops': factors influencing clinicians' teaching of pelvic anatomy

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Introduction: Pelvic anatomy is considered challenging to teach and learn, partly because its complexity can make it difficult to conceptualise. While a spiralled curriculum can support medical students to develop clinically orientated anatomy knowledge in the preclinical years, it is unclear how pelvic anatomy is taught in the clinical setting by clinician-educators. Understanding clinician-educator perspectives of pelvic anatomy teaching is important because of their critical role in supporting medical students to become knowledgeable, safe practitioners. This study examined the factors that influence clinician-educators' teaching of pelvic anatomy to medical students during clinical placement.

Materials and methods: This exploratory qualitative study was conducted in Australia using semi-structured interviews with 10 participants from obstetrics/gynaecology (n=4) and urology (n=6). Interviews were transcribed and thematically analysed.

Results: Two overarching factors were found to influence clinician-educators' teaching: (1) the way they defined the scope of knowledge, incorporating a consideration of patient safety, student career aspirations, and 'pet topics'; and (2) pedagogical understanding, which encompassed the nexus between learning and teaching experiences, clinical application and relevance, teaching strategies, and sensitivities surrounding pelvic anatomy.

Conclusion/s: Clinician-educators frequently draw upon their own experiences in defining the scope of pelvic anatomy knowledge required of medical students. Awareness of a defined syllabus underpinned by use of multiple teaching approaches could enhance clinician-educators' capacity to support medical students to navigate the complexities of pelvic anatomy, such as three-dimensional spatial relationships as well as potential sociocultural sensitives.

Life Drawing in Death: The Introduction of Life Drawing in Cadaveric Anatomy Studies to Improve Learning Outcomes

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An anatomist's introduction to the subject of anatomy is often accompanied by an exposure to anatomical illustrations by the early 'masters' – Leonardi da Vinci, Michelangelo, Andreas Vesalius. Anatomy is a highly visual and spatial science, where anatomical features are often named in accordance with their appearance and spatial location – consider *squamous* meaning 'flat' and *epi-* meaning 'over, above' (as in epicondyle) as examples. It should therefore be expected that anatomical science maintain an intimate relationship to the visual arts. Yet the images that illustrate our learning texts are often diagrammatic at best. I propose that there is merit in introducing the long-established practice of life drawing within anatomical studies, particularly within cadaveric anatomy studies and dissection. Understood as the drawing of people from live observation, life drawing and participation in the practice as a learning method has the potential to impart myriad benefits for students of anatomy. In cadaveric anatomy studies, the most significant benefits offered by the practice are: (1) its contribution to students' planning and understanding of the dissection process; and (2) an appreciation and comprehension of anatomical variance and gross anatomy, that is, the integration of human biological systems. Where drawing and anatomy studies are both understood as a process of 'learning to see', anatomy students engaged in life drawing are stimulated to become more observational and engaged, obtaining a better understanding of the structure and function of the human body, and overall improved learning outcomes.

Collaboration and co-creation: developing a state-of-the-art digital anatomy laboratory for the Sydney medical programme in Dubbo

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Innovation in the teaching and learning of anatomy is centred on digitisation, however a paucity of literature exists around case studies illustrating the application of educational design principles for co-creating virtual anatomy laboratories, especially in remote settings.

The Dubbo Digital Anatomy Lab is a novel anatomy learning space being created for the new Sydney Medical Programme in rural Dubbo, grounded in the principles of Universal Design for Learning. It is being co-created by a skilled team of anatomists, digital specialists, and educational designers in partnership with University of Sydney medical students.

The laboratory will provide virtual access to high-definition 3D-scanned anatomy models, to be accessed, manipulated, remixed, and republished using virtual reality. Each model can be captured, annotated, and animated for further study and revision. Co-created content can be used by students as peer-designed learning resources. Apart from fostering relevant knowledge and skills, the virtual spaces provide affordances for student and faculty engagement, representation, action, and expression.

The laboratory will be used by Dubbo students in 2023 as an adjunct to existing physical teaching and learning environments. Evaluations, including focus groups and questionnaires will take place at the end of each clinical block. Initial feedback indicates students' value 24-hour laboratory access and the ability to collaborate with peers to generate study tools. Educator's value providing avenues for student agency and self-directed learning.

We anticipate these digital assets will strengthen the teaching and learning of anatomy and are well suited for scalability, especially for other rural and remote medical programmes.

Normal morphology and soft tissue relations of the triquetrum

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Introduction: The goal of contemporary research into the wrist is to understand global carpal kinematics. To achieve this, an in depth understanding of the bone and soft tissue structures must be established. Research into the ulnar column is limited and conflicting. The purpose of this project was to investigate the osseous morphology and soft tissue relations of the triquetrum as a launching point for future ulnar column research.

Materials and methods: Normal triquetrum morphology was determined by creating 3D models of a dry triquetra sample (n=6). The dry bones were examined to determine common morphological features. Soft tissue attachments were determined by conducting fascicular dissection on embalmed human Body Donor specimens (n=9; mean age = 82.2 ± 10.83 years; F = 4, M = 5). The articular facets and fascicular tissue attachment areas were modelled and analysed in 3D using a digital microscribe.

Results: A standard triquetrum model was generated. Surface area quantification did not suggest morphological subtypes. In the embalmed sample, two distinct fascicular attachments were observed; a palmar attachment on all specimens, and a dorsal attachment on five specimens. Triquetra with a single palmar fascicular attachment were observed in wrists with type two lunates, while triquetra with both a palmar and dorsal attachment were observed in wrists with type one lunates.

Conclusion/s: The findings of this study suggest that the triquetrum can be subtyped based on its fascicular attachment. This provides support for whole wrist typing, suggesting that there are two distinct subtypes of wrist with different structure and ligament patterns.

Cephalometric landmark standards and recent trends in craniofacial identification (2018-22): Avoiding imposters by describing variant landmarks as supplemental

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Introduction: Facial soft tissue thicknesses (FSTTs) form the foundation of craniofacial identification methods by providing a metric guide of the depth of the soft tissue that overlies the skull. These FSTTs are determined by measuring the distance from the skin surface to the most superficial surface of the underlying skull at specific craniometric landmarks. Precise placement and definition of these anatomical landmarks are paramount to accurate analysis of cephalometric data. This study aimed to review recent FSTT literature (2018-22) to determine if recent papers adhere to standardised cephalometric landmark nomenclature.
Materials and methods: Facial soft tissue thickness (FSTT) studies published between 2018–2022 were identified using Google Scholar with the search phrases: facial AND soft tissue AND thickness AND craniofacial AND identification AND/OR forensic. Twenty-three resulting papers were reviewed.
Results: Twenty of 23 papers used at least one non-standardised or novel landmark. This included studies that confusingly used standard landmark names, but whose definition and/or placement diverged from standards. Other novelties included the confusion of proximally located landmarks with one another, entirely new landmark formulations, and departure from pre-existing technical terminology to imprecise lay vocabulary.
Conclusion/s: Despite prior calls to the importance of standardisation in FSTT research, recent literature continues to exhibit broad departures from established standards. In any study, novel landmarks should supplement a minimum set of standard landmarks so that cross-comparisons between studies using identically collected measurements are possible. Future FSTT research should award greater attention to including and meeting established FSTT cephalometric standards.

The journey of an electronic learning tool: from humble beginnings and serendipitous timing to online learning amidst a pandemic

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This presentation tracks the journey of an electronic learning package (E-tool); an online learning resource developed as a supplementary tool for laboratory revision in a first-year undergraduate Anatomy and Physiology course at an Australian University. Pilot development occurred in a pre-Covid19 environment in response to the lack of human cadaveric images available online reflecting specimens used during laboratory sessions. Timing proved serendipitous as anatomy students across the globe rapidly transitioned to online learning during the pandemic. Using a mixed methods design, student perception of satisfaction with the E-tool was evaluated via paper-based survey and student engagement was tracked by analytics within the online learning management system. Adapting to changing circumstances in higher education, and the move to *emergency remote teaching* throughout the pandemic, surveys were later conducted online during course offerings delivered in lockdown, and focus groups were conducted in person once face-to-face classes resumed. At completion of the pilot phase, positive student feedback and demand for more online resources drove the development and implementation of a full suite of online revision modules during the pandemic. The majority of responding students found the E-tool useful for their learning, as laboratory resources, images used in the online E-tool and summative assessment were constructively aligned. Additional reported advantages of the E-tool include flexibility and ubiquitous access for students at no additional cost, and development of student confidence through guided revision. Students overwhelmingly supported the E-tool as a supplement to their laboratory learning and its usefulness in targeting key learning outcomes for revision.

Anatomy of Surgical Exposure - cadaveric based teaching for the surgically inclined

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Currently cadaveric dissection has become obsolete in the modern medical curriculums aiming for reduction in costs and focusing on clinical medicine. Junior doctors have thus graduated with significant deficiencies of anatomical knowledge. This is particularly important in anatomical fields such as surgical and interventional medical professions, who require the expertise to perform safe operation and procedures. To overcome these shortcomings, postgraduate cadaveric courses are being developed to offer those further anatomical education. Specifically aiming at those interested in general surgery, the Anatomy of Surgical Exposure (ASE) is a cadaveric based course that is designed to teach common open general and emergency surgical

operations. The philosophy that underpins the course is that open surgery, particularly in re-operative setting and trauma, will always be required. The goal of ASE is to allow teaching of safe open operations and improve the specific anatomical knowledge involved.

The surgical course runs over three days and consists of two candidates to one cadaver. To simulate an operative environment, each station has a complete set of instruments and a theatre nurse. The station consists of one to two tutors, who are skilled senior surgeons, allowing unique and personalised teaching experiences. The candidates are quizzed on details of operative surgery and anatomy; and performance is marked using the Objective Structured Assessment of Technical Skills for a formative assessment. The educational experience offers surgical skills, operative techniques, and proficiency in surgical anatomy.

Mapping paediatric growth of the corpus callosum

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Introduction: Alterations to corpus callosum morphology has an established relationship with several neurological conditions; therefore, understanding the pattern of typical paediatric growth is vital to ensure accuracy in tracking healthy development. Current literature describing callosal morphology, however, is inconsistent due to limited sample sizes and differing normalisation for head size. This project therefore aims to develop a comprehensive profile of callosal morphology throughout paediatric development.

Materials and methods: Three hundred and twenty cranial computed tomography images, comprising 132 males and 188 females aged 0-19 years were analysed. Midsagittal callosal area, subregion area, anterior-posterior length and callosal thickness were evaluated.

Results: All variables, excluding anterior-posterior length, had a significant linear relationship with age when normalised to intracranial area, illustrating a relative increase in supero-inferior callosal thickness, as opposed to length. Periods of greatest growth velocity occurred between 0-2 years for midsagittal, isthmus, and body area, and between 2-11 years for almost all variables. Splenium growth velocity, however, increased between 0-3 years and 3-17 years. Females had larger splenium area, anterior-posterior length, and callosal thickness from infancy to juvenile development, however these differences didn't remain into adulthood.

Conclusion/s: The complete morphometric map of callosal growth presented, enhances the understanding of the pattern of paediatric callosal development. Outcomes describe a novel directionality of growth and emphasise the importance of the consideration of age and sex when tracking callosal development. Importantly, this study presents a baseline for future studies to investigate alterations to this developmental pattern in non-neurotypical patients as a potential diagnostic tool.

Developing an advanced protocol for bone 3D modelling under direct observation with a digital microscribe

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Introduction: Use of the digital microscribe in anatomical research has increased in the last ten years. Models of bones have either lacked accuracy using a microscribe, or researchers have opted for other technologies, such as laser scanning or computed tomography. These methodologies work well for general appreciation of bone shape but lack the resolving power and ability of the researcher to make judgement on a particular feature as they not done under direct observation. These are important when considering the detailed anatomy of small bones. This study aimed to determine whether microscribe modelling could meet the needs for detailed small bone investigation by establishing a protocol for modelling the hindfoot bones.

Materials and methods: A single set of dry hindfoot bones (calcaneus, talus, navicular and cuboid) were selected. A series of experimental protocols were designed and followed, each in triplicate by the same investigator. These ranged from modelling as much surface area as possible at once, to individual aspects, then individual facets and other features. Various patterns of landmark verification for alignment were also tested.

Results: Modelling each planar aspect (e.g., the medial surface) separately with at least three precise landmark points common to each modelling stage worked best. This allowed accurate and reproducible modelling with precise and seamless alignment of each model.

Conclusion/s: A clear protocol was established that now enables researchers to accurately and reproducibly generate more detailed small bone models than were previously possible.

How hard can it be: assessing the Shore hardness of cadaveric tissues

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Introduction: Designing medical skills trainers with haptic fidelity is a formidable challenge. Current literature suggests that by matching synthetic and human biomechanical properties will improve the current haptic fidelity of skills trainers. We have developed a protocol and measured the Shore hardness of cadaveric tissues in order to select 3D printed materials with similar hardness measurements.

Materials and methods: Starr digital durometers were used to measure the Shore A and Shore OO hardness of soft embalmed and formalin embalmed cadaveric tissues.

Results: Measurements using Shore A demonstrated significant differences in hardness between neck and chest muscles. Measurements using Shore OO demonstrated that here are significant differences in tissue hardness between vessels in the neck, neck and chest muscles, and skin from the neck and chest. We also assessed whether hardness was different between methods of embalming. The only significant difference was observed in muscle tissue. Soft embalmed cadavers had a significantly lower Shore OO hardness reading when compared to formalin-embalmed cadavers.

Conclusion/s: Shore hardness may be a useful tool for measuring biomechanical properties of human tissues in the design of clinical trainers. More work will be done to assess how Shore hardness of synthetic materials compares to human tissues and what the just noticeable difference for the haptic perception of hardness.

Occurrence of the Ossification of Petrosphenoid Ligament: A Retrospective Radiologic Study from Computed Tomographic Images

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Introduction: Various ligaments present in the skull base are of clinical and surgical importance. One among them, is the petrosphenoid ligament (PSL). PSL may ossify either in a partial or complete form and forms the roof of Dorello's canal underneath which the abducens nerve passes. Studies argued both protective and adverse effects of the ossified PSL. Hence, the incidence of PSL ossification has become a relevant subject in clinical practice to radiologists, neurologists and neurosurgeons for understanding its potential role in abducens nerve compression.

Materials and methods: We have undertaken this study to investigate the incidence of PSL ossification from multidetector computed tomography (MDCT) images of the patients who had been referred to the Medical Imaging Department of Mubarak Al-Kabeer Hospital in Kuwait. We retrospectively assessed a total of 200 patients' head CT scans (400 petroclival regions) between January 2021 and June 2022 in which 59% were males (n=118) & 41% were females (n=82) aged between 18-91 years.

Results: A total of 37 patients (male 26 & female 11) aged between 18-84 years were presented with ossification of PSL. Among these 37 patients, 28 patients were presented with unilateral ossified PSL, and 9 patients were presented with bilateral ossified PSL, amounting to the total of 46 ossified PSL from 400 CT images of the petroclival regions (11.5%). The gender wise and sidewise occurrence of the PSL ossification seen in different age groups were not statistically significant *(P>0.05)*. Among all the ossified cases, there was no patient presented with abducens nerve palsy.

Conclusions: We believe our results provide baseline data in the region for understanding PSL ossification and its impact on the abducens nerve palsy.

Vascular anomalies located within the tarsal tunnel

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Introduction: The Tarsal Tunnel (TT) is an anatomical space at the medial ankle, which acts as a passage for the neurovascular bundle containing the Posterior Tibial Artery (PTA), Posterior Tibial Veins (PTVs) and Tibial Nerve (TN). Tarsal Tunnel Syndrome (TTS) is an entrapment neuropathy describing the compression and irritation of the TN within this space. Among the many contributing factors of TTS are vascular anomalies. As literature regarding vascular anomalies within the TT is limited, this poster will present two vascular anomalies to consider when treating TTS symptoms.
Materials and methods: Fifteen embalmed cadaveric lower limbs were dissected at the medial ankle region to expose the contents of the TT. The neurovascular bundle containing the PTA, PTVs and TN were investigated for anatomical anomalies and were photographed accordingly.
Results: Two variants of vascular anomalies were identified across 33% (5) of specimens. Vascular leashes were identified in 20% (3) of specimens, while penetrating arteries were recognized in 20% (3) of specimens. Interestingly, one specimen contained both vascular anomalies.
Conclusion/s: The discussion of vascular anomalies within the TT in previous literature is sparse and results from this study suggest they may occur more commonly than discussed. Due to this lack of awareness, these anomalies are often missed during surgery. We propose that studying ways to identify these anomalies using diagnostic medical imaging may lead to more favorable outcomes from both conservative and surgical TTS treatments.

A computed tomography analysis of the olfactory fossa

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Introduction: The olfactory fossa is region on the anterior base of the skull that is susceptible to injury during functional endoscopic sinus surgery. This region is at highest risk of injury if deep or asymmetric. Thus, detailed knowledge and preoperative evaluation of olfactory fossa depth are vital to avoid accidental injury and resultant complications, and perform successful surgical procedures. The present study aimed to explore the depth of the olfactory fossa and its associated variations within a South African population.
Materials and methods: Eighty-six olfactory fossae were assessed through bilateral analysis of 43 computed tomography scans. Coronal images were utilised to acquire depth measurements using predefined radiological landmarks. Each olfactory fossa was then classified according to the Keros system (Types I-III) based on their depth.
Results: Statistically significant differences in the depth of the olfactory fossa were identified according to sex (p=0.023) and laterality (p=0.037), with the overall median (Q1-Q3) depth being 5.75 (4.30-6.50) mm. Keros Type I was observed in 16.3% of cases, Keros Type II in 75.6% of cases, and Keros Type III in 8.1% of cases.
Conclusion/s: The Keros classification provides valuable objective, reliable, and pre-emptive information on the olfactory fossa and should be utilised routinely during pre-operative planning. In comparison to other studied populations, the present study's South African cohort displayed deeper olfactory fossa in females, on the left side, and overall (thus, a higher risk of olfactory fossa injury).

Arcuate foramen prevalence in Sotho, Xhosa and Zulu subjects

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Introduction: The arcuate foramen (AF), is an anatomical variant of C1 consisting of a complete osseous bridge over the vertebral artery, the suboccipital nerve and the vertebral venous plexus. Meta-analyses revealed that complete AF is most prevalent in North Americans (11.3%) and Europeans (11.2%), and least

prevalent among Asians (7.5%). The aim of this research is to analyze the complete AF prevalence in sub-Saharan African subjects due to insufficient current information in the literature.

Materials and methods: We analysed 90 (100%) sub-Saharan African atlases from Zulu (n=30; 33.3%), Xhosa (n=30; 33.3%) and Sotho (n=30; 33.3%) skeletal samples that are representative of Bantu-speaking groups of Southern Africa housed at the Raymond A. Dart Collection of Modern Human Skeletons, School of Anatomical Sciences, Medical School, University of the Witwatersrand.

Results: Twelve subjects (13.3%) had at least one AF. The AF was bilateral in 5 (5.6%) and unilateral in 7 (7.8%) subjects. The unilateral AF was found in 3 (3.3%) left and in 4 (4.4%) right hemiarches. The twelve subjects that presented at least one AF were 2 (2.2%) Sotho, 7 (7.8%) Xhosa and 3 (3.3%) Zulu (p=0.138). The AF was bilateral in 1 (3.3%) Sotho, in 3 (10.0%) Xhosa and in 1 (3.3%) Zulu subject while it was unilateral in 1 (3.3%) Sotho, in 4 (13.3%) Xhosa and in 2 (6.7%) Zulu subjects respectively.

Conclusion/s: AF prevalence in sub-Saharan African subjects appears to be similar to that described in the literature for North Americans and Europeans and higher than in Asian populations.

Checklist-based active learning in anatomy demonstration sessions during the COVID-19 pandemic: perception of medical students

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Introduction: Anatomy is an essential component of the medical curricula. Anatomy education has been significantly affected during the COVID-19 pandemic. The aim of this study was to explore student's perceptions on a blended learning approach using Checklist-based Active Learning in Anatomy Demonstration Sessions (CALADS) as a method in comparison to the two previously used methods; namely face-to-face Structured Problem-Related Anatomy Demonstrations (SPRAD) and online anatomy learning.

Materials and methods: A comparative, cross-sectional, survey-based study was conducted. The survey was composed of 13 questions that explored preference of learning anatomy in demonstration sessions of 4th year pre-clerkship students who have had their anatomy learning through face-to-face SPRAD in year 2 (before COVID-19 pandemic), online in year 3 (during COVID-19 pandemic), and CALADS method in year 4. Descriptive statistics were used, and the level of significance was set at $p < 0.05$.

Results: The survey exhibited high internal consistency (Cronbach's α = 0.953). Validity of the survey was established through exploratory factor analysis. The preferred method for more than half of the students was CALADS method. Face-to-face SPRAD came next and lastly came the online method. However, more students preferred the online method in comparison to face-to-face method for "learning radiological anatomy". There were no statistically significant differences between male and female students regarding any of the survey questions.

Conclusion/s: CALADS method, as a hybrid, student-centered, interactive learning method of learning practical anatomy, was preferred by pre-clerkship students as a more effective method in understanding anatomy than face-to-face and online learning methods.

Surgically relevant soft tissue attachments to the trapezium

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Introduction: Osteoarthritis of the first carpometacarpal joint (CMC1) is a common and debilitating disease that is often inadequately treated by trapeziectomy. Given the prevalence of post-operative complications, improvement of reconstructive procedures is needed. This requires a full understanding of the soft tissue structures that are important for stability and mobility. A review of the literature has demonstrated limited and inconsistent knowledge of trapezial attachments, with ongoing debate about their attachment sites, fibre orientations and functional importance. This study aimed to accurately describe the soft tissue attachment sites on the trapezium.

Materials and methods: Seven hand specimens (n=7; mean age = 80.3 ± 10.2years; F = 4, M = 3) were used for fascicular dissection, where individual fibres of tendons and ligaments were traced to their precise trapezial attachment sites. After the soft tissue structures were dissected away, the attachment sites were carefully marked and converted into a virtual 3D map with a digital microscribe.

Results: Fourteen ligamentous and five tendinous attachments were identified, but only 11 ligaments and one tendon in all cases (100%). The incidence of other attachments ranged from 14-86%, including some that were not reported in the reviewed literature. Digital maps of the soft tissue attachment sites were created and compared, which allowed for the visualisation of changes caused by CMC1 joint degeneration.

Conclusion/s: These data suggest that the trapezium receives more, and more varied, attachments than previously suggested. These attachments should be carefully considered when performing a trapeziectomy.

Radiological anatomy of the vertebrobasilar artery in a select South African cohort of patients

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Introduction: The intracranial segment of the vertebral artery (VA) is the unique part of the artery where the two VAs join to form a single vascular channel, viz. the basilar artery. In addition to this typical description, anatomical variations have been described; anatomical variation has been associated with some pathological processes, neurological complications, and the risk of vascular diseases in the posterior circulatory territory. We evaluated the typical anatomical features and variations of the VA4 and the basilar artery to provide useful data on the prevalence of variation and morphometry of the vertebrobasilar artery.

Materials and methods: The study is a retrospective chart review of 654 consecutive South African patients who had been examined with multidetector computed tomography angiography from January 2009 to September 2019. A subset of the total sample size (100 radiographic images) focused on the geometry of the basilar artery. (Ethical No: BE 148/19).

Result: We report the incidence of VA hypoplasia, hypoplastic terminal VA, and atresia. Fenestration and duplicate posterior inferior cerebellar artery origin were also observed. The left intracranial VA was significantly larger than the right. Lateral displacement of the basilar artery was reported.

Conclusion/s: Our study shows that anatomical variation of the intracranial VA is common in the population studied, with a total prevalence of 36.5%. Knowledge of variant anatomy is imperative to the clinician in diagnosing many vascular-related pathologies. Understanding the patterns of anatomical variations of the VAs will contribute significantly to interpreting ischemic areas and diagnosing various diseases in the posterior circulatory territory.

Latissimus dorsi has a limited contribution to trunk movement and control. A systematic review and meta-analysis

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Introduction: Latissimus dorsi may contribute to trunk movement and control due to its extensive attachments to the trunk. However, electromyography studies have shown highly variable activity levels during trunk tasks. Therefore, the purpose of this systematic review was to critically evaluate whether latissimus dorsi has a role in trunk movement and/or control.

Materials and methods: Studies assessing the activation levels of latissimus dorsi, expressed as percentage of Maximum Voluntary Contraction (MVC), using electromyography during trunk movements and/or trunk stability tasks were sourced from six databases (May 2022). Risk of bias and quality of evidence was assessed and activation levels were pooled or meta-analysed where feasible.

Results: Of 6,125 studies identified in the search, 39 met the inclusion criteria. The meta-analyses showed that latissimus dorsi was activated at high levels (60% MVC) during ipsilateral trunk rotation and low levels during trunk contralateral rotation, extension and stability tasks (<20% MVC). There was considerable variability of latissimus dorsi activity levels between individual studies at high loads during trunk ipsilateral rotation (26-116% MVC), ipsilateral lateral flexion (15-85% MVC) and extension (10-79% MVC). Quality of evidence was very low to moderate.

Conclusion/s: Although high levels of latissimus dorsi activity were found during ipsilateral trunk rotation, there is very low confidence that these activity levels reflect the true levels. There is moderate confidence that latissimus dorsi has a limited contribution to trunk control. The use of surface electrodes and non-validated normalisation processes were critical methodological issues that contributed to lower quality of evidence.

Which learning outcomes are best served by online anatomy teaching?

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The sudden imposition of online teaching provoked by the pandemic meant many educators switched to online teaching with little opportunity for pedagogical design. Many incorporated proprietary digital resources while others developed in-house resources. The return to face-to-face classes has provided an opportunity to reflect on how anatomy is taught. As part of an evaluation of teaching, anatomy academics (casual and full-time, 19 in total) were asked to rate the success of teaching method (face-to-face teaching in wet labs and their online equivalent) in achieving unit learning objectives, and to indicate desired anatomy-based graduate attributes. A statistically significant difference was observed for some objectives (locate or describe a structure, understand relationships), teachers finding wet-lab classes fulfilled these well/extremely well. However, when taught online, these same objectives were not very well or poorly met. There was no difference for naming structures, describing their function and clinical application. Failure to achieve some of the related objectives may have repercussions on graduate attributes. The most common desired attributes were to be able to describe a structure to a patient (90%), identify a structure using an imaging technology (70%) and diagnose a condition (80%); in particular, the first two attributes are unlikely to be met by online teaching. This reflection provides a path for future planning and finds a place for online teaching but cannot replace wet-lab teaching of objectives that inform graduate attributes essential for students' future careers.

Morphological comparison of the paretic knee in people with stroke: An exploratory magnetic resonance imaging (MRI) study

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Introduction: Gait patterns often change post-stroke, influenced by altered biomechanics at the paretic knee, which differ from the non-paretic knee. Limited research exists around the potential implications of biomechanical changes on morphology. This study aimed to evaluate the chondral surfaces and surrounding soft tissues of the knee in people with stroke.
Materials and methods: Six participants (five males; mean [range] age, 74.5 [72-81] years) with stroke (mean [range] time since stroke, 83 [18-180] months) underwent MRI of both knees. The Whole-Organ MRI Score (WORMS) was used to assess chondral surfaces. Articular cartilage thickness of the distal femoral condyles (central aspect) was measured, and surrounding soft tissues assessed for pathology.
Results: The WORMS ranges were similar for the paretic (2-9/78) and non-paretic (2-12/78) knees. Mean (± SD) chondral thickness for the medial condyle was the same in paretic (1.9 ± 0.5 mm) and non-paretic (1.9 ± 0.6 mm) knees; with a small difference observed for the lateral condyle (paretic: 1.3 ± 0.2 mm; non-paretic: 1.6 ± 0.4 mm). Three participants had bilateral pre-patellar fat oedema, with patellar tendinopathy on the non-paretic side; another participant had tendinopathy only on the non-paretic knee.
Conclusion/s: WORMS scores and medial condyle chondral thickness were similar bilaterally. There was some thinning of the lateral femoral condyle cartilage in paretic knees, aligning with evidence from ultrasound studies. There were signs of pre-patellar fat oedema bilaterally, with patellar tendinopathy only observed on the non-paretic knee. Consideration of the small sample size is required when interpreting these findings.

Shape modelling of the oropharynx detects associations with body morphometry

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Introduction: Characterisation of the oropharynx, between the soft palate and the epiglottis, is limited to simple two-dimensional and three-dimensional measures. Statistical shape modelling may be more useful for systematically comparing morphometric features. The aim of this project was to examine whether oropharynx shape is associated with body morphometry.
Materials and methods: Participants (n=48) aged 18-39 years (mean 27.2±4.9; 33 females and 15 males) were recruited. Each participant was scanned using a 3-Tesla magnetic resonance (MR) scanner and demographic and body morphometry data collected. The oropharynx was segmented from T1-weighted MR images and digital three-dimensional oropharynx models constructed. Principal component analysis was performed with normalization to z-scores for consistency. Statistical analyses were undertaken using multivariate linear models.
Results: The shape model of the oropharynx revealed five modes which explained 90% of the variance. Mode 1 explained 59% of the variance and primarily described differences in oropharynx isometric size, including elongation. Mode 2 (13%) described AP (depth) and lateral (width) dimensions. Mode 3 (8%) described the AP dimension at the retroglossal region. Mode 4 (6%) described lateral dimensions at the retropalatal-retroglossal junction. Mode 5 (4%) described the lateral dimension at the inferior retroglossal region. Sex was not significant in any of the modes. However, for mode 1 there was a significant association with height (p=0.007), mode 2 neck length (p=0.044), and for mode 3 weight (p=0.027).
Conclusion/s: Statistical shape modelling detected associations with body morphometry indicating that it may be a useful tool for differentiating between different cohorts with oropharyngeal disorders.

Motivation to learn in university students studying anatomy: A mixed methods analysis of what drives learning

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Introduction: Exploring student motivation to learn is an area that is rapidly expanding, especially due to the ongoing influences of COVID-19 on education. In anatomy, most research on motivation to learn has targeted medical and other health professional students, but little is known about factors which drive students enrolled in science degrees. This mixed methods study explored what motivates undergraduate university science students to learn anatomy, whether motivation differs between cohorts (second- and third-year) and gender, and the effects imposed by Covid-19.
Materials and methods: Students (n = 171) completed a survey (the Science Motivation Questionnaire II [SMQII] and questions about learning experiences during the pandemic) and a subset (n = 12) participated in interviews. Quantitative data were compared using a Student's t-test, and a general inductive approach was employed to analyse the qualitative data.
Results: Based on the SMQII, the key components of motivation that students consistently identified with were grade, intrinsic and career. No statistically significant differences were found for motivation components between level of study or gender. Students reported that the COVID-19 pandemic tended to negatively impact motivational components, yet felt the pandemic had fast-tracked the development of online learning, with both positive and negative connotations.
Conclusion/s: Going forward, most science students support incorporating both traditional and online methods for teaching and learning anatomy. These findings could be utilised by anatomy educators when considering how to support science students in ways which embrace motivational components to foster success in those studying anatomy.

The use of microscribe for digitizing soft tissue structures; a scoping review

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Introduction: Cadaveric dissection allows detailed investigation of soft tissue structures. However, once dissected, data pertaining to that structure are lost. A microscribe digitizer can address this issue. This scoping review investigates how microscribe digitizers have been used to record data during dissection of soft tissues, and identifies the benefits and limitations of such technology in this field.

Materials and methods: Boolean search terms in multiple databases were used to identify articles published between 1997-2022 that utilised a microscribe digitiser to record anatomical features of soft tissues. Reference lists were searched for relevant papers not captured by the original search. Articles were imported into rayyan.ai (online intelligent systematic review software), and following deduplication, were evaluated for inclusion criteria. Two authors blindly reviewed, and agreed on the final 41 included papers. Main data were extracted to a spreadsheet for analysis, including coordinate tracking and measurement locale methods.

Results: Preliminary analysis shows that microscribe digitisers have captured information regarding muscles, ligaments, cartilage, and neurovascular structures. Data include spread mapping, lengths, volumes, cross-sectional areas, and pennation. Data recording ranged from sparse (i.e. "point A" to "point B" measurements), to dense (i.e. combined with surface scans, 3D modelling).

Conclusion/s: This scoping review identified the uses of microscribe digitisers for capturing soft tissue data. Future research using this technology must address limitations associated with users needing to be aware of potential distortion of soft tissue, and to be transparent with inter- and intra-observer reliability.
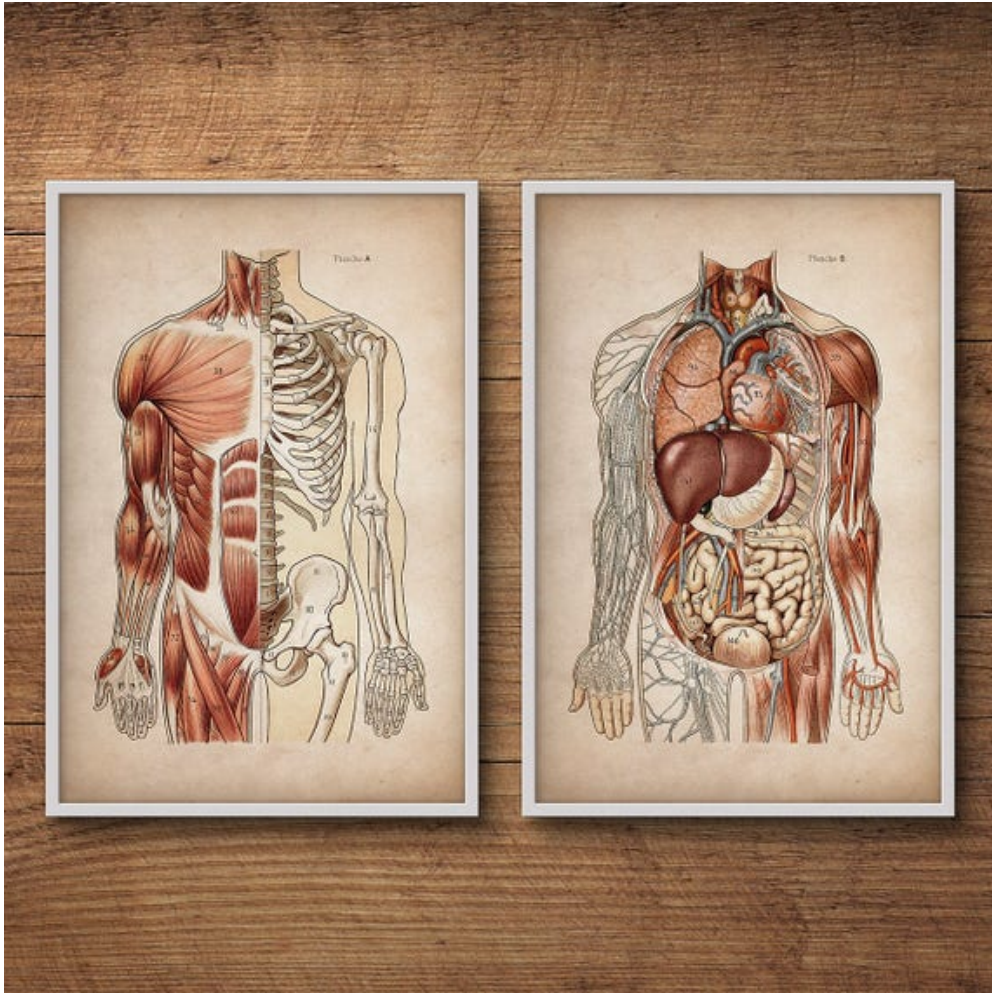
Abstracts– Poster only

Veterinary medicine, scientific research and near-peer tutors break down professional learning silos in histology and promote interprofessional learning

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Introduction: Biomedical disciplines are usually taught in separate physical and pedagogical spaces, by discipline experts. Interprofessional teaching and learning occur between related human healthcare fields, rather than outside human medicine. The challenges of modern medical education can be better met by diversifying the tutor pool to include veterinary scientists, near-peers and other biomedical research professionals, allowing students to engage with â€œoutsideâ€ professional expertise. Histology is ideal for student interaction with interprofessional tutors.Â
Materials and methods: We present our experiences in diversifying our histology tutor pool to include near-peers, and veterinary medicine, scientific research, and clinical medicine experts.
Results: Tutors from diverse professional backgrounds bring knowledge, skills, and extensive workplace experience. Conceptualising relationships between tutors and academic staff as professional partnerships facilitates broader and more enriching learning for students by informing content.
We promote respectful interprofessional discourse between tutors from different professional backgrounds and expertise, modelling for our students their later interactions with other professions. By interacting with tutors, students begin constructing working partnerships with professionals outside clinical medicine.
Conclusions: Interprofessional learning is important for meaningful communication and collaboration. It produces better understanding of animal models of human disease which underpin research and clinical practice, and prepares medical students for complex challenges such as zoonoses and food-borne disease in their future practice. Histology is an ideal location to inspire openness toward interprofessional collaboration, fostering positive attitudes for cross-sectoral collaboration and ensuring development of a functional One Health Culture.

Image repositories a potential new norm for anatomy education. A collaborative pilot

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Ethics reference number: RA2-2021-011-A

Introduction: Anatomy is a fundamental discipline for health professions. Traditionally, anatomy teaching centres on cadaver-based pedagogy. However, regulatory frameworks and rising maintenance costs are challenging this approach. Clinical diagnostics utilise imaging modalities to demonstrate internal features of viscera which are less easily demonstrated in cadavers. We collaborated with a team of radiographers and analysed the feasibility of developing an MRI (magnetic resonance imaging) image repository of major human organs.
Materials and methods: The project aims to develop an institutional image repository of abdominothoracic and pelvic organs. This pilot will focus on using embalmed cadaveric livers scanned with a 7T-MRI. The liver is a good trial model as understanding the internal organisation is critical in clinical therapeutic interventions such as biopsies and partial excisions.
Results: Initial data on the perceived benefits of this project was collected via structured questions (n=6) comprising of Likert scales, rankings, and binary options. The questions aimed to better clarify opinions and feasibility regarding understanding MRI images and if this approach will aid clinical studies. Many respondents (N=30) strongly supported the project and reported that a repository is highly likely to improve anatomy instruction and create dynamic and equitable classrooms.
Conclusion/s: An MRI image repository will be pivotal to learning anatomy and developing anatomical and clinical perspectives. Imaging aims to enhance the quality and efficiency of instruction in human anatomy by integrating biomedical and clinical sciences. Moreover, the database may be used for clinical workshops demonstrating clinical skills and has the potential to further guide self-directed and distance learning.

How good are 3D optical scanners and photogrammetry for scientific analysis of human bone anatomy?

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Introduction: Three-dimensional (3D) scanners are increasingly being used to record surface anatomy for scientific analysis. Somewhat surprisingly, the error performance of these instruments is rarely verified within the lab prior to scientific use.

Materials and methods: In this study, the errors of four data capture methods (3× 3D optical scanners and 1× photogrammetry method) for eight human bones (C4 vertebra, clavicle, femur, mandible, 2nd metacarpal, radius, scapula, talus) were measured via comparison to a VDI Part 3-calibrated 3D scanner with tested resolution to ≤ 0.01 mm (Solutionix® [AUD$55K]).

Results: In order of lowest to highest grand mean errors, the scanner accuracies were: EinScan® Pro 2X (AUD$7.5K) = 0.056 mm, Artec® Spider (AUD$36K) = 0.156 mm, NextEngine® Ultra HD (AUD$4K) = 0.139 mm and iPhone photogrammetry application Qlone® (iPhone, AUD$2K) = 0.936 mm. Large reductions in mean errors for all scan methods were observed when scans of bones that extended beyond the instrument's scan volume were removed. Qualitative analysis by anatomy experts rated Artec® scan quality highly (9.3/10), followed closely by EinScan® (8.8/10).

Conclusion/s: EinScan® and NextEngine® met their respective manufacturer stated accuracy values, while Artec® demonstrated much larger errors. Qlone® photogrammetry produced very large and irregular errors and is unlikely to be appropriate for rigorous scientific analysis involving 3D scans. Future research must continue to validate whether scan errors are permissible for specific scientific applications and research, with the methods of this study being a good starting point for accomplishing this.

The flexor digiti minimi muscle and the complex relations of plantar fourth and fifth rays

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Introduction: The lateral two rays of the foot are poorly understood, particularly on the plantar aspect. This increases outcome uncertainty with the repair of fifth metatarsal fractures, which are common and confounds understanding of more complex lateral ray degenerative disorders. The intrinsic muscles of the fifth ray include the abductor digiti minimi and flexor digiti minimi (FDM) muscles. There has been suggestion of an opponens digiti minimi (ODM) muscle, The interactions of these muscles with supporting tissues are key to understanding the lateral rays. The aim of this study was to assess the muscles of the lateral rays and their relations.

Materials and methods: Genelyn-embalmed feet (n=23; mean age=85 ± 4.7 years; female=11, male=12) were dissected using a fascicular approach. Each muscle was modelled in a 3D virtual environment using a digital microscribe.

Results: The FDM muscle was composed of either one (n=11) or two (n=12) bellies. The orientation of fibres (longitudinal or oblique) and distal attachments of these muscle bellies varied such that two main groups with a total of six variants were characterised. There was no evidence of a separate ODM muscle.

Conclusion/s: The common attachments suggest that all six types were all of the same muscle. The current study can therefore offer no support for the inclusion of the ODM muscle. The oblique fibres observed may contribute to rotational deformity of the fifth ray, and therefore be important to consider in fracture fixation. Acutely, this may make repair difficult, less predictable, or put other structures at risk.

The anatomical relationships of intrinsic plantar foot compartments are relevant to the radical treatment of acute foot compartment syndrome

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Introduction: Acute compartment syndrome is a potentially life-changing condition and is treated surgically. Accurate anatomical knowledge is essential for surgical treatment. Foot compartments, unlike those in the leg, are not well characterised. Several foot compartment models with between three and ten compartments have

been proposed, based on anatomical, rather than clinical, criteria. The criterion for surgical intervention is a sustained internal compartment pressure of 30mmHg.

Materials and methods: Cadaveric specimens (three fresh, 17 embalmed) were used to investigate foot compartments with potential for sustaining an internal pressure of 30mmHg. Possible communications between compartments, and effects of increased pressure in one compartment on neighbouring compartments were also studied. The results of dye injections followed by dissection best aligned to the three-compartment model. Ultrasound was used to confirm accuracy of cannulation for saline delivery to the three compartments, raising internal pressure, which was then monitored.

Results: Each of the three compartments individually sustained an internal pressure of 30mmHg for six to ten hours with saline injection. Internal pressures also rose in the two non-injected compartments, although not to a clinically relevant extent. Dye injections were confined within medial and lateral compartments, indicating these fascial spaces did not communicate with others. Centrally, dye enveloped both flexor digitorum brevis and quadratus plantae within the same space.

Conclusion/s: The three-compartment model (medial, central, lateral) is best supported. Dye injections show these compartments are enclosed by fascia sufficient to sustain pressure rises capable of causing acute compartment syndrome in living people. Our findings guide surgical approaches.

Estimating subject-to-camera distance from anatomy recorded in facial images

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Introduction: Craniofacial superimposition (CFS) is a forensic identification technique that uses a skull and facial photograph to create a photographic overlay. For the comparison to be anatomically valid, the camera perspective of the two images must match. It is critical that the subject-to-camera distance (SCD) of the reference facial photograph is estimated for skull photography. In 2017, the *PerspectiveX* algorithm was created for this purpose, however, the initial formulation is limited to frontal photographs only. This study aims to extend and validate the methods for profile face views.

Materials and methods: An extension to the *PerspectiveX* method was formulated to enable SCD estimation in profile views from just the face anatomy. Ten adults were photographed at 15 different known SCDs with 15 different cameras with multiple different lenses. *PerspectiveX*'s profile extension was applied to 3,418 photographs and the SCD estimation error was recorded in each case.

Results: Subject-to-camera distance in frontal and profile photographs could be accurately estimated in digital single-lens reflex (DSLR) cameras using the *PerspectiveX*, with mean signed errors (MSE) of 9.8% and 10.8% respectively. In the context of craniofacial superimpositions these errors, generate a 1% total difference (2mm) in facial height, which is generally considered to be tolerable. Tests revealed smartphone cameras to produce larger errors with MSEs ranging from -41.5% to 31.3%, which is unacceptable at shorter SCD such as <3m.

Conclusion/s: This study supports the use of PerspectiveX with both front and profile photographs, but warns against its use on images taken using smartphone cameras.

A unique coincidence of multiple musculotendinous variations of the forearm and hand

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Introduction: Variation of the musculotendinous structures of the forearm and hand is commonly observed in the clinical setting. An understanding of these variations is important in the diagnosis and management of forearm, and hand pathologies, as well as during the delivery of anatomical education to clinical professionals. However, these variations are typically reported as a single variation. The coincidence of multiple musculotendinous variations of the forearm and hand is equally relevant but is not well documented.

Materials and methods: Routine prosection was carried out on both upper limbs of a male cadaver at Macquarie University, Sydney, Australia. Variations were observed, photographed and measurements of muscle bellies and tendon lengths were obtained. Institutional ethics approval was received for this project.

Result/s: Variations observed were asymmetrical. Bilateral variations included extensor medii proprius, a tendinous slip from abductor pollicis longus to abductor pollicis brevis, and a bifurcating extensor digitorum tendon between the fourth and fifth digits. Left unilateral variations included a reversed palmaris longus and a

tendinous slip from flexor digitorum superficialis to the fourth tendon of flexor digitorum profundus. Right unilateral sided variations included a tendinous slip from the fourth tendon of extensor digitorum into the extensor hood of the fourth digit.

Conclusion/s: The coincidence of a change in typical anatomical position, the addition of accessory muscles and the addition of numerous accessory tendinous slips in this case is unique. This case study provides an example of the minimally understood clinical reality that is coincidental anatomical variation.

Comparison between real color sectioned images and corresponding ultrasound images for palmar wrist anatomy

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This study investigated to identify sequential changes in the sites and shapes of palmar wrist structures on the sectioned images and to compare these with those corresponding ultrasound (US) images. The sectioned images of the whole body were made from 70-year-old male cadaver. Color depth, intervals, resolution, and pixel size of the sectioned images were 48 bits color, 0.5 mm (trunk), 8688 x 5792 pixels, and 0.06 mm x 0.06 mm, respectively. Signed written informed consent was obtained from the single subject. Sectioned images and US images of the wrist were compared and labeled to analyze serial changes of the sites and shapes of the wrist structures. This study was approved by the Institutional Review Board of the Catholic Kwandong University (IRB no. CKU-21-01-0109). Serial changes of the sites and shapes of the structures from the distal forearm to the proximal metacarpal distinctively occurred in the bones, including their articulating parts, and in the median nerve, ulnar artery, ulnar nerve, and the flexor pollicis longus tendon, with the thenar and hypothenar muscles. These images of the wrist may yield guidelines for diagnosing various pathological lesions in the wrist.

An anatomical study of connections between the orbicularis oculi and levator labii superioris alaeque nasi

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Introduction: This study investigated to determine the anatomical connections between the inferior fibers of orbicularis oculi (OOc inf.) and the levator labii superioris alaeque nasi (LLSAN), providing morphological variations of the connecting fibers.

Materials and methods: This study examined the orbicularis oculi (OOc) and LLSAN of 44 specimens from 22 embalmed adult Korean cadavers. This study was approved by the Institutional Review Board of the Catholic Kwandong University (IRB no. CKU-21-01-1003).

Result/s: Connecting fibers between the OOc inf. and LLSAN were observed in 13 of the specimens (29.5%). Connecting patterns of the OOc inf. to the LLSAN were classified into three categories according to the directions of the connecting fibers. Type I (6 specimens, 13.6%), in which some of the OOc inf. coursed medially to blend with the lateral originating fibers of the LLSAN. Type II (5 specimens, 11.4%), in which some of the OOc inf. descended vertically to blend with the LLSAN. Type III (2 specimens, 4.5%), in which both types I and II were found simultaneously. Some of the OOc inf. coursed medially to blend with the lateral originating fibers of the LLSAN, and some of the OOc inf. descended vertically to blend with the LLSAN.

Conclusion/s: In the present study, the connecting fibers between the OOc inf. and LLSAN were located where movements of the eye, nose, and upper lip occur simultaneously. Additionally, these connecting fibers had various patterns, probably contributing to forming complicated expressions and deepening wrinkles in the region.

Anatomical contribution of the iliotibial tract to the knee joint capsule

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The aim of this study was to clarify the anatomical contribution of the iliotibial tract to the knee joint capsule. Knee joint area was examined in 19 specimens of 10 embalmed Korean adult cadavers. This study was approved by the Institutional Review Board of the Daegu Catholic University (IRB no. CR-22-051-L). Approximately a medial half or medial two thirds of the iliotibial tract obliquely descended toward the anterior joint capsule and it almost coursed transversely to cover the patella as well as the area just below the patella in all specimens (100%). The rest portion descended to attach to the anterolateral aspect of the lateral condyle of the tibia in all specimens (100%). The amount of the iliotibial tract that covered the patella varied. The iliotibial tract covered the whole anterior surface of the patella (2 specimens), approximately lower two thirds of the patella (6 specimens), lower half (3 specimens), and apex of the patella (8 specimens). These parts of the iliotibial tract coursed almost transversely superficial to and below the patella. Some of the aponeurosis of the vastus medialis descended obliquely and coursed transversely below the patella.
Conclusion/s: Thus, the iliotibial tract is thought to reinforce the anterior joint capsule, supporting the patella like a sling. Since the iliotibial tract is broadly attached to the ilium and tibia and covers the lateral thigh, its contribution to the anterior joint capsule related to the patella can connect the movements of the hip, leg and knee joint.

Evolution of anatomy education: Functional 3D printed foot model

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Anatomy is a foundational medical and health education component due to its critical role in effective clinical practice. However, anatomical education has transitioned from traditional 'hands-on' teaching methods such as cadaveric dissection, to be replaced by the increasing use of commercially produced two- or three-dimensional anatomical static models, prosected and plastinated specimens, and e-learning resources.

This change alters students' learning experience by minimizing 'hands-on' opportunities impacting long-term knowledge retention; evidence shows a rapid decline in anatomical knowledge over each year of study. 3D anatomy models benefit students with low visualization-spatial ability by helping decrease cognitive load, mediating working memory, and creating accurate mental representations scaffolding from hands-on experience. However, despite the benefits, commercially produced 3D models are primarily static, limiting fidelity and translation of knowledge to practice. Furthermore, many commercial 3D anatomy models currently used in undergraduate anatomy teaching do not resemble realistic anatomical structures.

Foot anatomy and function are challenging and an area prone to many chronic diseases that impact mobility and mortality. Finding educational solutions for anatomical education is significant when anatomical structures and pathology management are so complex.

This narrative review highlights the need for further innovation of functional 3D printed foot models to match clinical scenarios and translate to clinical practice. Thus, promoting prevention, early detection, and treatment of foot-related pathologies, leading to a more mobile and active population.

Effectiveness of peer discussion during gross anatomy teaching

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Active participation in discussion with peer can enhance the students learning during anatomy class. Currently, cadaveric dissection in teaching of gross anatomy is substituted by other techniques such as using of 4D anatomy, plastinated prosected specimens. We were trained as teacher-centered learning where the lecturer's didactic knowledge is conveyed to the students. Teaching learning in Newcastle University Medicine Malaysia

(NUMED) is student-centered learning where the students should know what they want to learn. The medical program of NUMED is case-based learning, and the total 25 cases are running from year 1 and year 2; like case 1 is hypertension and case 24 is trauma of lower limb. Anatomy was taught as lectures and practical according to the learning outcomes. Prior to attend the practical, the year 2 MBBS students require to do the self-directed exercise prepared by anatomy lecturers. With relate to the lower limb anatomy learning outcomes, 20 single best answer questions (SBA) are prepared by expert lecturers. Students are assigned into 4 sub-groups of 10 students in each. At beginning of the practical, a brief explanation of lower limb anatomy by the lecturer, followed by 45 minutes peer discussion. 117 of year 2 MBBS students answered 20 SBA questions before and after peer discussion as a formative assessment. The average score was 65.6 before peer discussion and 78.7 after peer discussion. The outcome of this study revealed that adding the peer discussion after lecturer explanation can improve the gross anatomy learning.

The distal interactions of the quadratus plantae muscle

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Introduction: The quadratus plantae muscle (QPm) and flexor digitorum longus (FDL) tendon are important in toe flexion, with increased importance placed on the QPm. Previous work suggests that the QPm has multiple bellies proximally, and distinguishable tendons to the FDL at the midfoot, but their distal relations *in situ* remain unclear. With electromyographic studies suggesting that the QPm is a power and independent toe flexor, are the distal tendons of this muscle more distinct from the FDL tendons than previously thought? The aim of this pilot study was to determine the mid- to forefoot relations of the QP muscle.
Materials and methods: Genelyn-embalmed feet (n=3; mean age=92±6.2 years) were investigated. Using fascicular dissection, the central plantar column was examined, and the tendons of the QPm traced to their distal terminus.
Results: The tendons and muscles of the central plantar column were inconsistently encapsulated by fascia from the mid- to forefoot. The QPm was composed of either one (n=2) or two bellies (n=1), with the deepest always giving off tendinous slips to the second to fourth rays (n=3). These were separated from one another and the surrounding soft tissues by fascia in the midfoot, but in the forefoot, the QP tendons merged with the FDL tendons.
Conclusion/s: The prominent muscle bellies and tendons of the QPm suggest that it is an independent flexor of the lesser toes. With further investigation, this may contribute to improving surgical applications of the central plantar foot, such as ensuring favourable functional alignment of tendons.

Dissecting cadavers at the molecular level

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Introduction: Cadavers are used as a teaching and research resource at both the macroscopic and microscopic level. However, exploring cadavers at the molecular level or genetic level has proved to be difficult. Extracting DNA from embalmed cadavers is known to be problematic, cellular decay occurs rapidly and damages the genetic material. Embalming cadavers with fixative such as formalin, creates molecular cross-linking within the tissues and slows the process of decay, however due to the strength of the chemicals used to embalm, this too can induce damage to molecules. This pilot project explored the feasibility of extracting viable DNA from different tissues which may provide an opportunity to explore pathologies that cannot be addressed in patients.
Materials and methods: Method 1. Biopsies were taken from a range of tissues and then were processed using the Qiagen QiaAMP DNA FFPE Tissue Kit. Method 2. Biopsies were taken from a range of tissues were processed, heated to 95ºC to reverse the cross-links, and followed with a standard phenol/chloroform extraction. The quality and quantity of the DNA will then be determined using the Nanodrop and Qubit fluorimeter. The purified DNA was then used for real-time polymerase chain reaction (PCR) analysis.
Results: The most favorable DNA extraction was the standard phenol/chloroform method, yielding not only the greatest quantity of DNA from a larger range of tissues, but also was the purest enabling downstream Real Time PCR amplification.

Conclusion/s: Viable DNA was successfully extracted from embalmed cadaveric tissues and used for real time PCR analysis, showing that DNA extraction and downstream genetic testing is possible.
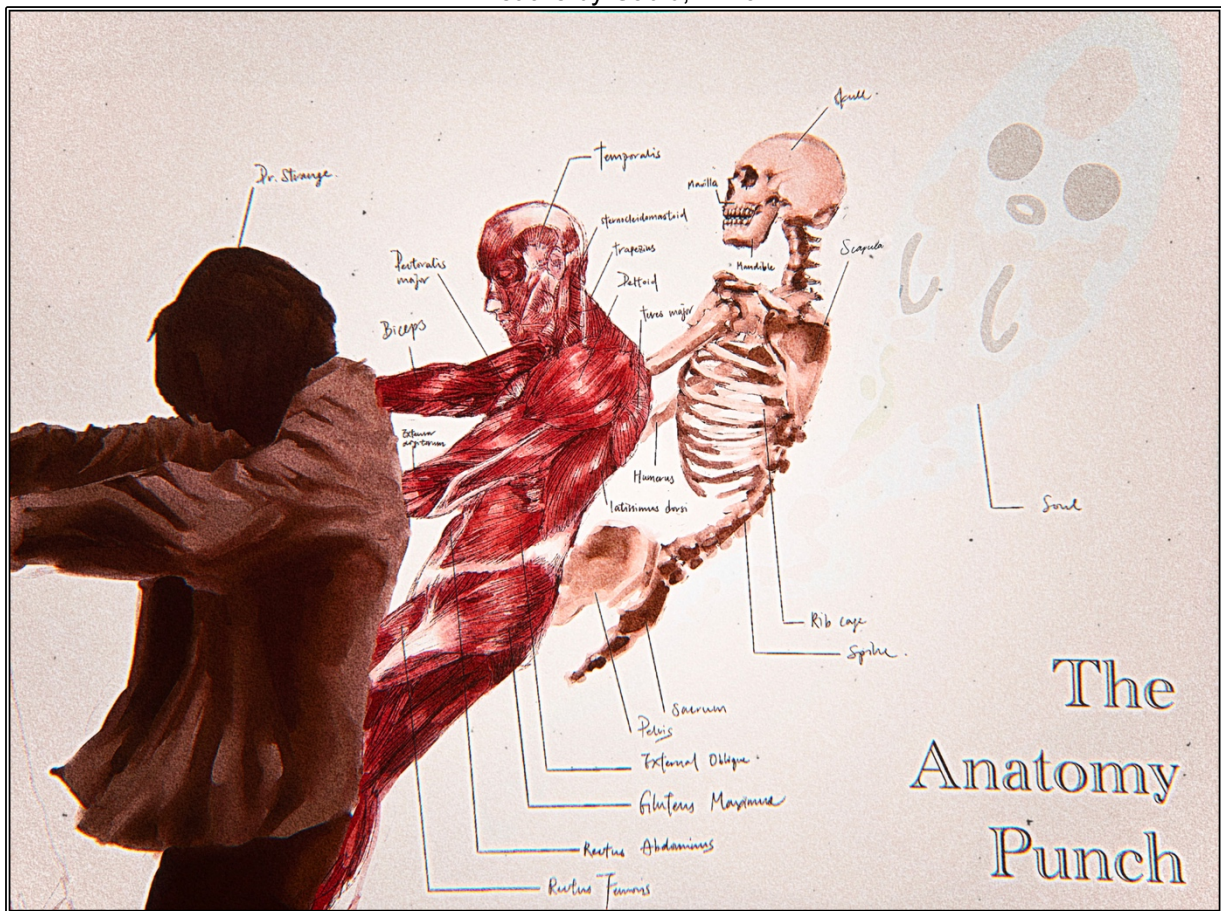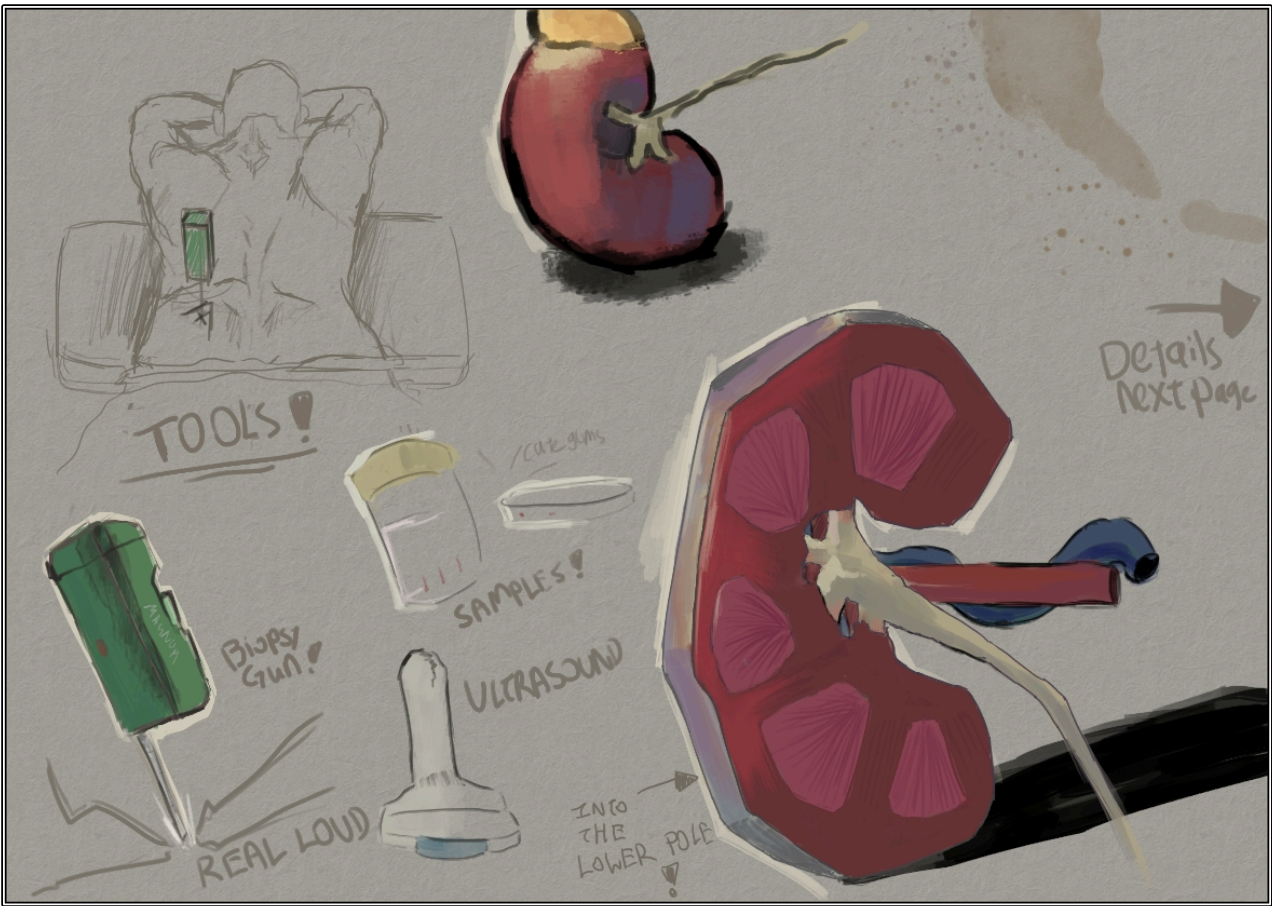
Student art

The neck by Allsop, Julia

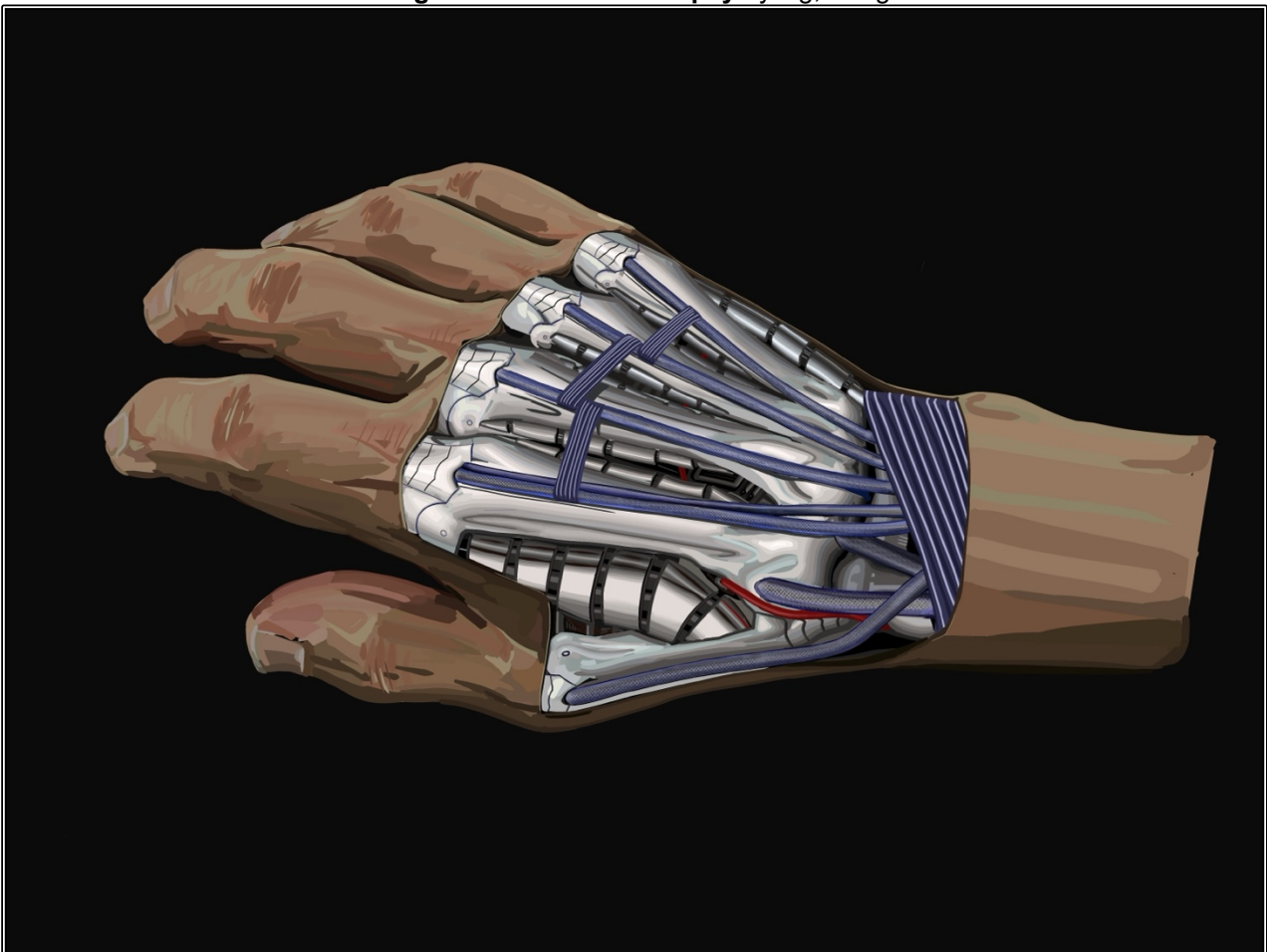

Only skin deep by Duncombe, Phoebe

Breathe by Gauld, Anna

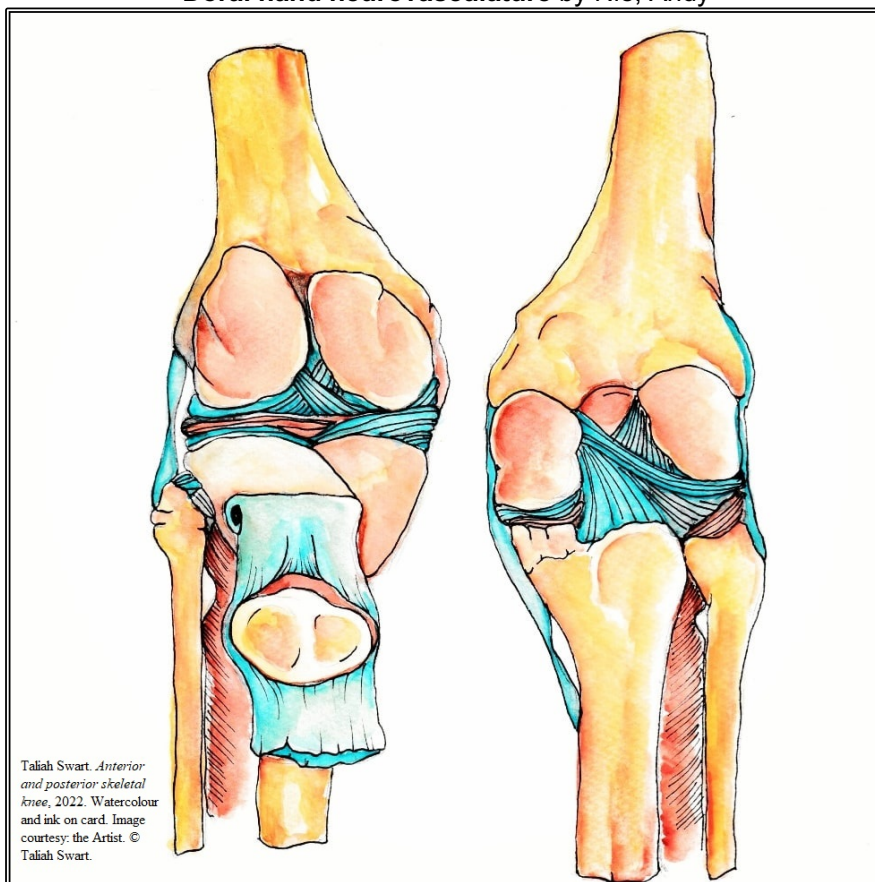**The anatomy punch** by Lam, Ching

Midnight notes on renal biopsy by Ng, Yung Yat

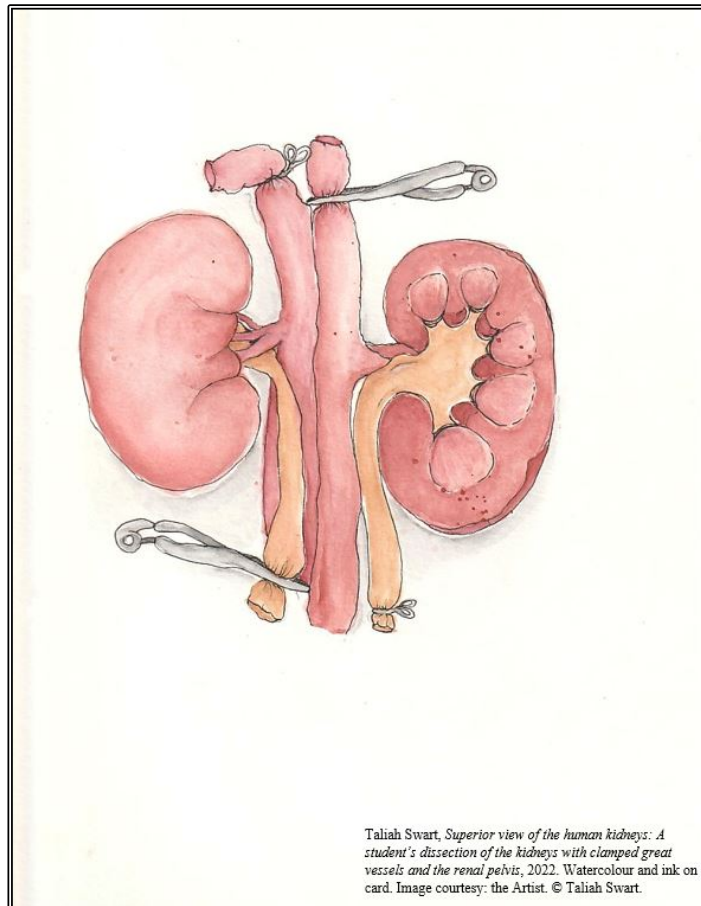**Prosthesis design inspired by dissection** by Nie, Andy

Doral hand neurovasculature by Nie, Andy

Taliah Swart. *Anterior and posterior skeletal knee*, 2022. Watercolour and ink on card. Image courtesy: the Artist. © Taliah Swart.

Anterior and posterior knee by Swart Taliah

Taliah Swart, *Superior view of the human kidneys: A student's dissection of the kidneys with clamped great vessels and the renal pelvis*, 2022. Watercolour and ink on card. Image courtesy: the Artist. © Taliah Swart.

Superior view of human kidneys and associated vasculature by Swart, Taliah