Anatomical Society Summer Meeting 2026

Musculoskeletal Anatomy

University of Bristol, Anatomy Building, 32 Southwell Street, Bristol, UK. BS2 8EJ

15th – 17th July 2026

University of BRISTOL

Contents

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#AnatSocSummer26 #AnatSocBristol

Musculoskeletal Anatomy

Welcome

The 2026 Anatomical Society Summer Meeting is hosted by Bristol Anatomy at the University of Bristol, 15th -17th July 2026. The conference brings together researchers, educators and clinicians to explore the full breadth of musculoskeletal anatomy, spanning basic and clinical anatomy, biomechanics, comparative and veterinary anatomy, palaeoanthropology, evolutionary morphology.

By highlighting musculoskeletal research from molecular mechanisms to whole-body function, and from living systems to fossil evidence, the meeting aims to encourage cross-disciplinary dialogue and new collaborations!

#AnatSocSummer26 #AnatSocBristol

Thanks to the Team

Dr Rebecca Shepherd (Bristol Meetings Organiser)
Jo Tomlinson, Allison Fulford, Lucy Hyde, Katrina Jones, Charlotte Miller, Russ Peters, Katie Shine, Michelle Spear, Ingmar Stacey, Natalia Trepp Centellas, Rebecca Willis

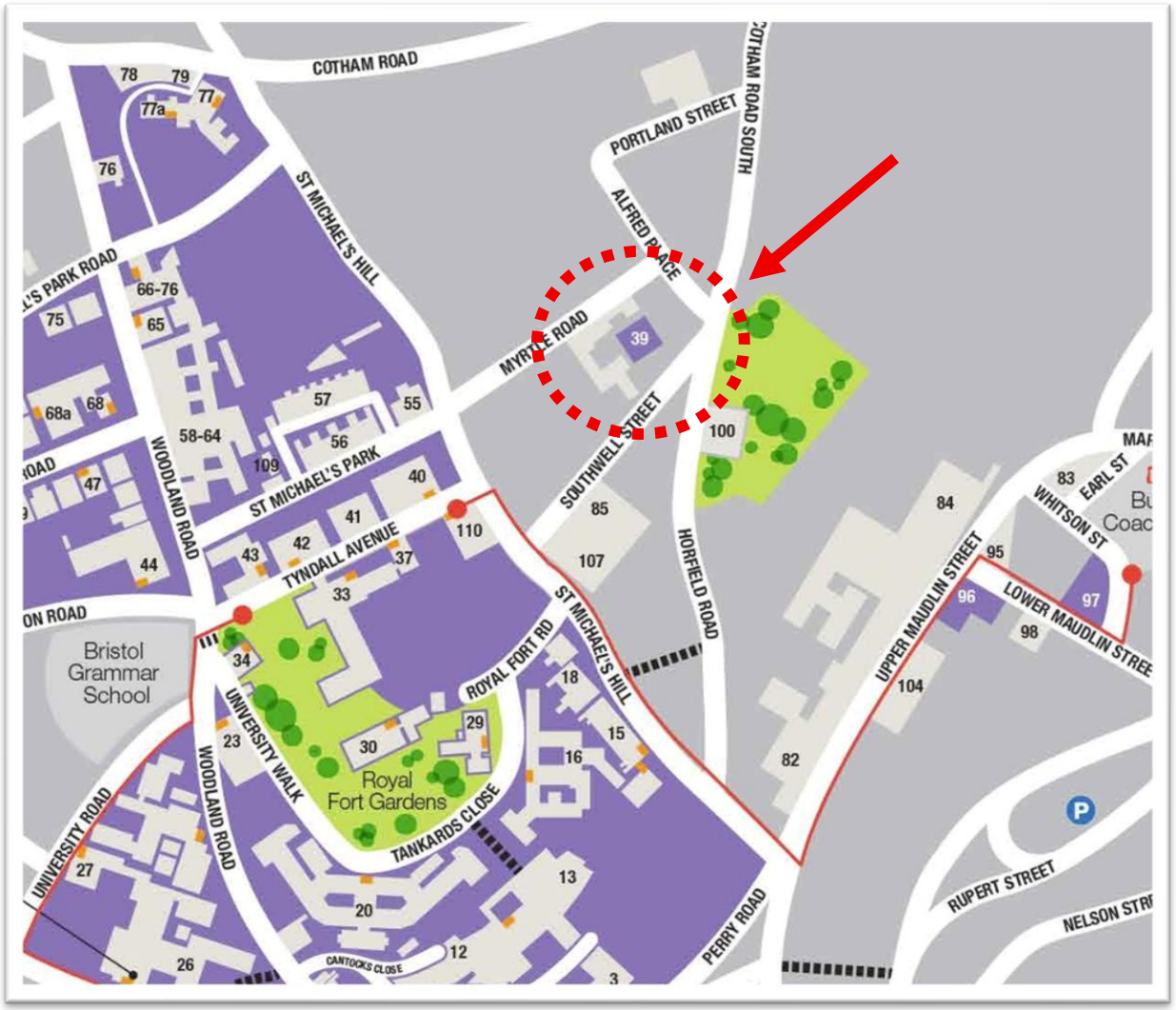
Rocky Cheung – Anatomical Society Meetings Officer

Hannah Webb- Anatomical Society Meetings Administrator

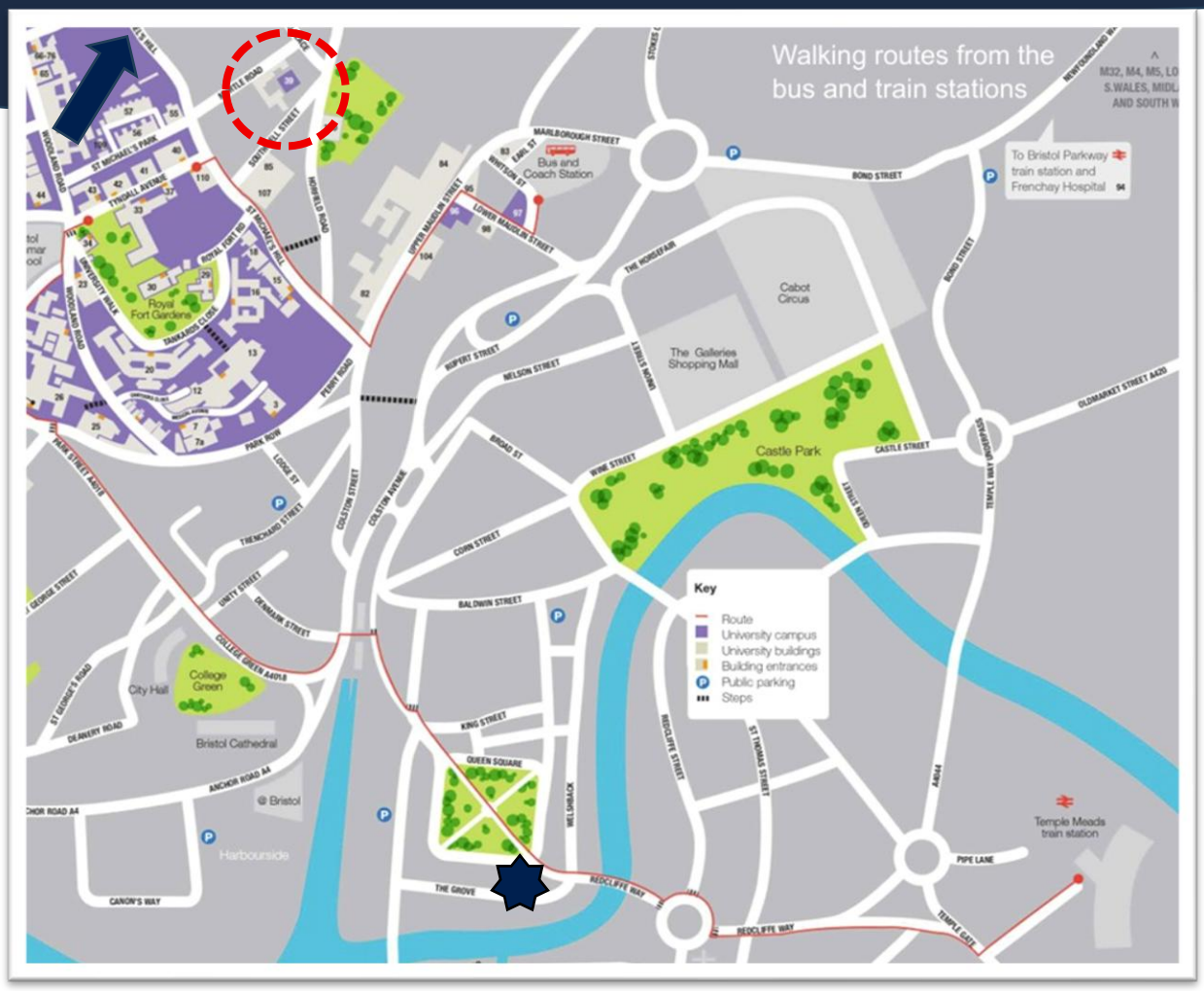
anatomicalsocietymeetings@gmail.com

Location

School of Anatomy,
32 Southwell Street,
University of Bristol,
Bristol, UK.
BS2 8EJ



Bristol



Riverstation, The Grove, Bristol. For the gala dinner.

The White Bear, 133 St Michael's Hill. Early Career Social

Anatomy building, 32 Southwell Street Building.

CONFERENCE INFORMATION

Pre conference workshop: Wednesday, 15th July, 10am

Title: Applied comparative anatomy: Investigating functional morphology in vertebrates as a tool for anatomy education
Organiser: Dr Natalia Trepp, Bristol Anatomy, Bristol
Booking: Open to everyone.
Description: This workshop is designed to enhance/attain practical skills on the identification and discussion of the systemic functional morphology of different species of vertebrates (mainly amniotes).
The aims for the session are to:

- Compare and contrast morphological and functional differences in the body systems of different species of vertebrates.
- Apply your anatomical knowledge of key mammalian species (the one you are most familiar with, e.g., human) to recognise less studied species of vertebrates (mammalian and non-mammalian).
- Recognise and discuss key organ and musculoskeletal adaptations in a range of vertebrate species.
- Explain how anatomical adaptations influence function in a range of vertebrate species.
- Discuss how you would teach comparative vertebrate anatomy across a range of species.

In this session participants will have the opportunity to manipulate osteological and wet specimens of different species of vertebrates with the aim to compare and contrast the anatomical adaptations that have enabled them to thrive in different environments. The session will also draw on practical skills beyond human anatomy and use comparative anatomy to enhance anatomical education.

Oral Presentations

We ask that you email your presentation slides to **rebecca.shepherd@bristol.ac.uk** by **8:30 am on the day of your presentation**. This will help us ensure that all talks run smoothly and on time. Please make sure the organisers have your presentation before your session starts.

Poster Presentations

Posters will be shown in the Student common room/LT2. Please make time to visit them during your breaks.

PRIZES

Anatomical Society Cave Young Investigator best poster prize

Awarded for the best poster presentation by an attendee, normally of relatively junior status at the AS summer meeting. The work presented shall have been carried out while the first author was an undergraduate or postgraduate student and presented within 1 year of the award of the Doctorate. Presenters will be judged in session A (Wednesday 15th 4:30pm) or session B (Thursday 16th 4:45pm).

Anatomical Society Prize

Awarded biennially on the recommendation of Council to a distinguished morphological scientist. Presented by Professor John Morris, Thursday 16th July, Session F.

Dr Sophie Miller Memorial Prize Presentation: Wednesday 15th July, Session B

Ms Lauren Barrett, University College Cork (UCC), Ireland.

'Uncovering the potential of SKOR1 as a novel therapeutic target for Parkinson's Disease'.

Dr Sophie Miller was an Anatomical Society funded PhD student from 2011-2014 at the University of Cambridge. She investigated olfactory ensheathing cells (OECs) and their potential for transplant-mediated repair of the central nervous system. During this time, she presented at many Anatomical Society meetings, with one of the publications from her PhD work appearing in the September 2016 issue of the Journal of Anatomy. Sophie was particularly supportive to her other early career researchers and colleagues in scientific and career development. She passed away in December 2016. In her memory, her family have generously provided support for young and aspiring anatomical researchers through the Anatomical Society.

SOCIAL EVENTS

Wine reception: Wednesday 15th July from 4:30pm, Anatomy Building

This will follow session B, and is at the same time as the first poster judging session.

Gala dinner details: Thursday 16th July 7pm

The Gala dinner will be held at the Riverstation, The Grove, Bristol, BS1 4RB (Bristol Harbourside). Tickets were reserved during registration. ~25-30 mins walk (1.3miles).

Starter

Ham hock terrine, sauce gribiche, house pickles *or* salt-baked celeriac, walnut, miso crème fraiche, leaves *(v, vg option)*

Main

Braised Aberdeen Angus ox cheek, mustard mash, seasonal veg, salsa verde *or* hand-rolled gnocchi, courgette, parmesan (v, vg option)

Dessert

Lemon posset, oat crumble

Early Career and Student Social: Wednesday 15th July from 7pm

The White Bear, 133 St Michael's Hill, Kingsdown, BS2 8BS. ~10 mins walk from the Anatomy Building (0.5miles) This event is hosted by the early career team at Anatomical Society. Casual drinks, pizza and a few fun social activities to help you get to know others in a similar position in their careers. Everyone is welcome. Meet outside the anatomy building but the cat at 6:45 pm to walk over together or see you there.

Invited Speakers

An exciting line-up of invited speakers will present at this year's meeting.

Professor Tim Holsgrove

Associate Professor of Biomedical Engineering, University of Exeter

Session: Wednesday 15 July · 12:30–13:00 · Session A · LT1

Chair: Russ Peters / Jo Tomlinson

Talk title: *Population-based spine testing using a six-axis bioreactor*

Biography*:* Tim Holsgrove is an Associate Professor of Biomedical Engineering at the University of Exeter. His research integrates in-vivo, in-vitro, and in-silico approaches to address complex clinical and biological challenges.

A key area of expertise is in the development of advanced test platforms to replicate the complex loading that the spine is subjected to during activities of daily living. These platforms are then used to explore spine biomechanics, mechanisms of injury and degeneration, and how mechanical loading influences cellular behaviour using whole-organ intervertebral disc cultures.

Dr Katrina Jones

Senior Lecturer & Royal Society University Research Fellow, School of Earth Sciences, University of Bristol

Session: Thursday 16 July · 09:00–09:30 · Session C · LT1

Chair: Natalia Trepp Centellas / Khadijah Awaisi

Talk title: *Telling the whale's tail: Anatomical evolution across the land-to-water transition in mammals*

Biography: I am a Senior Lecturer and Royal Society University Research Fellow at the University of Bristol in the Palaeobiology group at the School of Earth Sciences. Previously, I was a Presidential Fellow in the Department of Earth and Environmental Sciences at the University of Manchester, in the Ancient Life Group.

My lab studies locomotor evolution in the mammalian skeleton and examine the impacts of adaptation and constraint during major ecological transitions e.g., origins of mammals, land-to-water, evolution of novel locomotor modes. We combine techniques from comparative anatomy and dissection, to morphometrics, biomechanics, and evolutionary modelling to understand the factors impacting morphological evolution and phenotypic diversity through time. The lab has a special focus on the axial skeleton, a critical but understudied component of the mammalian skeleton.

Invited Speakers

Dr Charlotte Miller

Associate Professor in Comparative Anatomy, University of Bristol

Session: Thursday 16 July · 10:30–11:00 · Session D · LT1
Chair: Katrina Jones / Katie Shine
Talk title: *Life with substantial error bars: locomotor adaptations in complex environments*
Biography: Charlotte Miller is an Associate Professor in Comparative Anatomy at the University of Bristol. Her research background is in biomechanics through an evolutionary lens of functional morphology, having trained at Bristol, the Royal Veterinary College and Duke University.

Charlotte's research programme centres on animal-substrate interactions across Mammalia. She explores foot-substrate contact, how centre of mass movements impact ground contact, and what body shape and anatomy can (and can't!) help us to predict.

Professor Chrissy Hammond

University of Bristol

Session: Thursday 16 July · 14:00–14:30 · Session E · LT1
Chair: Jeremy Mortimer / Michelle Spear
Talk title: *Invited Speaker Lecture*
Biography: Chrissy Hammond spends an unreasonable amount of time persuading zebrafish to answer questions about how skeletons work. Her lab at the University of Bristol uses genetics, live imaging and an unhealthy enthusiasm for watching cells do unexpected things to explore how bones, joints and connective tissues develop, regenerate and age. Somewhere along the way she accidentally acquired interests spanning developmental biology, anatomy, immunology, biomechanics and ageing, and has shown remarkably little inclination to specialise ever since. She is particularly fond of experiments that begin with someone saying, “That's odd...”, because they usually turn out to be the interesting ones. When not trying to work out why a fracture heals (or doesn't), she can usually be found persuading audiences that fish are far more useful than they have any right to be.

She apologises in advance for the inevitable fish videos.

Invited Speakers

Professor John Morris

Professor of Human Anatomy, University of Oxford

Session: Thursday 16 July · 16:15–16:45 · Session F · LT1

Chair: Rocky Cheung / Lucy Hyde

Talk title: *An Unexpected life in medical science and education*

Biography: Professor John Morris is Professor of Human Anatomy at the University of Oxford work has centred on structure-function relations in neuroendocrine systems. He has made a about the mechanisms of release of peptide hormones from cells of the pituitary gland. His e prevalent idea of molecular dispersion as a mechanism of peptide release was wrong, and th released by exocytosis. His recent work has centred on elucidating the mechanisms whereby release of peptide hormones from magnocellular dendrites.

Ms Lauren Barrett

Dr Sophie Miller Memorial Prize Winner, University College Cork

Session: Wednesday 15 July · 15:00–15:30 · Session B · LT1

Chair: Rebecca Shepherd / Christopher Smith

Talk title: *SKOR1 inhibition as a therapeutic approach to prevent α-synuclein-induced degeneration in models of Parkinson's disease*

Biography: Lauren is a 3rd year PhD student at University College Cork (UCC) in Ireland and is one of the Anatomical Society's funded PhD students. Lauren is primarily supervised by Professor Gerard O'Keeffe and Professor Kieran McDermott. Her research explores SKI Family Transcriptional Corepressor 1 (SKOR1) as a novel therapeutic target for Parkinson's Disease (PD) using both in vitro and in vivo models of PD.

Lauren also has a passion for scientific outreach and currently serves as the vice-president of the Neuroscience Ireland Early Career Researchers Network (NSI-ECRN).

Invited Speakers

Dr Zoe Davies

Lecturer in Veterinary Sciences, Harper & Keele Veterinary School

Session: Friday 17 July · 09:00–09:30 · Session G · LT1

Chair: Charlotte Miller / Katie Shine

Talk title: *Locomotion on two, three and four legs: the comparative anatomy of movement*

Biography: Zoe is a Lecturer in Veterinary Sciences at Harper & Keele Veterinary School and leads the Companion Animal Health Sciences Research Group at Harper Adams University. In addition to leading the first year Veterinary Anatomy and Physiology module in her teaching, Zoe's research centres on locomotor biomechanics and functional anatomy in canines and equines, with an emphasis on understanding the factors influencing performance and musculoskeletal health. Her work has included gait analysis across multiple species and research into the biomechanics of tripedal locomotion in canine amputees. Zoe graduated from the University of Bristol's School of Anatomy with a degree in Equine Science before undertaking a PhD at the Royal Veterinary College's Structure & Motion Laboratory. Her doctoral research examined the biomechanical factors limiting athletic performance in racehorses. Zoe is also a qualified veterinary physiotherapist and has further interests in the efficacy of physiotherapeutic interventions in veterinary patients.

Professor Sorrel Langley-Hobbs

Professor of Feline Orthopaedics, University of Bristol

Session: Friday 17 July · 11:00–11:30 · Session H · LT1

Chair: Rebecca Shepherd / Albi Carson

Talk title: *Osteopetrosis in the cat*

Biography: I am a veterinary orthopaedic surgeon with specialist interest in cat bone and joint disease. I operate on cats with fractures and joint conditions such as cranial cruciate ligament rupture, patella luxation and hip dysplasia, and I teach undergraduate and postgraduate veterinary surgeons and nurses on all orthopaedic topics.

My clinical research is focused on a condition that I recognised called PADS (patella fracture and dental anomaly syndrome), where cats have persistent deciduous teeth and brittle bone resulting in pathological fractures of specific bones.

SCHEDULE

BRISTOL ANATOMY CENTRE · 15–17 JULY 2026

Anatomical Society Summer Meeting 2026

Time	Session / Title	Type	Speaker(s)	Chair	Location	Notes
Wednesday 15 July 2026						
10:00–12:00	**Registration & workshops**	Registration / Workshops	Registration – Lucy Hyde and Jo Tomlinson		Veterinary Dissection Room – Natalia and Rebecca	
Session A 12:00–13:30 · LT1						
12:00–12:15	**Welcome and housekeeping**		**Head of Anatomy**	Rebecca Shepherd	LT1	*10 mins*
12:15-12:30	**Tribute to Prof Harold Ellis**		**Prof. Ceri Davies**	Rebecca Shepherd	LT1	*5 mins*
12:30–13:00	**Population-based spine testing using a six-axis bioreactor**	Invited Speaker	**Dr Timothy Holsgrove**	Russ Peters / Jo Tomlinson	LT1	*25+5 mins*
13:00-13:15	**Structural capacity, not mechanical demand, dominates regional fracture vulnerability in the human mandible: a patient-specific finite element study**	Talk	Răzvan Costin Tudose	Russ Peters / Jo Tomlinson	LT1	*10+5 mins*
13:15 – 13:30	**Can Stable Cervical Bony Morphometry Support First-Line Screening of Cervical Canal Stenosis Compared with MRI Measures in MRI-Limited and Resource-Limited Settings?**	Talk	Ikenna Ikele	Russ Peters / Jo Tomlinson	LT1	*10+5 mins*
13:30–13:45	**Erector spinae muscle fibre size estimation using high-density surface electromyography in people with and without non-specific chronic low back pain**	Talk	Shilpa Purushotham	Russ Peters / Jo Tomlinson	LT1	*10+5 mins*
13:45–15:00	***Coffee / Tea / Posters Session***	Break	14:30 – Tour of Comparative Anatomy Museum (Lucy Hyde)		Foyer, LT2, Student Common Room	*Sponsor stands*
Session B 15:00–16:30 · LT1						

Time	Session / Title	Type	Speaker(s)	Chair	Location	Notes
15:00–15:30	**SKOR1 inhibition as a therapeutic approach to prevent a-synuclein-induced degeneration in models of Parkinson's disease**	Sophie Miller Prize	**Ms Lauren Barrett**	Rebecca Shepherd / Christopher Smith	LT1	25+5mins
15:30–15:45	**Architectural and functional Adaptations to eccentric Training in human adolescent Volleyball Players: a randomized controlled Trial**	Talk	Seda Gözener Canbülbül	Rebecca Shepherd / Christopher Smith	LT1	*10+5 mins*
15:45–16:00	**Investigating the expression patterns of intermediate filament proteins in mice to uncover the differential vulnerability of striated muscles in laminopathies and desminopathies**	Talk	Emad I H Shaqoura	Rebecca Shepherd / Christopher Smith	LT1	*10+5 mins*
16:00–16:15	**Mapping the Bony Landmarks of the Cavernous Sinus – A Morphometric Study on Human Skulls**	Talk	Cezar Octavian Morosanu	Rebecca Shepherd / Christopher Smith	LT1	*10+5 mins*
16:15–16:30	**See It Move: A New Dimension in MSK Anatomy Education**	Sponsor Talk	Daheen Lee, Primal Pictures	Rebecca Shepherd / Christopher Smith	LT1	*10+5 mins*
16:30–18:30	***Drinks reception / Poster session A***	Social	Anatomical Society Council to judge posters		Foyer, LT2, Student Common Room	*Sponsor stands*
From 19:00	***ECR Social — The White Bear***	Social	Christopher Smith, Lucy Steward, Albi Carson, Khadijah Awaisi		The White Bear	

Time	Session / Title	Type	Speaker(s)	Chair	Location	Notes
Thursday 16 July 2026						
Session C 09:00–10:00 · LT1						
09:00–09:30	***Telling the whale's tail: Anatomical evolution across the land-to-water transition in mammals***	Invited Speaker	**Dr Katrina Jones**	Natalia Trepp Centellas / Khadijah Awaisi	LT1	25+5mins
09:30–09:45	**Mandible function across the vertebrate water-to-land transition is underpinned by unossified tissues**	Talk	Hady George	Natalia Trepp Centellas / Khadijah Awaisi	LT1	*10+5 mins*
09:45–10:00	**Anatomical Determinants of Head Centre of Mass in Homo sapiens and Pan troglodytes**	Talk	Kira L. Crabtree	Natalia Trepp Centellas / Khadijah Awaisi	LT1	*10+5 mins*
10:00–10:30	***Coffee / Tea / Posters***	Break			Foyer, LT2, Student Common Room	
Session D 10:30–12:00 · LT1						
10:30–11:00	***Life with substantial error bars: locomotor adaptations in complex environments***	Invited Speaker	**Dr Charlotte Miller**	Katrina Jones / Katie Shine	LT1	25+5mins
11:00–11:15	**Darkest just before dawn: the role of the calcified cartilage in osteoarthritis**	ARDA Talk	Juliette Hughes	Katrina Jones / Katie Shine	LT1	*10+5 mins*
11:15–11:30	**Integrating Histology and Transcriptomics to Understand Human Skeletal Muscle Ageing Across the Lifecourse: From GTEx to Spatial Transcriptomics**	Talk	Nessrin Almaghtuf	Katrina Jones / Katie Shine	LT1	*10+5 mins*
11:30–11:45	**Reassessing the Flexor Digitorum Profundus enthesis in Jersey Finger: does dissection technique alter our anatomical understanding of tendon–bone attachment?**	Talk	Ashley Benge	Katrina Jones / Katie Shine	LT1	*10+5 mins*
11:45–12:00	**Mapping nerve entry points into the cervical portion of the human semispinalis capitis muscle for enhanced clinical precision**	Talk	*Seda Gözener Canbülbül*	Katrina Jones / Katie Shine	LT1	*10+5 mins*
12:00–14:00	***Lunch & Posters***	Lunch	13:30 - Tour of Comparative Anatomy Museum (Natalia Trepp Centellas)		Foyer, LT2, Student Common Room	*AGM optional — in LT1*

Time	Session / Title	Type	Speaker(s)	Chair	Location	Notes
Session E 14:00–15:15 · LT1						
14:00–14:30	**Invited Speaker**	Invited Speaker	**Prof Chrissy Hammond**	Jeremy Mortimer / Michelle Spear	LT1	
14:30–14:45	**Medial bias in Achilles tendon morphology in healthy young individuals: application of a validated ultrasound protocol**	Talk	Natasha Noel-Barker	Jeremy Mortimer / Michelle Spear	LT1	*10+5 mins*
14:45–15:00	**The talus bones with different types of calcaneal articular facets differ in their sizes**	Talk	Radik Khayrullin	Jeremy Mortimer / Michelle Spear	LT1	*10+5 mins*
15:00–15:15	**Enhancing Anatomy Education Through Immersive 3D Visualization of Real Human Data**	Sponsor Talk	Leila El Mardadi, Anatomage	Jeremy Mortimer / Michelle Spear	LT1	*10+5 mins*
15:15–15:45	***Coffee / Tea / Posters***	Break			Foyer, LT2, Student Common Room	
Session F 15:45–17:00 · LT1						
15:45–16:00	**Shape Variation and Covariation Between the Calvarial Sutures and the Viscerocranium in Normocephalic and Craniosynostotic Human Skulls**	Talk	Emily Baxter	Rocky Cheung / Lucy Hyde	LT1	*10+5 mins*
16:00–16:15	**Selenium and Magnesium Functionalised Scaffolds for Dual Bone Regeneration and Anti-Cancer Therapy**	Talk	Eavan Pakenham	Rocky Cheung / Lucy Hyde	LT1	*10+5 mins*
16:15–16.45	**An unexpected life in medical science and education**	Anatomical Society Prize Speaker	**Prof John Morris**	Rocky Cheung / Lucy Hyde	LT1	25+5mins
16.45–18:00	***Poster session B***	Posters	Anatomical Society Council to judge posters		Foyer, LT2, Student Common Room	
19:00	***Gala dinner***	Social			Riverstation	

Time	Session / Title	Type	Speaker(s)	Chair	Location	Notes
Friday 17 July 2026						
Session G 09:00–10:15 · LT1						
09:00–09:30	**Locomotion on two, three and four legs: the comparative anatomy of movement.**	Invited Speaker	**Dr Zoe Davies**	Charlotte Miller / Katie Shine	LT1	25+5mins
09:30–09:45	**Breaking the mammalian 'rule of seven' is associated with first rib repatterning in Xenarthra**	Talk	Elizabeth Webb	Charlotte Miller / Lucy Steward	LT1	*10+5 mins*
09:45–10:00	**Distinctive modulation of chewing dynamics in rabbits**	Talk	Roger W. P. Kissane	Charlotte Miller / Lucy Steward	LT1	*10+5 mins*
10:00–10:15	**What makes a hypermobile mandible? The development of the intramandibular hinge in snakes**	Talk	Maricci Basa	Charlotte Miller / Lucy Steward	LT1	*10+5 mins*
10:15–10:30	**3D Organon: Transforming Medical Education Through Immersive Technology**	Sponsor Talk	Fernando Montanes Salcedo, 3D Organon	Charlotte Miller / Lucy Steward	LT1	*10+5 mins*
10:15–11:00	***Coffee / Tea / Posters***	Break	10:30 - Tour of Comparative Anatomy Museum (Katie Shine)		Foyer, LT2, Student Common Room	
Session H 11:00–12:00 · LT1						
11:00–11:30	**Osteopetrosis in the cat**	Invited Speaker	**Prof Sorrell Langley-Hobbs**	Rebecca Shepherd / Albi Carson	LT1	25+5mins
11:30–12:00	**Prizes & closing remarks**	Closing	**Anatomical Society Council**		LT1	30mins

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INVITED SPEAKER TALK 1

Population-based spine testing using a six-axis bioreactor

Professor Tim Holsgrove

Associate Professor of Biomedical Engineering, University of Exeter

Biography

Tim Holsgrove is an Associate Professor of Biomedical Engineering at the University of Exeter. His research integrates in-vivo, in-vitro, and in-silico approaches to address complex clinical and biological challenges.

A key area of expertise is in the development of advanced test platforms to replicate the complex loading that the spine is subjected to during activities of daily living. These platforms are then used to explore spine biomechanics, mechanisms of injury and degeneration, and how mechanical loading influences cellular behaviour using whole-organ intervertebral disc cultures.

YOUNG INVESTIGATOR

Structural capacity, not mechanical demand, dominates regional fracture vulnerability in the human mandible: a patient-specific finite element study

Răzvan Costin Tudose, Mugurel Constantin Rusu

1 Division of Anatomy, Department 1, Faculty of Dentistry, "Carol Davila" University of Medicine and Pharmacy, 050474 Bucharest, Romania; 2 Research Department, "Dr. Carol Davila" Central Military Emergency Hospital, 010825 Bucharest, Romania

Mandibular fractures often initiate at sites remote from the point of impact, classically the condylar neck after chin trauma, implying that regional vulnerability is an intrinsic structural property, not a simple consequence of stress concentration. We tested whether this regional vulnerability is governed principally by mechanical demand or by structural capacity, decomposing a demand-capacity Failure Index (FI). Thirty patient-specific human mandibular models (17 dentate, 10 partially edentulous, 3 edentulous; 15 male, 15 female; aged 22 to 83 years) were reconstructed from cone-beam computed tomography (CBCT) and analysed by finite element simulation under antero-posterior loading at the mental region and latero-lateral loading at the body and angle, each at 500, 1000 and 2000 N. Mechanical demand was the peak von Mises stress and structural capacity the product of cortical thickness and cross-sectional area at the mental, body, angle and condylar-neck regions; an FI (stress/capacity) was computed per region and partitioned into demand and capacity contributions. Cortical thickness decreased from 3.41 ± 0.24 mm at the mental region to 1.24 ± 0.18 mm at the condylar neck, and cross-sectional area from 260.9 ± 19.0 to 85.7 ± 8.4 mm^2, whereas peak stress rose modestly (108.7 ± 9.4 to 227.7 ± 19.7 MPa at 2000 N). The condylar neck carried the highest FI in every mandible and under all loading scenarios. From the mental region to the condylar neck, demand increased 2.1-fold while capacity fell 8.4-fold; thus approximately three-quarters of the resulting 17.6-fold rise in FI reflected declining capacity and only one-quarter rising demand, consistently across scenarios and forces. FI magnitude nevertheless varied between individuals (coefficient of variation 28% at the condylar neck). Regional mandibular fracture vulnerability is therefore capacity-dominated: the steep anatomical gradient in cortical thickness and cross-sectional area, not the distribution of mechanical demand, determines where the mandible is structurally weakest, recasting fracture topography as a predictable consequence of skeletal architecture. Anonymised CBCT data were analysed retrospectively; the study was approved by the Research Ethics Committee of the "Dr. Carol Davila" Central Military Emergency Hospital, Bucharest, Romania, and subjects gave informed consent for use of their imaging data.

Talk 3

YOUNG INVESTIGATOR

Can Stable Cervical Bony Morphometry Support First-Line Screening of Cervical Canal Stenosis Compared with MRI Measures in MRI-Limited and Resource-Limited Settings?

Ikenna Theophilus Ikele[123], Seaneen McDougall[2], Kismet Hossain Ibrahim[2], Tracey Wilkinson[4]

[1] Turnbull Centre for Basic Science, Anatomy Department, Queen Mary University of London, UK; [2] Centre for Anatomy & Human Identification (CAHID), University of Dundee, UK; [3] Department of Anatomy, University of Nigeria, Nsukka, Nigeria; [4] Human Anatomy Unit, College of Medicine and Health, University of Birmingham, UK

Cervical canal stenosis (CCS) is typically evaluated using MRI grading systems, but soft-tissue factors such as intervertebral disc height (DH) and ligamentum flavum thickness (LFT) can vary with posture. In contrast, cervical bony morphometry (BM) offers a stable, anatomical basis for initial screening, especially where MRI access is limited. Age-related DH loss correlates moderately with LFT thickening, suggesting a link between bony degeneration and soft-tissue encroachment. This study evaluated whether relatively stable cervical BM parameters associated with the risk of CCS could provide a reproducible anatomical foundation for first-line CCS screening, compared with dynamic MRI-derived DH and LFT. Standardised osteological measurements, including canal diameter, vertebral body height (VBH), anterior–posterior vertebral body ratios (VBHA/VBHP), and the Torg ratio (TR), were obtained from Thiel-embalmed human cervical spine specimens from a Scottish elderly population. Although measured directly on bone, these parameters correspond to indices that can be obtained in vivo from standard cervical radiographs. BM parameters were compared with MRI-derived DH and LFT assessed in flexion and extension, and relationships were examined using correlation coefficients. BM demonstrated high reliability and low variability across cervical levels, consistent with fixed osseous constraints. MRI-derived DH and LFT showed greater variability, reflecting posture-dependent changes. The correlation between DH and the VBHA/VBHP ratio at C5 was weak ($r = 0.18$), while TR demonstrated modest associations with VBHA/VBHP ($R^2 = 0.22$) and with cervical sagittal alignment assessed using Cobb angle in flexion ($R^2 = 0.25$). Significant relationships were observed between TR and alignment in flexion ($p = 0.01$) and extension ($p = 0.05$). Correlations between VBH ratios and LFT were poor ($r < 0.20$). Overall, although BM shows promise as a stable anatomical framework for first-line screening and MRI referral prioritisation in MRI-limited and resource-limited settings, caution is required when interpreting BM-MRI relationships, as weak correlations may reflect technical factors, including unequal sample sizes, pixel resolution, imaging quality, and software limitations. MRI remains essential for definitive diagnosis and soft-tissue evaluation. Ethical approval for the repeatability component was obtained, and the study complied with the institution's licence for the use of human material in line with Scottish legislation.

Talk 4

YOUNG INVESTIGATOR

Erector spinae muscle fibre size estimation using high-density surface electromyography in people with and without non-specific chronic low back pain

Shilpa Purushotham[1,2], Andrea Casolo [3], Michail Arvanitidis [1], Agnese Grison [4], Adrian Gardner [5,6], Deborah Falla [1]

1. Centre of Precision Rehabilitation for Spinal Pain (CPR Spine), School of Sport, Exercise and Rehabilitation Sciences, University of Birmingham, Birmingham, UK; 2. Department of Biomedical Sciences, School of Infection, Inflammation and Immunology, College of Medicine and Health, University of Birmingham, Edgbaston, Birmingham, UK; 3. Department of Biomedical Sciences, University of Padova, Via Marzolo, 3 - 35131 -Padova, Italy; 4. Department of Bioengineering, Imperial College London, South Kensington, London; 5. The Royal Orthopaedic Hospital NHS Foundation Trust, Northfield, Birmingham, UK; 6. Aston Medical School, Aston University, Birmingham, UK.

There is limited evidence on whether lumbar erector spinae (ES) fibre morphology is altered in people with low back pain (LBP), largely due to there being very few studies using invasive biopsies on a small number of participants. High-density surface electromyography (HDsEMG) provides an opportunity to assess motor unit properties, allowing non-invasive estimation of muscle fibre morphology for a larger number of participants. The objectives of this study were to compare ES estimated fibre size and activity in people with and without non-specific, chronic LBP, and to examine correlations with clinical features in those with LBP. HDsEMG data was acquired from the ES from people with and without LBP (28/group) during isometric lumbar extension contractions at maximum (MVC) and submaximal levels (10%, 30%, 50%, 70% MVC). First, HDsEMG signals were decomposed to estimate motor unit conduction velocity (MUCV), fibre diameter (FD), and fibre cross-sectional area (CSA). Additionally, global estimates of HDsEMG were assessed including amplitude, entropy and y- and x- barycentre of topographical HDsEMG amplitude maps. Pearson's correlation was used to examine their associations with clinical features. The results show that there were no significant differences between the groups for MUCV ($p = 0.1310$), FD ($p = 0.1310$), or CSA ($p = 0.2875$). Differences in the regional activation of ES along the y-axis ($p=0.009$) as well as modified entropy ($p=0.023$) were observed between groups, indicating a more cranial and heterogeneous distribution of ES activity in people with LBP. There was a weak but significant negative correlation between fibre CSA and perceived disability at the 50% torque level ($r = -0.379$, $p = 0.049$). In conclusion, estimated ES fibre morphology did not differ in people with non-specific chronic LBP. However, people with LBP demonstrate an alteration in the spatial distribution of ES activity during isometric trunk extension contractions. EMG-derived fibre CSA appears to be lower in people with greater LBP-related disability. The study was approved by the University of Birmingham ethics committee (ethics reference number: ERN_2022-0522).

SOPHIE MILLER MEMORIAL PRIZE LECTURE

Uncovering the potential of SKOR1 as a novel therapeutic target for Parkinson's Disease.

Lauren Barrett

University College Cork (UCC), Ireland.

Parkinson's Disease is a common brain disorder that affects the coordination of movements. It is a progressive disease caused by an excess of a misfolded protein known as α-Synuclein causing the death of dopamine producing neurons, and there is currently no cure. SKOR1 is a protein that has previously been shown to be present at higher levels in experimental models of Parkinson's Disease. We have found that reducing the levels of SKOR1 in laboratory models of Parkinson's Disease protect against the damage caused by the α-Synuclein protein. We also know that aging is a major risk factor for Parkinson's Disease, so we are using mice at various ages to examine the expression of SKOR1, α-Synuclein and related proteins in dopamine producing neurons across the lifespan as they age. Together, we hope that this work will bring us closer to discovering a new treatment for Parkinson's Disease.

YOUNG INVESTIGATOR

Architectural and functional adaptations to eccentric training in human adolescent volleyball players: a randomized controlled trial

Seda Gözener Canbülbül [1,2], Bayram Ufuk Şakul [1]

1Department of Anatomy, Faculty of Medicine, İstanbul Medipol University, Istanbul, Türkiye; 2Department of Physiotherapy and Rehabilitation, Faculty of Health Sciences, Bahçeşehir University, Istanbul, Türkiye

The aim of this study was to examine the effects of an eight-week eccentric heel-drop program on triceps surae architecture, muscle strength, and jump performance in adolescent female volleyball players. Twenty-six athletes were randomized to an exercise group (n = 14) or a control group (n = 12). The exercise group performed supervised eccentric heel-drops three times weekly for eight weeks, while the control group continued their regular training only. Ultrasonography was used to assess muscle thickness, fascicle length, and pennation angle of the gastrocnemius medialis, gastrocnemius lateralis, and soleus. Muscle strength was measured via dynamometry, and vertical jump performance (squat, countermovement, block, and attack jumps) was evaluated. The exercise group showed significant increases in gastrocnemius medialis muscle thickness ($p = 0.03$) and fascicle length ($p = 0.002$). No significant changes were observed in other muscles ($p > 0.05$). While both groups showed strength improvements, no significant between-group differences were found. However, the exercise group demonstrated significant improvements in squat, block, and attack jump performance ($p < 0.05$). Eight weeks of eccentric plantar-flexor training elicited muscle-specific architectural adaptations and improved sport-specific jump performance in adolescent athletes. These results indicate that progressive eccentric heel-drop exercises are an effective addition to youth conditioning programs for enhancing structural and functional outcomes. The institutional ethics committee approved this study, and all participants and their legal guardians provided written informed consent.

Talk 3

YOUNG INVESTIGATOR

Investigating the expression patterns of intermediate filament proteins in mice to uncover the differential vulnerability of striated muscles in laminopathies and desminopathies

Emad I H Shaqoura[1,3,5], Eve McCallion[1], Cameron Blakeston[6], Özge Çetin[7], Heidi Fuller[1,2,4], Melissa Bowerman[1,4]

1 School of Medicine, Faculty of Medicine and Health Sciences, Keele University, UK; 2 School of Pharmacy and Bioengineering, Faculty of Medicine and Health Sciences, Keele University, UK; 3 Islamic University of Gaza, P.O. Box 108, Gaza, Palestine; 4 Wolfson Centre for Inherited Neuromuscular Disease, RJAH Orthopaedic Hospital, Oswestry, UK; 5 Department of Biomedical Sciences, College of Medicine and Health, University of Birmingham, UK; 6 School of Life Sciences, Keele University, UK; 7 Pharmacology, University College London, UK

Lamins A/C are ubiquitously expressed nuclear intermediate filament proteins (IFs), while desmin is a tissue specific cytoplasmic IF, both play major roles in striated muscle functions. Mutations in the LMNA encoding lamins A/C and DES genes desmin led to striated muscle disorders called laminopathies and desminopathies, respectively. Despite the universal expression of lamins A/C, laminopathies predominately affect striated muscles. Moreover, specific muscles are often involved earlier than others in both laminopathies and desminopathies. However, the mechanisms underlying this tissue and muscle specificity remain poorly understood. Using RT-qPCR and western blot analyses, we quantified lamin A/C and desmin mRNA and protein levels in skeletal muscles of wild type (WT) female and male mice from different anatomical regions. We systematically assessed the effects of muscle location, muscle region (belly vs MTJ), sex, age, and exercise on the expression of lamin A/C and desmin. Lamin A/C expression was significantly higher in the extensor digitorum longus (EDL) compared with all other muscles in both sexes at the gene and protein levels (2.1–97.8-fold increase; $p < 0.05$–0.0001). In contrast, desmin expression was significantly lower in EDL than in most other muscles at both mRNA and protein levels in males only (2.2–3.3-fold decrease; $p < 0.05$–0.0001). Region-specific differences in lamins A/C and desmin were also observed. Indeed, lamin A expression was higher in the soleus MTJ than in the belly at both mRNA (5.3-fold; $p<0.01$) and protein (2.3-fold; $p<0.0001$) levels in males. Conversely, desmin mRNA was higher in the bellies of gastrocnemius (1.8-fold; $p<0.001$) and soleus (2-fold; $p<0.01$), whereas desmin protein levels were higher in the MTJs of biceps (3-fold; $p<0.01$) and soleus (1.8-fold; $p<0.01$), again in males only. Both acute and chronic exercise regimens, performed on a rotarod, increased lamin A/C, desmin, and two downstream mediators of lamin A/C (Rapsn, and Dok7) expression in most muscles of females but not males. Although IF gene expression was generally higher in adult males than females, protein expression showed muscle-specific elevations in females compared to males. Finally, aging significantly reduced lamin A/C, but not desmin, expression in most muscles of both sexes. Lamin A/C and desmin expression varies according to muscle location, region, sex, age, and exercise, thus potentially providing mechanistic insights into the selective vulnerability of skeletal muscles observed in laminopathies. All animals were obtained from, and all experiments were conducted in, the Biomedical Sciences Unit (BSU) at Keele University. Before the start of the project, all the necessary approvals from Keele University's ethics committee and the UK Home Office have been in place. The study was conducted under projects licenses P99AB3B95 and PP3186945 held by Melissa Bowerman and a personal license I49187872 held by Emad I H Shaqoura, in compliance with the UK's Animals Scientific Procedures Act of 1986.

Mapping the Bony Landmarks of the Cavernous Sinus – A Morphometric Study on Human Skulls

Cezar Octavian Morosanu, Amy Manson, Mae Hunter, Alistair Bond

Human Anatomy Resource Centre, Faculty of Health and Life Sciences, University of Liverpool, UK

Surgical approaches to the cavernous sinus require a detailed understanding of its complex anatomical relationships. The surrounding osseous structures serve as important surgical landmarks and access points to the parasellar region. This study aimed to characterise the morphometry of the bony anatomy surrounding the cavernous sinus and provide quantitative anatomical data that may assist surgical planning and reduce operative risk during skull base procedures. The morphometric study was conducted on 105 skulls from our osteological collection in the Anatomy Department. Measurements were conducted on the bitemporal and interoptic distance, the prechiasmatic sulcus and the planum sphenoidale. The distance between the inner plate of the temporal bone and the anterior clinoid process (ACP), foramen rotundum (FR), foramen ovale (FO), foramen lacerum (FS), foramen lacerum (FL) were recorded. In addition, the landmarks and surface area of the oculomotor triangle were assessed. All measurements were obtained using digital calipers, and the resulting data underwent statistical analysis. Our results show the mean bitemporal distance was 117.24 mm, while the mean interoptic distance measured 22.06 mm. The mean length of the prechiasmatic sulcus and planum sphenoidale were 6.18 mm and 17.73 mm, respectively. The mean distance from the inner plate of the temporal bone to the ACP was 43.31 mm, compared with 37.74 mm to the FR, 27.82 mm to the FO, 24.29 mm to the FS, and 29.33 mm to the FL. The mean surface area of the oculomotor triangle was 37.08 mm^2. Several significant correlations were identified. The distance from the inner table of the temporal bone to the middle cranial fossa foramina demonstrated a positive correlation with bitemporal diameter. Prechiasmatic sulcus length showed a negative correlation with the distance from the temporal bone to the FO, FS and FL. Additionally, planum sphenoidale length was negatively correlated with both prechiasmatic sulcus length and the distance from the temporal bone to the FO and FS. This study identified significant morphometric relationships between key osseous landmarks surrounding the cavernous sinus. Recognition of these anatomical patterns may improve surgical orientation, facilitate operative planning, and reduce the risk of neurovascular injury during skull base procedures. Ethical approval reference number 16266.

Sponsor talk

See It Move: A New Dimension in MSK Anatomy Education

Daheen Lee, Anatomist and Product Owner, Primal Pictures

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INVITED SPEAKER TALK

Telling the whale's tail: Anatomical evolution across the land-to-water transition in mammals

Katrina Jones

Senior Lecturer & Royal Society University Research Fellow, School of Earth Sciences, University of Bristol, UK

Biography

I am a Senior Lecturer and Royal Society University Research Fellow at the University of Bristol in the Palaeobiology group at the School of Earth Sciences. Previously, I was a Presidential Fellow in the Department of Earth and Environmental Sciences at the University of Manchester, in the Ancient Life Group.

My lab studies locomotor evolution in the mammalian skeleton and examine the impacts of adaptation and constraint during major ecological transitions e.g., origins of mammals, land-to-water, evolution of novel locomotor modes. We combine techniques from comparative anatomy and dissection, to morphometrics, biomechanics, and evolutionary modelling to understand the factors impacting morphological evolution and phenotypic diversity through time. The lab has a special focus on the axial skeleton, a critical but understudied component of the mammalian skeleton.

Talk 2

YOUNG INVESTIGATOR

Mandible function across the vertebrate water-to-land transition is underpinned by unossified tissues

Hady George [1]; Hugo Dutel [1,2]; Enrico Panettieri [3]; Rocky Yu [1,4]; Alec T Wilken [5]; Ryoko Matsumoto [6]; Anthony Herrel [7]; Antonio Ballell Mayoral [1,8]; Amandine Gillet [1]; Pablo S Milla Carmona [1,9]; Tahlia I Pollock [1]; Allyse Ferrara [10]; Laura B Porro [8]; Emily Rayfield [1]

1 University of Bristol, Bristol, UK; 2 University of Bordeaux, Bordeaux, France, 3 University of Pisa, Pisa, Italy; 4 University of York, York, UK; 5 University of Missouri, Columbia, USA; 6 Kanagawa Prefectural Museum of Natural History, Odawara, Japan; 7 Muséum National d'Histoire Naturelle, Paris, France; 8 University College London, London, UK; 9 Centro Nacional Patagónico, Puerto Madryn, Argentina; 10 Nicholls State University, Thibodaux, USA

@houdzgeorge.bsky.social

The vertebrate water-to-land transition was a formative event in the history of life, laying the foundation for tetrapod diversity and success. Reconfiguring mandibular form and function to move away from suction feeding under water to biting on land has long been thought to characterise this transition. However, recent studies have suggested variation in morpho-functional traits of the mandible lagged behind fin-limb evolution, with deep jaws capable of withstanding strong bites not evolving until well after terrestrialisation. This apparent contradiction has led to an impasse in understanding feeding evolution across the transition. We address this by leveraging advances in computational modelling alongside quantitative dissections to perform the largest and most detailed functional study yet of the mandibles of key taxa phylogenetically bracketing the transition. We use finite element analysis incorporating unossified tissues (e.g., Meckel's cartilage, sutures) and muscle architecture data to quantify the structural performance of mandibles of 5 ray-finned fishes (Polypterus, Amia, Lepisosteidae), 1 lobe-finned fish (Latimeria), 6 salamanders (Ambystoma, Necturus, Amphiuma, Andrias, Tylototriton) and 2 caecilians (Herpele, Rhinatrema). We find no general difference between fishes and amphibians, and mandible function is instead underpinned by factors besides ancestry. Derived morphological characteristics play an important role, as shown by high strain values along the strongly curved regions of the U-shaped mandibles of some salamanders and the elongate mandibles of gars. Also, mandibles with relatively low proportions of bone were found to have greater biting efficiency. To further investigate the role of unossified tissues, we reran all analyses with all tissues treated as cortical bone. Across the sample, both biting efficiency and strain magnitudes decreased. This is pertinent to early tetrapods, as across the Devonian-Carboniferous boundary (358.9 mya), tetrapods generally no longer ossified their Meckelian element. Following our findings, this anatomical change would have increased biting efficiency at the cost of the mandible's structural performance. Structural constraints may have prevented the gross mandible morphology of early tetrapods from deviating from the plesiomorphic condition to avoid further compromising mechanical performance. Our conclusion reconciles the apparently contradicting standpoints and provides fresh perspective on the biomechanics behind the advent of vertebrates feeding out of water. Ethics statement: No animals were harmed for the purposes of this study. All specimens were collected and studied in accordance with official guidelines and laws of the UK, EU, USA, and Japan.

Talk 3

YOUNG INVESTIGATOR

Anatomical Determinants of Head Centre of Mass in Homo sapiens and Pan troglodytes

Kira L. Crabtree, Laura C. Fitton

The University of York Department of Archaeology, York, UK; The University of York Department of Archaeology and Hull York Medical School, York, UK

The centre of mass (CoM) of the head is important for its stability during bipedal locomotion. However, the biomechanical impact of changes to craniofacial anatomy during human evolution is poorly understood, partly because the relative contributions of the hard and soft tissue units to overall head CoM are hard to quantify. This study utilises biomechanical modelling to quantify how differences in hard and soft tissue morphology between Homo sapiens and Pan troglodytes influence head CoM. We hypothesise that head CoM would reflect the integrated effects of skull shape and the spatial organisation of its functional units, with diverging craniofacial configurations producing species-specific effects on its position. To address this, Head and Neck CT scans of H. sapiens (n = 7) and P. troglodytes (n = 7) were segmented into the following components: the cranium; mandible; hyoid bone; masticatory muscles; brain; tongue, floor of mouth and suprahyoid muscles; and skin combined with subcutaneous tissues. Head CoM was subsequently estimated using segment volumes and reported tissue densities, allowing us allowing us to estimate the relative effects of these functional units on head CoM. Geometric morphometrics and two-block partial least squares (2B-PLS) analyses were employed to analyse covariation between skull shape, relative functional unit mass, and whole-head CoM. Results demonstrate that H. sapiens possesses a more posterior-superiorly positioned head CoM than P. troglodytes. The individual functional units had diverging impacts on head CoM between the species, reflecting differences in their spatial positioning between them. The 2B-PLS regressions revealed that head CoM covaries more strongly with overall skull shape than with the relative masses of its functional units. Together, these findings indicate that the contributions of the functional units of the head to its CoM are modulated primarily by their spatial organisation relative to the overall architecture, and that structurally similar tissues may have markedly different impacts for head balance between species. This study provides a novel framework for investigating the biomechanical trade-offs and mosaic trait evolution in hominin craniofacial morphology, offering new insights into the potential functional consequences of the anatomical shifts defining the lineage. The University of York's Department of Archaeology granted ethical approval for this study, and the New Mexico Decedent Imaging Database and the Kyoto University Primate Research Institute approved access to the CT scans of the H. sapiens and P. troglodytes individuals used within this research.

INVITED SPEAKER TALK

Life with substantial error bars: locomotor adaptations in complex environments

Dr Charlotte Miller

Associate Professor in Comparative Anatomy, University of Bristol

Biography

Charlotte Miller is an Associate Professor in Comparative Anatomy at the University of Bristol. Her research background is in biomechanics through an evolutionary lens of functional morphology, having trained at Bristol, the Royal Veterinary College and Duke University.

Charlotte's research programme centres on animal-substrate interactions across Mammalia. She explores foot-substrate contact, how centre of mass movements impact ground contact, and what body shape and anatomy can (and can't!) help us to predict.

Anatomy Research Development Award Talk

Darkest just before dawn: the role of the calcified cartilage in osteoarthritis

Juliette Hughes

Institute of Life Course and Medical Science, University of Liverpool

Osteoarthritis is a worldwide healthcare burden with no effective treatment currently available. The mechanism in which cartilage degrades must be elucidated in order to provide new therapeutic targets. The calcified cartilage of joints, sandwiched between the underlying bone and superficial non-calcified articular cartilage, is very much understudied in osteoarthritis research. The study of human articular cartilage is mostly restricted to imaging modalities and donated tissue that is typically very diseased. This project will examine the knee joints from a combination of two mouse models that both exhibit calcified cartilage pathology. STR/Ort mice, which spontaneously develop osteoarthritis, show larger calcified cartilage chondrocytes (hypertrophy) before osteoarthritis develops. In the rare metabolic disease alkaptonuria, early and severe osteoarthritis is caused by pigmentation of cartilage due to increased levels of homogentisic acid, which is observed as calcified cartilage chondrocyte pigmentation in alkaptonuric mice known as $Hgd^{-/-}$. How cartilage pigmentation causes severe degeneration in alkaptonuria is unknown. Here, we plan to study joints of mice that have both the STR/Ort and alkaptonuria phenotypes, by using a novel gene silencing approach. An alkaptonuria metabolic phenotype will be induced in STR/Ort mice by using silencing RNA targeted to homogentisate 1,2-dioxyegenase, which increases circulating homogentisic acid. The osteoarthritic and pigmentation phenotypes will be assessed histologically within the knee joints, to determine if tissue pre-disposed to osteoarthritis is more likely to pigment, and if pigmentation in turn worsens the severity of osteoarthritis.

Talk 3

YOUNG INVESTIGATOR

Integrating Histology and Transcriptomics to Understand Human Skeletal Muscle Ageing Across the Lifecourse: From GTEx to Spatial Transcriptomics

Nessrin Almaghtuf, Karen Suetterlin, Laura Greaves, Antoneta Granic

Newcastle University, Newcastle upon Tyne, UK

Age-related skeletal muscle decline contributes to reduced physical function, frailty and disability. Human muscle ageing has been characterised using transcriptomics or histology, but their integration remains limited. The Genotype–Tissue Expression (GTEx) resource combines skeletal muscle RNA sequencing with matched histology and pathology review. GTEx v10 skeletal muscle from fast-death donors (Hardy categories 1–2) was analysed. In the bulk cohort (n=241; 188 male, 53 female; 20–79 years), gene expression was summarised as eigengenes for ten curated Molecular Signatures Database (MSigDB) modules. Age and sex effects were tested using general linear modelling with FDR correction and linear regression. GTEx pathology notes were converted into quantitative scores for adiposity (0–3), atrophy, fibrosis and inflammation. A histological subset (n=26; 16 male, 10 female) underwent manual morphometric analysis, and histology–transcriptomic associations were assessed using Spearman's correlation. Ageing was associated with coordinated activation of remodelling pathways, including fibro/adipogenic progenitors (FAPs; β=0.243, FDR=0.010), extracellular matrix (ECM; β=0.223, FDR=0.005), inflammation (β=0.205, FDR=0.003) and myogenesis (β=0.207, FDR=0.003), alongside reduced mitochondrial oxidative phosphorylation (β=−0.133, FDR=0.043). Morphometric analysis demonstrated significant reductions in fibre cross-sectional area (6144±1057 to 3171±855 μm²; $p<0.001$) and minimum Feret diameter (65.9±4.0 to 49.5±6.4 μm; $p<0.001$), accompanied by increased interstitial space (5.5±1.7% to 18.9±9.2%; $p<0.001$). These age-associated morphological changes were observed in both males and females, with no significant age-by-sex interactions detected. Pathology scores aligned with transcriptomic remodelling; atrophy correlated positively with cellular senescence (ρ=0.283), satellite cell niche (ρ=0.276), denervation (ρ=0.270) and FAP (ρ=0.244) modules, while fibrosis and adiposity showed similar associations with ECM, FAP and inflammatory pathways (all FDR<0.05). The strongest inter-module association was observed between ECM and FAP pathways (ρ=0.93, FDR=0.002). These findings demonstrate that age-related structural deterioration of human skeletal muscle is closely aligned with coordinated molecular programmes centred on stromal remodelling, inflammation and impaired oxidative metabolism. These findings identify candidate pathways for spatial interrogation and understanding muscle ageing. This work provides the foundation for ongoing Xenium spatial transcriptomic analyses of human vastus lateralis biopsies from the MASS Lifecourse study; preliminary findings will be presented at the meeting. Ethical approval was not required as de-identified GTEx data were used.

Reassessing the Flexor Digitorum Profundus enthesis in Jersey Finger: does dissection technique alter our anatomical understanding of tendon–bone attachment?

Ashley Benge [1,2], Katie Daly [2], Mike Cronin [1,2], Cian McCafferty [1,2] Gerard O'Keeffe [1,2]

1. School of Medicine, University College Cork, Cork, Ireland; 2. Department of Anatomy and Neuroscience, University College Cork, Cork, Ireland

Jersey finger, a zone I avulsion injury in which the Flexor digitorum profundus tendon is forcibly detached from the distal phalanx, is the most common closed flexor tendon injury of the hand and can lead to substantial loss of distal interphalangeal joint flexion, grip strength and hand function. Surgical repair remains challenging, with complications including stiffness, flexion contracture and re-rupture frequently reported. Successful restoration depends on recreating the native FDP enthesis: the specialised transition from tendon to fibrocartilage, calcified fibrocartilage and bone. Despite its importance, published anatomical measurements of the FDP insertion vary considerably. This study aimed to characterise the native FDP footprint and investigate whether dissection technique contributes to variation reported in the literature. In the initial study, FDP insertions from digits two to five were exposed, stained and reflected from the distal phalanx before ImageJ analysis for a n=72. Mean insertional area measured 56.80 mm^2 ± 11.99 (range 34.19–86.96), with average distal phalanx coverage of 34.17% ± 7.13. Morphology varied between specimens but a broadly trapezoidal configuration was consistently observed. These findings differed substantially from previously published reports, prompting the hypothesis that sharp dissection may underestimate the enthesis by removing insertional tissue during tendon detachment. A second matched-pair cadaveric study was undertaken (n=72 digits), comparing sharp dissection of left-hand FDP insertions with blunt reflection of matched right-hand digits. A significant difference in measured insertional area was identified between techniques ($p<0.001$), while no significant difference was found between digits ($p=0.8419$). These findings demonstrate that dissection technique significantly influences measurement of the FDP enthesis and may explain discrepancies in the anatomical literature. Sharp dissection may remove portions of the tendon–bone transitional tissue, leading to underestimation of the native footprint. This has direct relevance for surgical management of jersey finger injuries, where accurate restoration of the tendon–bone interface is critical. Improved anatomical definition of the FDP enthesis may help guide more anatomically faithful repair strategies and support improved functional outcomes following zone I avulsion injury. This research has been done on human cadavers from the UCC Anatomical Donor Program. All donors have consented to use their bodies for medical education, research and training in accordance with Anatomy Act and in line with the Irish Medical Council Guidelines.

YOUNG INVESTIGATOR

Mapping nerve entry points into the cervical portion of the human semispinalis capitis muscle for enhanced clinical precision

Seda Gözener Canbülbül [1,2,3], Servet Çelik[3]

1 Department of Anatomy, Faculty of Medicine, İstanbul Medipol University, Istanbul, Türkiye; 2 Department of Physiotherapy and Rehabilitation, Faculty of Health Sciences, Bahçeşehir University, Istanbul, Türkiye; 3 Department of Anatomy, Faculty of Medicine, Ege University, İzmir, Türkiye

The semispinalis capitis muscle is a frequent target for clinical interventions such as injections and surgery. This study aimed to identify and quantify the locations, frequencies, and diameters of nerves entering the semispinalis capitis muscle to provide morphometric reference data for safer and more precise clinical procedures. Twenty semispinalis capitis muscles from ten formalin-fixed human cadaveric specimens were dissected. Anatomical landmarks including the external occipital protuberance, mastoid process, and the spinous process of the seventh cervical vertebra were identified. For each nerve entry point, the number, location, and diameter were recorded. Perpendicular distances from the external occipital protuberance–mastoid process and external occipital protuberance–spinous process of the seventh cervical vertebra lines were measured. Data were analyzed using a linear mixed-effects model to determine nerve distribution and thickness across cervical regions. Nerve entry points were most frequently located in the SP2–SP3 (28.88%), EOP–SP1 (25.16%), and SP1–SP2 (17.39%) segments ($p = 0.0002$). The thickest nerves were identified in the EOP–SP1 region (1.18 ± 1.26 mm), followed by SP1–SP2 (0.92 ± 0.75 mm). Conversely, the thinnest nerves were located in the SP6–SP7 region (0.25 ± 0.10 mm) ($p = 0.0002$). This study provides a detailed morphometric map of the cervical dorsal rami entering the semispinalis capitis muscle. These findings offer clinically relevant anatomical reference points that may enhance the safety and precision of cervical injections, surgical procedures, and other targeted interventions by identifying zones of highest nerve density and thickness. The use of human cadaveric specimens for this research was approved by the institutional review board and conformed to national legal and ethical regulations regarding anatomical dissections.

INVITED SPEAKER TALK

Invited Speaker Lecture

Professor Chrissy Hammond

University of Bristol

Biography

Chrissy Hammond spends an unreasonable amount of time persuading zebrafish to answer questions about how skeletons work.

Her lab at the University of Bristol uses genetics, live imaging and an unhealthy enthusiasm for watching cells do unexpected things to explore how bones, joints and connective tissues develop, regenerate and age. Somewhere along the way she accidentally acquired interests spanning developmental biology, anatomy, immunology, biomechanics and ageing, and has shown remarkably little inclination to specialise ever since.

She is particularly fond of experiments that begin with someone saying, “That's odd...”, because they usually turn out to be the interesting ones. When not trying to work out why a fracture heals (or doesn't), she can usually be found persuading audiences that fish are far more useful than they have any right to be.

She apologises in advance for the inevitable fish videos

Medial bias in Achilles tendon morphology in healthy young individuals: application of a validated ultrasound protocol

Natasha Noel-Barker[1] , Laura Clark[1] , Lucy Hanslip[1] , Stefan Kluzek[2,3,4]

1-School of Life Sciences, University of Nottingham, Nottingham, UK; 2-School of Medicine, University of Nottingham, Nottingham, UK; 3-Nuffield Department of Orthopaedics, Rheumatology and Musculoskeletal Sciences, University of Oxford, Oxford, UK; 4- Department of Orthopaedic Surgery and Rehabilitation, Wake Forest School of Medicine, Winston-Salem, North Carolina, USA

X: Nnoelbarker

Achilles tendon adaptation is associated with repetitive mechanical loading and may manifest as regional structural variation before the development of symptomatic tendinopathy. Previous research has shown that a standardised ultrasound protocol can reliably quantify mid-portion Achilles tendon cross-sectional area (CSA) and detect medial–lateral differences in healthy tendon tissue. This cross-sectional study included 36 healthy, physically active adults aged 18–65 years. Anthropometric measurements, ankle range of motion, and dynamic balance (Y-Balance Test) were collected during a single testing session. Bilateral Achilles tendon imaging was performed using high-frequency ultrasound (3-15MHz) with participants positioned prone according to a standardised protocol. Repeated scans were obtained to assess reliability. Images were analysed offline using Horos software where total and regional (medial and lateral) CSA measures and tendon depth were quantified using manual segmentation. Paired t-tests, correlation analyses, and linear mixed-effects models were used to evaluate medial–lateral CSA ratio, within individual variation, and associations with anthropometric and biomechanical variables. Medial Achilles tendon CSA was significantly greater than lateral CSA, with a mean medial: lateral CSA ratio of 1.09 ± 0.15. This difference was statistically significant (95% CI 1.05–1.12, p < 0.001, d z = 0.53), representing a moderate effect size. No significant differences were observed between dominant and non-dominant limbs (p = 0.205, d z = - 0.24) or between males and females (p = 0.073, d = 0.51). Medial CSA was not significantly associated with navicular height (ρ = -0.06, p = 0.676), Foot Posture Index score (r = -0.11, p= 0.415), age (ρ = 0.18, p = 0.177), or body mass index (ρ = 0.19, p = 0.142). Similarly, greater medial Achilles tendon CSA was not associated with dynamic balance performance, demonstrating no significant positive correlations with anterior, posteromedial and posterolateral YBT reach distances. Healthy Achilles tendons demonstrate a significant regional variation in morphology, with the medial CSA approximately 9% greater than the lateral CSA. As this variation was independent of anthropometric and biomechanical measures, regional CSA may represent an intrinsic feature of healthy tendon structure and provide a useful baseline against which pathological adaptations can be compared. Ethical approval was granted by the University of Nottingham Faculty of Medicine and Health Sciences Ethics Committee (FMHS 205-0625).

The talus bones with different types of calcaneal articular facets differ in their sizes

Radik Khayrullin [1,2,3], Tatiyana Ulitko [1,2]

1- REAVIZ Private University, St Petersburg, Russia; 2- Academician Ivan Pavlov First Saint-Petersburg State Medical University, St Petersburg, Russia, 3- Osh State University, Kyrgyzstan

https://www.linkedin.com/in/radik-khayrullin-05415a183

The talus plays a pivotal role in upright posture and foot function in humans, and the morphology of its calcaneal articular surfaces — or articular facets — significantly determines the functioning of the locomotor system as a whole. Although the anatomical structure, dimensions, and shape of this skeletal element have been the subject of extensive investigation, considerable lacunae remain in the study of articular facet variation with respect to the anatomical and functional adaptive mechanisms underlying their formation. These variations may potentially fulfil a pathogenetic role in the development of ankle joint disorders. The aim of the study was to identify differences in the osteometric parameters of the human talus associated with types of calcaneal articular facets. The study material comprised 75 dry adult talar specimens carefully selected from several skeletal collections (49 male, 26 female), all free from signs of damage. Using a digital calliper with a precision of 0.01 mm, three groups of measurements were recorded: seven length parameters, four height parameters, and six width parameters. The resulting data were analysed using set similarity methods alongside parametric and non-parametric one-way analyses of variance. In examining the anatomical variability of talar morphology with respect to calcaneal articular facet configuration, it was established that the Type II talus — characterised by two facets separated by a ridge — was the most prevalent form, occurring in 56% of specimens. The similarity between the frequency distribution of articular facet types in the present sample and those reported by other investigators was 70%. The osteometric parameters that best discriminated between bones with different facet types were, in the male subsample, total length, anterior height, lateral trochlear height, and inferior articular surface width; in the female subsample, the corresponding discriminating parameters were total and medial bone length, posterior height, and anterior trochlear width. The findings demonstrate, for the first time, that the osteometric parameters of talar bones with differing calcaneal articular facet types are statistically distinguishable, and that these differences are sex-specific. Permission to study the skeletal collections was granted by the Local Ethics Committee of the Private (Medical) University REAVIZ (Protocol No. 2/28, dated September 30, 2024).

Sponsor talk

Enhancing Anatomy Education Through Immersive 3D Visualization of Real Human Data

Leila El Mardadi, *Anatomage*

The teaching of human anatomy is undergoing significant transformation, driven by advances in digital and visualization technologies. This presentation examines the role of immersive three-dimensional (3D) visualization, based on real human cadaveric data, in supporting contemporary anatomy education. Anatomage technology enables the exploration of anatomical structures within a spatially accurate and interactive environment. By facilitating dynamic manipulation of volumetric datasets, it supports the development of spatial understanding, which is essential for both anatomical learning and clinical application. The integration of this approach within academic curricula offers opportunities to enhance student engagement, improve knowledge retention and support the transition from theoretical knowledge to clinical reasoning. Furthermore, it aligns with the increasing emphasis on competency-based education and the development of clinical confidence in healthcare training pathways. This session will discuss practical strategies for incorporating immersive 3D visualization into anatomy teaching and highlight its role in complementing traditional methodologies in higher education.

Anatomage

YOUNG INVESTIGATOR

Shape Variation and Covariation Between the Calvarial Sutures and the Viscerocranium in Normocephalic and Craniosynostotic Human Skulls

Emily Baxter[1], Marcela Cardenas-Serna[2], Martin Van Carlen[3], Christian Duncan[3], Alana Sharp[1]

1 Department of Musculoskeletal and Ageing Science, University of Liverpool, Liverpool, UK; 2 Human Anatomy Resource Centre, University of Liverpool, Liverpool, UK; 3 Craniofacial Department, Alder Hey Children's Hospital, Liverpool, UK

Craniofacial growth is a non-linear process facilitated by the calvarial sutures. Their role in neurocranial expansion is well documented, but the secondary impact of their growth on the viscerocranium remains unknown. The nature and timing of this covariation is pertinent to the surgical management of craniofacial conditions. This research aimed to document craniofacial shape change, the influence of growth allometry and the onset of sexual dimorphism in a control population, aged 0-17 years. Also, to compare non-variant skull growth and covariation of the viscerocranium and neurocranium within a craniosynostosis population. 142 fixed landmarks and curve points were assigned to volume-rendered CT scans in 3DSlicer. Sliding semilandmarks (n=75) were assigned to the calvarial sutures and fixed landmarks (n=67) were assigned to biologically homologous positions on the human skull. This was carried out for the control population (n=109) and the clinical group (n=20), aged 0 to 49 months. Generalised procrustes analysis (GPA) and principal component (PC) analysis were performed using Geomorph in R to visualise the principal modes of shape variation within the sample. The first two PCs explained 95.9% of the total shape variation within the control sample, with PC1 correlated with centroid size and age in months, suggesting an allometric growth component. This was visualised as a relative constriction of the neurocranium at the sagittal and coronal sutures and expansion of the facial skeleton, particularly about the midface. The shape variation along PC2 could be explained by fontanelle closure. The clinical population demonstrated greater variation compared with controls, with separation based on diagnoses that deviated from the average control shape. Limited sexual dimorphism in shape was observed within the clinical group between ages 0-4 years. These findings suggest that the neurocranium and viscerocranium grow under competing demands of the brain and masticatory apparatus. Morphological integration present between the calvarial sutures and the viscerocranium is pertinent to craniofacial surgeries. This research obtained ethics approval from the NHS Health Research Authority (IRAS ID: 336327) and institutional sponsorship at the University of Liverpool (Ref: UoL001818). This research was performed with the understanding and consent from participants and/or their guardians.

Selenium and Magnesium Functionalised Scaffolds for Dual Bone Regeneration and Anti-Cancer Therapy

Eavan Pakenham[1], Avelino Ferreira[1], Robert D Johnston[1], Kulwinder Kaur[1,2], T Clive Lee[1], Caroline M Curtin[1,3,4] , Ciara M Murphy[1,3,4]

1 Tissue Engineering Research Group, Dept. of Anatomy and Regenerative Medicine, Royal College of Surgeons in Ireland, Dublin, Ireland; 2 School of Pharmacy and Biomolecular Sciences, The Royal College of Surgeons in Ireland (RCSI); 3 Trinity Centre for Bioengineering, Trinity College Dublin, Dublin, Ireland; 4 Advanced Materials and Bioengineering Research Centre (AMBER), RCSI and TCD, Dublin, Ireland

Bone cancer defects pose a challenge in terms of treatment options due to disrupted bone formation and resorption, while posing a risk of recurrence from residual cancer cells. Incorporation of bioactive ions into biomaterials has gained remarkable attention. Magnesium (Mg2+) is capable of modulation bone resorption and formation, while Selenium (Se2-) has shown positive results as a cancer therapeutic, exhibiting oxidative and apoptosis inducing effects against cancer cells. Nano-hydroxyapatite (nHA) nanoparticles are excellent candidates for ion delivery due to their crystal structure capable of accommodating ionic substitution. This project aims to utilise the therapeutic potential of these ions and develop and characterise novel Se and Mg functionalised nHA nanoparticles, incorporated within a collagen-based scaffold, developing a multifunctional bone regenerative and anti-cancerous scaffold for the treatment of bone cancer defects. Se functionalised nHA (10mM) and Mg functionalised nHA (1 or 10mM) nanoparticles were synthesised and loaded within a collagen based scaffold at a 2:1 ratio of Se-nHA to Mg-nHA. Fourier Transform Infrared Spectroscopy(FTIR) analysis confirmed successful incorporation of the ion functionalised nHA within the scaffolds. Compressive modulus of the scaffolds was unaffected, though degradation and ion release rates increased at higher ion concentrations. Mesenchymal stem cells (MSCs) and prostate cancer(LNCaP) cells were cultured on the scaffolds to assess cytotoxicity using quantitative assays such as AlamarBlue™ and PicoGreen™. In addition, the anti-cancer and pro-regenerative capabilities of the scaffold were investigated assessing reactive oxygen species(ROS) production and osteogenic differentiation.Scaffolds containing 10mM Se-nHA with either 1mM or 10mM Mg-nHA, significantly reduced cancer cell proliferation and increased ROS production compared to the control group. Notably, the scaffolds loaded with 10mM Se-nHA with 1mM Mg-nHA enhanced MSC proliferation alongside promoting enhanced differentiation and mineralisation compared to the all groups. By delivering Se at 10mM with 1mM Mg-nHA in the same scaffold, it will allow for multi-targeting therapeutic that enhances bone formation through both Se and Mg but inhibits cancer cell activity through Se, advancing the gold standard treatment options. This research is funded by the Anatomical Society and Research Ireland(GOIPG/2025/6128). No ethics is required for this project due to commercial cell lines being used.

ANATOMICAL SOCIETY PRIZE TALK

An Unexpected life in medical science and education

John Morris, Emeritus Professor of Human Anatomy, BSc, MB, ChB, MD, MA, FMedSci

Department of Physiology, Anatomy and Genetics, University of Oxford, Oxford, UK

Biography

Professor John Morris is a leading British anatomist and neuroendocrinologist whose career at the University of Oxford has been marked by major contributions to both anatomical science and medical education. After completing his medical and scientific training at the University of Bristol, he joined Oxford in 1977, eventually becoming Professor of Human Anatomy and a Fellow and Tutor in Medicine at St Hugh's College. He was appointed Emeritus Professor of Human Anatomy in 2010.
Professor Morris's research has significantly advanced understanding of peptide hormone release within neuroendocrine systems. His work demonstrated that peptide hormones are released by exocytosis, overturning earlier assumptions about molecular dispersion. He later identified how steroid hormones rapidly trigger peptide release from magnocellular dendrites—findings that have influenced modern neuroendocrinology. His collaborations have extended into studies of folliculo-stellate cells, exosome signalling in drosophila reproduction, and exosome behaviour in colon cancer cells.
Alongside his research, Professor Morris has been deeply committed to medical education. He served as Director of Preclinical Studies from 2004 to 2010 and is widely recognised for his exceptional teaching. His contributions were honoured with the Medical Sciences Division Lifetime Achievement Award for Teaching Excellence, reflecting his long-standing impact on generations of Oxford medical students. He is also co-author of the Oxford Textbook of Functional Anatomy, a foundational multi-volume resource for anatomical teaching.
Professor Morris has played an important role in scientific leadership, serving as Chairman of the British Neuroendocrine Group, President of the Anatomical Society, and a member of the Society for Endocrinology's editorial board.
As Emeritus Professor, he remains active in Oxford's academic community, continuing to support teaching and research in functional anatomy and neuroendocrinology. His career is defined by rigorous scientific inquiry, influential scholarship, and a lasting dedication to medical education.

INVITED SPEAKER TALK

Locomotion on two, three and four legs: the comparative anatomy of movement

Dr Zoe Davies

Lecturer in Veterinary Sciences, Harper & Keele Veterinary School

Biography

Zoe is a Lecturer in Veterinary Sciences at Harper & Keele Veterinary School and leads the Companion Animal Health Sciences Research Group at Harper Adams University. In addition to leading the first year Veterinary Anatomy and Physiology module in her teaching, Zoe's research centres on locomotor biomechanics and functional anatomy in canines and equines, with an emphasis on understanding the factors influencing performance and musculoskeletal health. Her work has included gait analysis across multiple species and research into the biomechanics of tripedal locomotion in canine amputees.

Zoe graduated from the University of Bristol's School of Anatomy with a degree in Equine Science before undertaking a PhD at the Royal Veterinary College's Structure & Motion Laboratory. Her doctoral research examined the biomechanical factors limiting athletic performance in racehorses. Zoe is also a qualified veterinary physiotherapist and has further interests in the efficacy of physiotherapeutic interventions in veterinary patients.

Talk 2

YOUNG INVESTIGATOR

Breaking the mammalian 'rule of seven' is associated with first rib repatterning in Xenarthra

Elizabeth Webb[1], Amandine Gillet[2], Jonathan Codd[1], Katrina Jones[2]

1- University of Manchester, Oxford road, Manchester, UK, 2- University of Bristol, Bristol, UK

The fixed mammalian cervical count is a well-known case of evolutionary constraint. Two of the genera that break this are the tree sloths, within the clade Xenarthra, which have independently evolved variation in cervical count. In addition to a variation in cervical count, xenarthrans exhibit variation in the numbers of their ribs relative to other mammals, suggesting widespread release from constraints in axial patterning, likely related to changes in hox gene expression. However, little is known about axial patterning of the ribcage, and how this relaxed constraint may impact its morphology. Here, we examine how variation in axial patterning in xenarthrans impacted ribcage morphology and regionalization? To address this question, we examined rib count (20 species) and rib shape, using 3D geometric morphometrics, in xenarthrans (323 ribs of 24 specimens). Despite variation in the total ribcage length across the group, changes in rib count result from adding ribs equally to all regions indicating conserved regional patterning and total count did not impact morphology. The first rib was morphologically distinctive from the rest of the ribcage and potentially adaptive. However, this unique patterning of the first rib appears to be suppressed in sloths, which exhibit greater uniformity in rib morphology. Further, they repattern the craniocaudal trajectory along the length of the ribcage. Indicating that breaking the cervical constraint in mammals may be associated with repatterning of the first rib and the whole ribcage trajectory.

Distinctive modulation of chewing dynamics in rabbits

Roger W. P. Kissane[1,2], Michael J. Fagan[3], Peter J. Watson[3,4], Graham N. Askew[2], Karl T. Bates[1].

1 Department of Musculoskeletal & Ageing Science, University of Liverpool, The William Henry Duncan Building, 6 West Derby Street, Liverpool, UK; 2 School of Biomedical Sciences, University of Leeds, UK; 3 School of Engineering, University of Hull, Hull, UK; 4 Institute of Medical and Biological Engineering (iMBE), School of Mechanical Engineering, University of Leeds, Leeds, UK

Mammalian mastication is highly structured and rhythmic, yet must remain flexible enough to process foods that differ markedly in mechanical properties. Rabbits (Oryctolagus cuniculus) are a valuable model for studying masticatory control because they are successful generalist herbivores and are widely used to understand the motor control of feeding. Here, we used X-ray Reconstruction of Moving Morphology (XROMM) to quantify how rabbits modulate the temporal architecture of chewing across foods that vary in mechanical challenge. Ten New Zealand white rabbits were implanted with 1 mm tantalum markers in the skull and mandible to reconstruct temporomandibular joint kinematics during feeding. Chewing cycles were divided into fast close, slow close, slow open and fast open phases, allowing us to quantify food-dependent changes in whole-cycle duration and phase timing. Fine-wire electrodes were implanted in the superficial masseter to record electromyographic (EMG) activity during chewing, enabling quantification of muscle recruitment alongside jaw kinematics. Rabbits systematically increased total chewing cycle duration when processing tougher foods, with pellets requiring longer cycles than apple. This temporal flexibility is achieved primarily by extending the slow closing phase (i.e. the power stroke), which occupied a greater proportion of the cycle during tougher-food chewing. Despite this modulation in duration, within-food variability in slow closing showed no clear food-dependent shift, suggesting that rabbits combine flexible cycle timing with a relatively stereotyped power stroke. Superficial masseter EMG further indicated functional modulation with food properties and differences between working and balancing sides, consistent with graded recruitment of jaw-closing musculature during mechanically challenging feeding. Finally, we collated a comparative XROMM dataset spanning seven additional mammalian species too compare temporal kinematics. Uniquely, rabbits appeared to be the only species that systematically modulate their cycle duration and the proportion of the cycle spent breaking down the food bolus. These findings suggest that rabbit mastication is governed by a high degree of temporal control, allowing modulation of feeding duration while maintaining a consistent power-stroke pattern. All experimental procedures were performed in accordance with the UK Animals (Scientific Procedures) Act 1986 and were approved by the University of Liverpool Animal Welfare and Ethical Review Body under Home Office Project Licence P84984FFD.

Talk 4

YOUNG INVESTIGATOR

What makes a hypermobile mandible? The development of the intramandibular hinge in snakes

Maricci Basa [1,2], Ryan N. Felice[2,3], Abigail S. Tucker [1]

1 Centre for Craniofacial and Regenerative Biology, Faculty of Dentistry, Oral and Craniofacial Sciences, King's College London, London, UK; 2 Department of Cell and Developmental Biology, Centre for Integrative Anatomy, University College London, London, UK; 3 Department of Genetics, Evolution and Environment, University College London, London, UK

@mariccibasa.bsky.social

Snakes possess a highly articulating mandible that facilitates the ingestion of large prey. In most non-mammalian vertebrates, the mandible consists of six bones which fuse together during development to form the united mandible. In snakes, however, the anterior (dentary and splenial) and posterior (angular, surangular, coronoid and articular) bones do not fuse, creating an intramandibular hinge (IMH). This hinge offsets craniomandibular stress and strain during feeding, supports lateromedial flexion of the mandible, and increases gape, allowing larger prey to be ingested. Here, the microanatomy and development of the IMH in snakes are explored, with the domestic chicken used as comparison due to its fused mandible. Histology and whole-mount skeletal stains of snake skulls showed that the IMH is absent of bone throughout development but bridged by Meckel's cartilage. Sirius red staining under circular polarised light and whole fast green staining highlighted a dense network of mature non-elasticated collagen fibres across the snake IMH and surrounding the angular-splenial connection. Extensive collagen remodelling was also evident surrounding the angular-splenial region of the snake IMH. The snake IMH is, therefore, supported by fibres, which may control lateromedial intramandibular flexion. Unexpectedly, given the lack of bone development in the IMH, expression of the osteoblast marker RUNX2 was present across the developing IMH of the snake in a similar pattern to the chick. This implies that cells with osteogenic potential were located in the intramandibular region of both sauropsids. Osteoclasts were associated with tooth development and bone-muscle attachment but were not found at high levels in the IMH, suggesting that bone remodelling was not responsible for keeping the IMH absent of bone. In contrast, programmed cell death was evident in the forming IMH and may play a role in the maintenance of a bone-free IMH. Our investigation highlights the adaptations required for greater intramandibular kinesis demonstrated by snakes. Snake embryos were provided from a colony housed in the Biological Services Unit of King's College London. Chicken eggs were bought from Henry Stewart (Medeggs). Embryos were culled using a schedule 1 method approved by the UK Home Office. No further ethical approval was required.

Sponsor talk

3D Organon: Transforming Medical Education Through Immersive Technology

Fernando Montanes Salcedo, *3D Organon*

3D Organon is a pioneer in immersive medical education, specializing in XR and AI-powered solutions that are reshaping how anatomy and medical sciences are taught and learned worldwide. Having originally launched the first fully interactive VR anatomy platform, 3D Organon continues to expand its ecosystem of educational tools designed to make medical knowledge more intuitive, accessible, and engaging for students, educators, and healthcare professionals. This presentation explores how 3D Organon supports modern medical training through highly immersive anatomy exploration, medical imaging, simulations, comprehensive assessments, and clinical training experiences, alongside a suite of intelligent learning tools designed for curriculum delivery and lesson management. It also highlights the platform's role in fostering a global community of educators, learners, researchers, and specialists who are advancing more interactive and effective approaches to medical education.

Fernando combines a background in chemical engineering with a PhD and expertise in customer development to drive 3D Organon's global growth. He oversees the creation and management of worldwide distributor networks that bring 3D Organon's solutions to medical and allied health institutions, working closely with faculty, clinical teams, and partners to translate technical capabilities into curriculum-ready solutions. Fernando also brings international experience across the pharmaceutical and biotechnology sectors, with a focus on projects related to greener technologies and sustainable practices.

INVITED SPEAKER TALK

Osteopetrosis in the cat

Professor Sorrell Langley-Hobbs

Professor of Feline Orthopaedics, University of Bristol

Biography

Sorrell is a veterinary orthopaedic surgeon with specialist interest in cat bone and joint disease. She operates on cats with fractures and joint conditions such as cranial cruciate ligament rupture, patella luxation and hip dysplasia, and teaches undergraduate and postgraduate veterinary surgeons and nurses on all orthopaedic topics.
Her clinical research is focused on a condition that she recognised called PADS (patella fracture and dental anomaly syndrome), where cats have persistent deciduous teeth and brittle bone resulting in pathological fractures of specific bones.

POSTER PRESENTATIONS

Poster number	Presenting author	Presentation title	YI Poster session
1	Anas Alkharusi	Development of an AI-based deep learning analytical method for the accurate and precise detection of blood vessels in cadaveric human spinal cord histology	A
2	William Antcliff	The impact of Urban Particulate Matter on Neurodevelopment: An Interdisciplinary Study of Environmental Stressors in the Zebrafish Model	B
3	Luke A Barlow	Evolution of suckling and the pterygoid region in mammals	A
4	Marina Marianova Polania Baskova	How well does AI understand anatomy? A comparative study of generated images of the eye, the kidney, the liver, the heart and the bones of the hand	B
5	Bassani Roberto	Can vascular anatomical variability modify the surgical approach and strategy for anterior spine reconstruction?	
6	Ashley Benge	Middle Cerebral Artery Anatomy, Variations & Musculoskeletal Motor Control: an Irish Cadaveric Study	A
7	Ashley Benge	Unusual Muscle Variant Connecting Brachialis and Biceps Brachii in a Human Cadaver	B
8	Harry Berks	High Functional Optimality in Mammalian Jaws Reflects an Evolutionary Trade-Off Between Strength and Speed	A
9	Jane Botzaropoulos	Reframing the Body in Anatomy Education: The Influence of Terminology on Respect, Professionalism, and Ethical Perception	
10	Zekiye Karaca Bozdağ	Intraoperative Gastric–Splenic Arterial Patterns and Their Association with Partial Splenic Ischemia: An Exploratory Anatomical Study	
11	Zekiye Karaca Bozdağ	Prevalence of Circle of Willis Variations Across Different Modalities: A Systematic Review, Meta-analysis, and Institutional Cadaveric Validation	
12	Zekiye Karaca Bozdağ	Age and Sex Related Variations in Quadriceps Angle and Lower Extremity Alignment Parameters: A Retrospective Radiographic Study	
13	Anthony Bright	The efficacy of utilising ultrasound technology in early human anatomy education to improve sonography skills in Sports Medicine	
14	Lorna Brockbank	Variations of the Radioulnar Anastomosis in Humans	B
15	Sumar Chan	A Pioneering Five-model Machine Learning Paradigm for Metric Sex Estimation of Adult Asian Mandibles (Homo sapiens)	A
16	Fidelis Chibhabha	Effects of Pranayama (yogic breathing) on undergraduate medical student stress and autonomic regulation: A mixed methods study	
17	Shona Cumming	Repeatability and Reproducibility of Deep Learning-assisted MRI-Derived Iliopsoas Muscle Volume and Muscle Fat Infiltration in Humans	
18	Charlie Cunnane	A preliminary study investigating the accuracy of an image-based subject-specific biomechanical model of the flexor group of the human forearm.	B
19	Chani Daly	Description and ecological inferences of a novel mustelid specimen from the Indian Siwalik Group	A
20	Dorien de Vries	Dietary reconstruction and disparity through time of South American fossil metatherians using dental topography and machine learning methods	

21	Daniel Dineen	How does the ability to form mental images impact anatomy learning in veterinary students?	B
22	Grzegorz Fibiger	Anatomical variability of the acromion and its clinical significance - a systematic review with meta-analysis	A
23	Daniele Giampietro	DEVELOPING A LIBRARY OF DIGITALLY REANIMATED HUMAN MITRAL VALVES	
24	Kat Gregory	Morphological Relationships Between Hard and Soft Tissue in the Domestic Chicken Cranium (Gallus gallus)	B
25	Kevin Gunawardena	Integrating Point-of-Care Ultrasound into Undergraduate Musculoskeletal Anatomy Teaching: A Pilot Study at UCL Medical School	A
26	Lucy Handford	When Do Children Become Capable of Processing Mechanically Challenging Foods? An Ontogenetic Analysis of Human Masticatory Performance	B
27	Sarah Hennigan	Investigating embryonic movement as a regulator of spinal ligament development in the embryonic chick.	A
28	Ernie Ho	Repurposing Ion Channel Modulating Drugs to Enhance Axon and Synaptic Regeneration in a Mouse Model of Nerve Injury	B
29	Louise Hosty	Development of a pro-angiogenic hyaluronic acid hydrogel decorated with vascular cell-derived ECM	A
30	Alix Hudson	Anatomical Variations of the Human Spring Ligament: A Cadaveric Study Using Combined Plantar and Dorsal Approaches	B
31	Juliette Hughes	The contribution of mechanical loading to osteoarthritis and ochronosis in Hgd-deficient mice	
32	Mohammed Ismail-Khan	Bridging Anatomy and the Operative Field: Teaching Modality of Vertically Integrated Human Pelvic Anatomy Shapes Cognitive Load and Surgical Anatomy Interpretation in Undergraduate Medical Students	
33	Philippa Jewell	Variability of Perforating Arteries for the Design and Dissection of the Anterolateral Thigh Flap	A
34	Radik Khayrullin	Assessment of the Topological Modularity of Human Wrist Skeleton	
35	Achiraya Kittiboonya	Investigating Variation in the Auriculotemporal nerve and distances between Auriculotemporal Nerve and Related Structures	B
36	Csenge Koppány	Automatic versus semi-automatic segmentation tools for microCT-based 3D modelling: a study using archaeological human bones	
37	Pui Ting Lau	Sex-based differences in the morphology and morphometry of the oblique popliteal ligament: a donor-based anatomy study	A
38	Luisa Leiss	Occipitalisation of the Atlas and Associated Craniovertebral Variations in Dry Human Skulls	
39	Abbie Maitland	Investigating Inter Hemisphereic Differentes in Cortical Thickness and Neuron Density- Examining Humans Brocas and Wernickes area to suggest an anatomical basis for lateralisation of language	B
40	Amy Manson	Does Resource Sequencing Matter? Evaluating the Impact of Model and Prosection Order in Anatomy Teaching for Year 2 Medical Students	
41	Amy Manson	Enhancing understanding of ultrasound through small group teaching in Year 2 MBChB anatomy labs	
42	Amy Manson	From Anatomy to Application: Introducing Clinical Vignette-Style Small-Group Discussion Quizzes Using Whiteboards	

43	Anandita Mariappan	Impact of Rac1 Loss on Epidermal Proliferation and Collagen Remodeling in Mice Keratinocytes Following Inflammation	A
44	Victoria McCulloch	Inclusive 3D Model of a Uterus for Visually Impaired Anatomy Students	
45	Victoria McCulloch	Creating Accessible Anatomy Teaching Resources for Visually Impaired Individuals	
46	Victoria McCulloch	Anatomy Uncovered: integrating UV light-activated labelling on anatomical models for 3D interactive flashcard creation	
47	Alannah J Mortimer	Early neuromuscular synaptopathy precedes network dysfunction in ALS mice and is reversible	
48	Abygail Mottram	Enhancing Musculoskeletal Anatomy Learning Using an Anatomage Table in Undergraduate Medical Education	
49	Max Mulligan	Identifying Suitable Donors for Motor Nerve Grafting in the Thigh: A Cadaveric Study of 3 Human Thighs	A
50	Tamra Nathan	Is Less Always More? Cognitive Load Implications of AI-Optimised Anatomy Images in Pre-clinical Learning.	
51	Ana Roberta Nita	Kugel's Artery Revisited: A Systematic Review and Meta-Analysis of Current Literature	
52	Natasha Noel-Barker	Exploring Distal Tendon Morphology of Tibialis Posterior and Fibularis Longus and Its Relationship with Foot Arch Structure. A Human Cadaveric Study.	B
53	Thomas O'Mahoney	Investigating the Effect of Obesity on the Human Ribs Using Geometr	A
54	Thomas O'Mahoney	Cranio-caudal Patterning of Human Foetal Thoracic Vertebral Development: A 3D Geometric Morphometric Study	B
55	Young Seok Park	The Human Omohyoid Muscle as a Functional Interface : Anatomical and Clinical Implications	
56	Ecaterina Pogorenii	Functional Anatomy of the Orbit Relevant to Transorbital Surgical Approaches: Reflections from Cadaveric Orbital Dissection.	A
57	Tahlia I Pollock	Functional consequences of extremes in cranial anatomy in wild canids and domestic dogs	
58	Rhieya Rahul	Modulation of ECM Composition to Determine the Effect on Human Triple-Negative Breast Cancer (TNBC) Cells in 3D Scaffolds	B
59	Sharmila Saran Rajendran	Evaluating Geographic Variance in Postcranial Sex Estimation in Humans.	
60	Maria Rose-Møller	Comparative anatomy of the larynx in bats, rodents and ungulates	
61	Isabel Samuel	A Rare Bilateral Variant of the Foramen Rotundum: A Human Cadaveric Case	A
62	Alana C. Sharp	Reassessing the functional significance of the temporal fascia in human cranial biomechanics	
63	Rymyana Smileveska	Thomson’s type 2 formation of the portal vein in a human cadaveric donor: a case report and review of portal venous variants	
64	Samuel Snowdon	Variation in the Branching Pattern of the Axillary Artery: Third-Part Branches Arising from the Second Part	
65	Atena Soltanian	Ecological drivers and evolutionary constraints in wild caprines	B
66	Kacper Starczewski	Development of a comprehensive 3D computational musculoskeletal model of a Japanese macaque and workflow for locomotory studies using OpenSim-Moco	A
67	Lucy Steward	Measuring Morphological Semitendinosus Variation in Human Cadavers: Implications for Anterior Cruciate Ligament Grafts	B

68	Ronja Struck	Fibreomics in the Tumour Microenvironment – Biomarkers Concealed in Extracellular Matrix Protein Organisation	A
69	Zak Vincent	A multi-organ morphological investigation into the consequences of reduced PPT1 using ovine models.	B
70	Joseph Biddlecombe, Laura Waller	Exploring medical student perceptions of 'good death' and donor motivations: Implications for the educational experience in the human dissecting room.	A
71	Colin Wan	The Language of Anatomy: An Etymological Activity to Understand and Identify the Muscles of Facial Expression.	
72	Ziyi Wang	From Lab to Clinic: Comparative Heart Anatomy and Histology of Human, Porcine and Ovine Powering Translational Device Design	B
73	Miriam Wassell	The association between mode of birth and long-term pelvic floor dysfunction: A systematic review of the literature	A
74	George Watts	The influence of island evolution on size-shape relationships in the anatomy of Myotragus balearicus and its relatives	B
75	Ian Woods	Testing the efficacy of a bioengineered drug eluting synthetic dural patch for spinal cord injury repair applications	
76	Jitendra Singh Yadav	Morphometric Analysis of the Suprascapular Notch and Superior Transverse Scapular Ligament Ossification in Human Scapulae from a North Indian Skeletal Collection	
77	Ellie Christina Yates	Comparative evaluation of fixatives for histological preservation of testis tissue from fresh-frozen human cadavers	A

POSTER ABSTRACTS

Poster 1

YOUNG INVESTIGATOR

Development of an AI-based deep learning analytical method for the accurate and precise detection of blood vessels in cadaveric human spinal cord histology

Anas Alkharusi, Ayman Alhabsi, Fabio Quondamatteo, Adrian Dervan

Royal College of Surgeons in Ireland, Dublin, Ireland

The human spinal cord (SC) is supplied by a complex vascular network and dysfunctional changes have been linked to ageing, injury, and disease. Traditional histological identification and analysis of BVs is time consuming and prone to observer bias. Therefore, this study aimed to develop a deep learning framework for automated blood vessel detection across different histological stains using embalmed cadaveric SC tissue. Paraffin-embedded spinal cord sections from four donors enrolled in the Anatomical Gift Programme at RCSI were stained with haematoxylin and eosin (H&E), periodic acid-Schiff (PAS) or Alcian Blue (AB) and imaged to generate approximately 1,000 images per stain. Following manual annotation, images were partitioned into training, validation, and test datasets (70:15:15). A YOLOv11-cls model was trained for stain classification, and three stain-specific YOLOv11 object detection models were developed for automated blood vessel detection and localisation. The stain classification model achieved 100% accuracy in differentiating between H&E-, PAS-, and AB-stained images. Evaluation of the blood vessel detection models was performed using precision, recall, F1-score, and Mean Average Precision at an Intersection over Union threshold of 0.5 (mAP@0.5), a standard computer vision metric used to assess object detection accuracy. Before augmentation, the PAS model achieved an mAP@0.5 of 89.2% with precision, recall, and F1-score values of 84%, 83%, and 84%, respectively. The AB model achieved an mAP@0.5 of 90.6% with precision, recall, and F1-score values of 83%, 85.5%, and 84%, respectively. The H&E model achieved an mAP@0.5 of 76.6% with precision, recall, and F1-score values of 71.6%, 71%, and 71%, respectively. Following augmentation, the PAS and AB models achieved mAP@0.5 scores of 90% and 91%, respectively, while the H&E model achieved 75.5%. When applied to stained medulla sections, all three models accurately identified blood vessels, demonstrating feasibility for BV identification in other brain regions. The analytical framework developed in this study demonstrates the feasibility and potential of applying artificial intelligence-based identification of human SC microvasculature across multiple staining techniques, supporting its potential as a scalable neurohistopathological tool for future spinal cord vascular research. This study was kindly supported by an Anatomical Society Undergraduate Summer Vacation Research Scholarship (2025).

Poster 2

YOUNG INVESTIGATOR

The impact of Urban Particulate Matter on Neurodevelopment: An Interdisciplinary Study of Environmental Stressors in the Zebrafish Model

William Antcliff, Molly Mann, Claire Thornton, Imelda McGonnell

Royal Veterinary College, University of London, London, United Kingdom

X --> @AntcliffWilliam, Linkedin --> William Antcliff

Urban particulate matter (UPM), a mixture of solids, gases and aerosols, is associated with ~7 million premature deaths annually. Early-life UPM exposure impacts upon cognition, memory and behaviour, yet it remains unclear whether UPM acts directly or instead, primes the nervous system to respond to other environmental challenges. There is also an emerging link between maternal stress and poor air quality. The zebrafish model offers a powerful system for gaining mechanistic insight into how UPM and maternal stress may combine to disrupt early human brain development. This model was used to test the hypothesis that repeated exposure to UPM and the stress hormone cortisol induce neurodevelopmental deficits. Zebrafish embryos and larvae were treated with UPM (100µg/ml) ± Cortisol (1µM) between 0-5 days post fertilisation (dpf). Treated larvae were assessed for alterations in morphometry using microscopy. Larvae incubated in UPM ± Cortisol showed significantly reduced head width—a proxy for forebrain/midbrain growth—at 5dpf. Neuronal architecture was examined using immunohistochemistry and confocal microscopy, showing qualitative differences in axonal connections in the brains of individual larvae. Novel computational pipelines are in development to quantify these changes. Histological and TUNEL analysis revealed distinct changes in cellular morphology at 5dpf, suggesting cell death mechanisms. To understand the functional impact, a suite of behavioural analysis was conducted. Reduced spontaneous tail movement was seen in treated embryos at 1 dpf, along with reduced speed and distance moved at 5dpf. Conversely, the opto-kinetic response, measuring visual acuity, was increased. These functional manifestations collectively suggest underlying altered neuro-motor development. Ultimately, this work will advance understanding of environmental risk to neurodevelopment and identify targets for intervention to mitigate the lifelong consequences of pollution exposure. It also introduces new computational pipelines capable of sensitively quantifying neuronal architecture, resolving both large-scale structural patterns and fine-scale local variations. This project has been approved by the RVC Animal Welfare and Ethic Review Board and is being conducted under Home Office Project License PP5309866. Zebrafish larvae were euthanised using a Schedule 1 method.

Poster 3

YOUNG INVESTIGATOR

Evolution of suckling and the pterygoid region in mammals

Luke A Barlow, Abigail S Tucker

Centre for Craniofacial and Regenerative Biology, Floor 27 Guy's Tower, Guy's Hospital, King's College London, London Bridge, London, UK

Throughout mammalian evolution from early synapsid ancestors to extant lineages, craniofacial structures associated with feeding have undergone substantial modification. Lactation is a defining mammalian characteristic, enabling postnatal nourishment via milk until independence. Extant mammals are divided into monotremes, marsupials, and placentals. Although they lactate, monotremes lack teats and instead secrete milk onto specialised abdominal skin patches. Therian mammals (marsupials and placentals) possess a specialised cranial element associated with the sphenoid bone, known as the medial pterygoid plate, from which the pterygoid hamulus arises as a posterior projection. This structure functions as a mechanical pulley for the tensor veli palatini, contributing to soft palate elevation and stabilisation during suckling and swallowing. The medial pterygoid plate develops late in gestation (~E15.5 in Mus musculus). It is notably absent in monotremes, although they possess two elements in the same region, known as the pterygoid and ectopterygoid. Here, we examine the comparative development of the pterygoid region across mammals, including the mouse (Mus musculus), gray short-tailed opossum (Monodelphis domestica), platypus (Ornithorhynchus anatinus), and short-beaked echidna (Tachyglossus aculeatus). Using trichrome and haematoxylin and eosin staining alongside immunofluorescence for Runx2, Sox9, and 12/101, we characterise the formation of the medial pterygoid plate and associated fibrocartilage in therians and assess possible homologous structures in monotremes. In therians, the medial pterygoid plate forms through coordinated intramembranous and endochondral ossification from distinct developmental domains. In monotremes, the pterygoid and ectopterygoid remain as unfused elements throughout ontogeny. However, the presence of fibrocartilage below the ectopterygoid in historical monotreme specimens suggests that soft-tissue specialisations in this region may predate the therian condition. These findings refine interpretations of the pterygoid hamulus as a therian-associated functional adaptation and suggest a more complex evolutionary history of cranial soft tissues involved in mammalian feeding mechanics. All animal use was approved by the Faculty Biological Safety Committee and the UK Home Office under the Animals (Scientific Procedures) Act 1986 Amendment Regulations (SI 2012/3039). Opossum specimens were obtained from the Francis Crick Institute (London, UK). Pouch young echidna samples were collected from a breeding colony at Currumbin Wildlife Sanctuary (Queensland, Australia). No additional ethical approval was required.

Poster 4

YOUNG INVESTIGATOR

How well does AI understand anatomy? A comparative study of generated images of the eye, the kidney, the liver, the heart and the bones of the hand

Marina Marianova Polania Baskova, Rumyana Smilevska

International French High School Pierre Deschamps, Alicante, Spain; Department of Physiology, Anatomy and Genetics, University of Oxford, Oxford, UK

Artificial intelligence (AI) has been increasingly used to generate medical images in research and academic work, however, its anatomical accuracy remains uncertain. This study aims to evaluate the anatomical quality of images generated by different AI models across different human organs, focusing on accuracy, number of items represented, hallucination, reproducibility as their potential suitability for use in education and generate quizzes. Images of five organs (eye, kidney, liver, heart and bones of the hand) were generated using different AIs such as ChatGPT, Copilot, Canva and Gemini with the same prompt. Each model was asked to create detailed anatomical illustration in the style of a professional medical atlas. The generated images were independently assessed through comparison with a standard anatomical reference: Netter's Atlas of Human Anatomy and points were awarded for each of the five categories. Gemini and ChatGPT scored higher in accuracy, numbers of items represented and had a lower number of hallucinations. Structures such as the bones of the hand and the kidney were better illustrated, and each AI created them in almost identical way. However, for the eye, no AI was able to be comparable to Netter´s. AIs had problems when creating an image of the liver, since each one represented it differently and, most of the time, incorrectly. In these cases, ChatGPT still appeared to have the greatest knowledge on the topic. Finally, it is important to highlight that Canva is one of the worst AIs for creating anatomical images because its function is more related to creativity, therefore, it modified the organs considerably and sometimes even attempted to represent them as art work. In terms of reproducibility, no AI was able to produce the same image twice. Overall, this study highlights both the potential and the current limitations of AI-generated anatomical images in education. While AI tools may serve as useful supplementary resources for visualization and rapid content creation, they cannot yet reliably replace validated anatomical atlases or expert-reviewed educational materials. This study did not require an ethical approval.

Poster 5

Can vascular anatomical variability modify the surgical approach and strategy for anterior spine reconstruction?

Roberto Bassani, Giuseppe Diodato Santoro

Spine Surgery Department, IRCCS Ospedale Galeazzi-Sant'Ambrogio, Milano, Italy.

Lumbar anterior column reconstruction may be achieved through prevertebral, antepsoas, and transpsoas approaches to the anterolateral lumbar spine. Although anterior lumbar interbody fusion (ALIF), oblique lumbar interbody fusion (OLIF), and lateral lumbar interbody fusion (LLIF) are distinct techniques, their selection depends on the interaction between target level, reconstructive objective, corridor anatomy, anatomical variability, patient-specific factors, and surgical manoeuvres. This narrative review examines the applied anatomy of these corridors and factors influencing approach selection. A narrative review of indexed anatomical, radiological, and surgical literature was performed. Evidence was organized by anatomical corridor, spinal level, structures at risk, relevant variants, acquired patient-related modifiers, and approach-specific manoeuvres. Given heterogeneity in anatomical definitions, imaging protocols, and surgical endpoints, no quantitative synthesis was undertaken. The prevertebral anterior corridor, used in ALIF, provides direct lower lumbar access, particularly at L5–S1, and enables midline discectomy, anterior longitudinal ligament release, large-footprint cage placement, disc-height restoration, and segmental lordosis correction. Feasibility depends on protection or mobilization of the peritoneal sac, ureter, aortic bifurcation, common iliac vessels, iliolumbar vein, middle sacral vessels, presacral venous plexus, and superior hypogastric plexus. The oblique antepsoas corridor, used in OLIF, exploits the interval between the great vessels and anterior psoas border, limiting direct lumbar plexus violation but requiring management of the ureter, sympathetic chain, segmental vessels, vascular window, and psoas retraction. The lateral transpsoas corridor, used in LLIF, avoids anterior vessel mobilization but traverses the psoas; therefore, lumbar plexus position, genitofemoral nerve, femoral nerve contributions, iliac crest height, rib cage, and disc obliquity become decisive constraints. L4–L5 is limited by iliac vessel mobility, narrowing of the antepsoas window, and greater plexus vulnerability, whereas conventional LLIF is generally unsuitable for L5–S1. Prior abdominal or retroperitoneal surgery, pelvic radiotherapy, infection, obesity, vascular calcification, transitional anatomy, deformity, and vertebral rotation may favour one corridor over another. Anterolateral lumbar interbody fusion should be understood as an approach-dependent surgery. Knowledge of regional anatomy and patient-related modifiers define the operative window, structures at risk, manoeuvres required, and circumstances in which one corridor becomes safer, more effective, or less appropriate than its alternatives.

Poster 6

YOUNG INVESTIGATOR

Middle Cerebral Artery Anatomy, Variations & Musculoskeletal Motor Control: an Irish Cadaveric Study

Ashley Benge, Grace Cahill, Andreea Factor

University College Cork, Cork, Ireland

The middle cerebral artery (MCA) is the largest and most anatomically complex cerebral artery, supplying key cortical and subcortical regions, which are critical for motor planning, coordination and movement execution. These territories include the lateral frontal and temporal cortices, the parietal cortex as well as the internal capsule and basal ganglia. This extensive vascular distribution of both left and right MCA establishes an essential direct link between cerebrovascular anatomy and musculoskeletal function, highlighting the importance of these arteries. Disruption of MCA perfusion can impair limb movements and gait, resulting in neuromusculoskeletal deficits frequently encountered in clinical practice. The MCA is the cerebral blood vessel most frequently affected in acute cerebrovascular accidents or strokes, and its occlusion can result in various degrees of contralateral motor and sensory deficits, including weakness and spasticity of upper and lower limbs. Such deficits severely affect an individual's motor performance and functional ability. This study examined the MCA morphology and variations in an Irish Cadaveric population, focusing on all four of its segments: M1 (sphenoidal), M2 (insular), M3 (opercular), and M4 (cortical). Both quantitative and qualitative assessments were performed, including measurements of the MCA vessel diameter and length, as well as evaluation of its anatomical course, branching patterns and variations. Notably, variability, such as bifurcation, trifurcation, early branching, and different looping configurations, were documented, within the M2 segment. Additionally distinct variations in the origin of the angular artery, a MCA cortical branch in the M4 segment, were also identified. The angular artery contributes to vascularisation of cortical regions involved in higher-order motor function. These findings provide further anatomical insight into MCA morphology and variation in an Irish population and highlight the clinical relevance of cerebrovascular anatomy to musculoskeletal motor control. Improved understanding of these neurovascular patterns may help explain the varied neuromusculoskeletal presentations seen following MCA compromise and support more targeted assessment and rehabilitation strategies. This research has been conducted on human cadavers from the University College Cork Anatomical Donor Program. All donors in the program have consented to the use of their bodies for medical education, research and training in accordance with the Anatomy Act and in lines with the Irish Medical Council Guidelines.

Poster 7

YOUNG INVESTIGATOR

Unusual Muscle Variant Connecting Brachialis and Biceps Brachii in a Human Cadaver

Emilie Aloeristok[1], Ashley Benge[1,2], André Toulouse [1,2]

1. School of Medicine, University College Cork, Cork, Ireland; 2. Department of Anatomy and Neuroscience, University College Cork, Cork, Ireland

This case study presents details of an unusual muscle slip connecting biceps brachii and brachialis identified during dissection. Anatomical variation in the upper limb is common and may complicate surgical approaches or contribute to compression of adjacent neurovascular structures. While variation of the vasculature is more common, atypical muscular connections within the upper arm have been reported. Differences in the musculature of the upper arm can have important implications for surgical interventions, as they can unexpectedly hinder access to neurovascular, muscular or skeletal components. They can also cause compression of adjacent structures, necessitating medical intervention. There is the potential for muscular variations to confound radiological diagnosis, potentially obscuring other structures or making imaging difficult to interpret. Despite these challenges, additional muscle slips or bellies can serve as valuable tools during reconstructive surgeries, by providing additional endogenous tissue. A distinct muscular slip, extending from the deep aspect of biceps brachii near its distal tendon to superficial fibres of brachialis, was identified during dissection of the left arm of a 79-year-old male donor. Variation involving biceps brachii is relatively common; however, brachialis is less frequently implicated. Muscular connections such as this one may have implications for surgical approaches to the distal arm and antecubital fossa, therefore should be considered when assessing upper limb pathology involving compression of adjacent neurovascular structures. Recognition of such variants remains important for anatomists and clinicians managing the upper limb. The donor consented to the use of their body for medical education, research and training in accordance with the Irish statutes governing anatomical dissection and in line with the Irish Medical Council Guidelines.

Poster 8

YOUNG INVESTIGATOR

High Functional Optimality in Mammalian Jaws Reflects an Evolutionary Trade-Off Between Strength and Speed

Harry Berks, Josh Anderson, Sidney Davies, George Duffin, Owain Evans, Soph Fasey, Jack Lovegrove, Spencer Pevsner, Iain Ratter, Andrew Shepherd, Philip Vixseboxse, Oliver Weeks, Winston Wilson, Alistaire Wu, Phil Donoghue, Emily Rayfield

University of Bristol, Bristol, UK

The vertebrate mandible provides an ideal system to test the evolutionary relationships between form and function, offering rich extant and fossil sampling, and playing a key role in feeding biomechanics. Furthermore, the jaw can be modelled as a simple lever system, presenting a well-established functional trade-off between strength and speed. Here, we quantify jaw shape diversity across Mammalia and evaluate the impact of the strength-speed trade-off in this key vertebrate clade. Using Elliptical Fourier analysis, we quantified lateral jaw shape in 2,063 extant and extinct mammal species, representing all 27 extant and 25 extinct orders. To investigate functional jaw properties throughout morphospace we evaluated the mechanical performance of theoretical jaw morphologies across the morphospace. Rotational efficiency and median von Mises stress during a bite-muscle load simulation act as proxies for speed and strength respectively. Combining the subsequent functional landscapes in a Pareto optimality ranking, revealed high optimality in the strength-speed trade-off. Extreme morphologies linked to specialized ecologies, e.g. filter-feeding, show reduced optimality, suggesting relaxation or overriding of the trade-off in these groups. Our findings showcase the importance of biomechanical trade-offs in morphological evolution, revealing how mammalian jaws have evolved to balance competing mechanical demands across a great range of ecologies.

Poster 9

Reframing the Body in Anatomy Education: The Influence of Terminology on Respect, Professionalism, and Ethical Perception

Jane Botzaropoulos, Marcela Bezdickova

Swansea University Medical School, Faculty of Medicine, Health and Life Science, Swansea, UK

The terminology used to describe human bodies in anatomy education varies, with terms such as “cadaver” and “donor” often used interchangeably. However, linguistic choices may influence how learners conceptualise the body, shaping perceptions of respect, professionalism, and ethical practice. This study examined the impact of terminological choices on perceptions among students and educators, and whether these differ across stages of training and experience. A cross-sectional online survey was distributed via institutional gatekeepers across the United Kingdom and Ireland to anatomy students and educators. Perceptions were measured using Likert-scale items, alongside open-ended responses. Quantitative data were analysed using descriptive and comparative techniques in SPSS, while qualitative data were examined using thematic analysis. Responses from 106 participants across 10 institutions indicated that anatomical terminology was perceived differently, with higher agreement for “donor” as reflecting ethical and professional values (M=4.23, SD=1.01) than “cadaver” (M=3.07, SD=1.30). Conversely, “cadaver” was more strongly associated with scientific and educational purpose (M=4.00, SD=1.11) than “donor” (M=3.38, SD=1.13). High agreement was reported that terminology influences public perceptions of anatomy education (M Likert score=4.07, SD=1.01). Preference was most commonly context-dependent (46.2%), followed by “donor” (30.2%) and “cadaver” (19.8%). No significant difference was observed between students and educators in perceptions of “donor” as reflecting ethical values (p=0.217). These findings demonstrate that anatomical terminology carries distinct ethical and functional meanings within anatomy education, with implications for professional identity formation, communication, and public understanding, and support the use of context-sensitive language in anatomy education. Ethical approval for this study was granted by Swansea University Medical School Research Ethics Sub-Committee (approval number: 2 2026 14568 15185), and all participants provided informed consent prior to participation.

Poster 10

Intraoperative Gastric–Splenic Arterial Patterns and Their Association with Partial Splenic Ischemia: An Exploratory Anatomical Study

Emre Bozdağ[1,2], Zekiye Karaca Bozdağ[3], Ayla Kürkçüoğlu[4]

[1] Department of Gastroenterological Surgery, University of Health Sciences, Kanuni Sultan Süleyman Training and Research Hospital, Istanbul, Türkiye; [2] Department of Gastroenterological Surgery, Aydın City Hospital, Aydın, Türkiye; [3] Department of Anatomy, Faculty of Medicine, Istanbul Yeni Yüzyıl University, Istanbul, Türkiye; [4] Department of Anatomy, Faculty of Medicine, Yüksek Ihtisas University, Ankara, Türkiye

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The gastric–splenic arterial network represents one of the most anatomically variable vascular territories of the upper abdomen, yet the functional intraoperative relevance of this variability remains insufficiently understood. This prospective observational anatomy-oriented study aimed to characterize intraoperative gastric–splenic arterial patterns and evaluate their relationship with partial splenic ischemia observed during laparoscopic gastric surgery. Forty adult patients undergoing laparoscopic procedures for obesity, gastric GISTs, or achalasia were evaluated using standardized intraoperative laparoscopic video recordings and photographic documentation. Arterial anatomy supplying the gastric fundus and splenic hilum was classified into three dominant intraoperative configurations: Type A (dominant arterial trunk), Type B (segmental branching), and Type C (diffuse branching). Splenic perfusion was assessed macroscopically following vascular division and categorized as focal, segmental, or multisegmental ischemia according to the distribution of visually identified ischemic areas. Type A anatomy was identified in 13 patients (32.5%), Type B in 23 (57.5%), and Type C in 4 (10.0%). Arterial branch counts differed significantly among arterial patterns ($p=0.0002$), with Type B and Type C configurations demonstrating a more complex branching architecture than Type A. Qualitative vascular morphology also differed significantly, with Type A anatomy characterized by longer and thicker vessels, whereas Types B and C demonstrated shorter and thinner segmental or diffuse branches. Partial splenic ischemia was observed intraoperatively in 15 patients (37.5%). Among these, focal ischemia was the most frequent pattern (46.7%), followed by segmental (33.3%) and multisegmental ischemia (20.0%). Although ischemic changes occurred across all arterial configurations, arterial pattern type alone did not independently predict ischemia. These findings suggest that splenic perfusion during gastric surgery depends not only on static arterial morphology but also on collateral vascular continuity and dynamic intraoperative vascular relationships. Recognition of gastric–splenic arterial variability may improve anatomical interpretation during upper gastrointestinal surgery and contribute to more informed intraoperative assessment of splenic perfusion. Ethical approval was obtained from the Clinical Research Ethics Committee of Kanuni Sultan Süleyman Training and Research Hospital (Approval No: 2025.09.236).

Poster 11

Prevalence of Circle of Willis Variations Across Different Modalities: A Systematic Review, Meta-analysis, and Institutional Cadaveric Validation

Zekiye Karaca Bozdag[1], Ozkan Oguz[2], Roger W. Soames[3], Abduelmenem Alashkham[4,5]

1 Department of Anatomy, Faculty of Medicine, Istanbul Yeni Yüzyıl University, Istanbul, Türkiye; 2 Department of Anatomy, Faculty of Medicine, Cukurova University, Adana, Türkiye; 3 Centre for Anatomy and Human Identification, School of Science and Engineering, Dundee University, Dundee, UK; 4 Edinburgh Medical School, Department of Anatomy, University of Edinburgh, Edinburgh, UK; 5 Department of Anatomy, Faculty of Medicine, Zawia University, Zawia, Libya

https://x.com/zekiyekaraca?s=11

Variations of the Circle of Willis (CoW) are clinically important due to their association with collateral cerebral circulation, aneurysm formation, cerebrovascular disease, and neurovascular surgical planning. However, reported prevalence rates vary considerably across studies because of methodological heterogeneity, differing definitions of hypoplasia, and variation in imaging or cadaveric assessment techniques. The present study aimed to evaluate the prevalence of common CoW variations according to study modality and to perform a preliminary comparison with a cadaveric cohort from the University of Dundee. A systematic PubMed search identified 388 records. Following screening and eligibility assessment, cadaveric, computed tomography angiography (CTA), and magnetic resonance angiography (MRA) studies reporting extractable prevalence data were included. Data extraction focused on completeness of the CoW, A1 hypoplasia/aplasia, posterior communicating artery (PCoA) hypoplasia/aplasia, and unilateral or bilateral fetal-type posterior cerebral artery (FTP). Studies without extractable numerical data were excluded from pooled prevalence analyses. Preliminary findings demonstrated substantial variability between modalities. Cadaveric studies generally reported higher frequencies of complete CoW configurations compared with imaging-based studies, whereas PCoA hypoplasia and fetal-type posterior circulation variants were more frequently identified in CTA and MRA datasets. Considerable methodological inconsistency was observed across the literature, particularly regarding the definition of hypoplastic vessels and classification of incomplete configurations. A preliminary cadaveric comparison cohort derived from the University of Dundee demonstrated variation patterns comparable to those reported in the wider cadaveric literature, supporting the feasibility of future institutional comparative analyses. These findings highlight the importance of modality-specific interpretation when evaluating CoW anatomy and underline the need for standardised anatomical terminology and reporting criteria in future prevalence studies and meta-analyses. Ethics statement: Ethical approval for the study was obtained from the Istanbul Yeni Yüzyıl University Non-Interventional Health Sciences Research Ethics Committee (Decision No: 2026/03-1895).

Poster 12

Age and Sex Related Variations in Quadriceps Angle and Lower Extremity Alignment Parameters: A Retrospective Radiographic Study

Zekiye Karaca Bozdag[1], K. Ayberk Sinci[2], Fatih Senturk[3], Roger W. Soames[4], Ozkan Oguz[5], Abduelmenem Alashkham[6,7]

1 Department of Anatomy, Faculty of Medicine, Istanbul Yeni Yüzyıl University, Istanbul, Türkiye; 2 Department of Radiology, Health Sciences University, Kanuni Sultan Süleyman Training and Research Hospital, Istanbul, Türkiye; 3 Department of Orthopaedics and Traumatology, Health Sciences University, Kanuni Sultan Süleyman Training and Research Hospital, Istanbul, Türkiye; 4 Centre for Anatomy and Human Identification, School of Science and Engineering, Dundee University, Dundee, UK; 5 Department of Anatomy, Faculty of Medicine, Cukurova University, Adana, Türkiye; 6 Edinburgh Medical School, Department of Anatomy, University of Edinburgh, Edinburgh, UK; 7 Department of Anatomy, Faculty of Medicine, Zawia University, Zawia, Libya

https://x.com/zekiyekaraca?s=11

Quadriceps angle (Q angle) is an important indicator of lower extremity alignment and patellofemoral biomechanics; however, its relationship with age-related alignment changes remains incompletely understood. This study aimed to investigate variations in Q angle according to age, sex, and selected lower extremity alignment parameters using standing long-leg radiographs. Forty individuals were retrospectively evaluated and stratified into four age groups (18–29, 30–44, 45–59, and ≥60 years; n=10 per group). Bilateral Q angle, hip-knee-ankle angle (HKA), mechanical lateral distal femoral angle (mLDFA), medial proximal tibial angle (MPTA), femur length, tibia length, and mechanical axis deviation (MAD) were measured on standing lower extremity radiographs. Descriptive statistics, one-way ANOVA, independent samples t-tests, and correlation analyses were performed. Mean Q angle values demonstrated significant variation among age groups, with relatively higher values observed in younger and older individuals compared with the middle-aged groups (18–29 years: 15.23° ± 2.99; 30–44 years: 12.41° ± 1.03; 45–59 years: 12.68° ± 1.39; ≥60 years: 15.78° ± 1.44; p=0.0002). Significant age-related differences were also identified for HKA (p=0.00004), mLDFA (p=0.043), and MPTA (p=0.0017). Female participants demonstrated significantly greater Q angle values than males (15.06° ± 2.46 vs 12.98° ± 1.75, p=0.004), whereas MPTA also differed significantly according to sex (p=0.009). Correlation analysis revealed weak negative associations between Q angle and HKA (r=-0.18) and between Q angle and MPTA (r=-0.25), suggesting that coronal lower extremity alignment may contribute to quadriceps angle variability. Scatter plot and regression analyses demonstrated that Q angle was not explained by a single anatomical parameter, supporting the multifactorial nature of lower extremity alignment. These preliminary findings suggest that both age and sex may influence Q angle morphology and associated coronal alignment characteristics. In particular, proximal tibial alignment parameters may contribute more substantially to Q angle variability than distal femoral alignment measures. Further studies with larger cohorts are warranted to clarify the biomechanical and clinical implications of these findings. Ethical approval was obtained from the Istanbul Yeni Yüzyıl University Non-Interventional Health Sciences Research Ethics Committee (Approval No: 2026/03-1894).

Poster 13

The efficacy of utilising ultrasound technology in early human anatomy education to improve sonography skills in Sports Medicine

Anthony Bright [1], Natasha Noel-Barker[1], Rudolf Billeter-Clark[1], Christian Wilson [2]

1 University of Nottingham, Nottingham, UK; 2 University Hospitals of Leicester NHS Trust, Leicester, UK

Effectively being able to interpret and use ultrasound technology is widely known as an important skill in Medicine. Sport and Exercise Medicine is one area where it has become increasingly important and useful for fast, live imaging. Many students studying Medicine, or specialised medical degrees such as MSc Sport and Exercise Medicine have little pre-clinical practice with sonographic technology. Considering the higher variability in user skill levels than other imaging techniques, it's imperative this skill is improved in students going on to these professions, in pre-clinical medicine but also Sports and Exercise programs that teach Sports Medicine modules. In the 25/26 academic year at the University of Nottingham, ultrasound technology has been introduced with a higher involvement than previous years in pre-clinical Medicine, BSc Sports and Exercise Science (SES) and MSc Sports Medicine to teach clinical aspects of the musculoskeletal system. Surveys were conducted throughout the academic year for the SES course following clinical sessions that involved student and clinician use of ultrasound technology to assess student opinion of ultrasound effectiveness (n=24, 17, 34). A pilot study was also conducted to evaluate the effectiveness of teaching with ultrasound in combination with human cadaveric material to teach wrist anatomy (n=42). For the SES clinical sessions, the 10 minute ultrasound station was noted as the most preferred part of the 2 hour session by 25%, 53% and 35% of students (respectively from 3 different classes) without being prompted in an open-ended question. The pilot study resulted in majority (80%) of the MSc Sports Medicine students noting they wanted more time with the ultrasound, and many stated it was the reason they came to the study. This study shows the importance of improving skills in sonographic technology within early higher education for those heading towards Sports Medicine. This study was conducted with ethical approval from the University of Nottingham School of Life Sciences, ethics code: B020925AB. Human cadaveric material use was approved under the Human Tissue Authority licence: 12085

Poster 14

YOUNG INVESTIGATOR

Variations of the Radioulnar Anastomosis in Humans

Lorna Brockbank, Clare Lamb, Seaneen McDougall

Centre for Anatomy and Human Identification, University of Dundee, Dundee, Scotland

The ulnar artery (UA) and radial artery (RA) usually form the superficial palmar arch (SPA) and deep palmar arch (DPA) in the hand. This creates the radioulnar anastomosis, allowing the arteries to compensate for each other following damage. Due to this, the RA is used for various medical procedures that may remove its vascular supply. However, variations can cause a disconnect in the arches. Additionally, accidental surgical arteriopuncture can occur due to uncertainty regarding arterial positions. As such, this study aimed to investigate and document the artery patterns of the radioulnar anastomosis to discover the extent of collateral supply present and the lengths and positions of those arteries. No previously published works were found that investigated palmar arterial variations in Scotland, and only one that had used Thiel-embalmed cadavers. The hands of 25 cadavers were bilaterally injected with silicone intra-arterially and dissected. This was undertaken in the Centre for Anatomy and Human Identification, under the Anatomy Act 1984 and the Human Tissue (Scotland) Act 2006. The lengths of the arteries and their positions relative to the bistyloid line and metacarpophalangeal-bistyloid line anatomical landmarks were measured using a caliper. The hands were photographed and the same measurements carried out digitally using ImageJ. Complete SPAs were found in 68% of hands, with a higher rate of complete arches in males than females ($p=0.003$). According to classification systems created by previous authors, 48% of SPAs were of the classic radioulnar type, 16% were complete ulnar-only, 2% were complete medianoulnar, 2% were complete radiomedianoulnar, 2% were incomplete radioulnar, 28% were incomplete ulnar-only, and 2% were incomplete medianoulnar. A median artery (MA) was found in 6% of hands. The DPA was complete in 94% of hands. Both arches were incomplete in 1 hand (2%), and 8% of hands risked ischemia following UA, RA or MA damage. Many arteries were longer or further from anatomical landmarks in males than females. Discrepancies exist between arterial classifications in the literature, limiting study comparisons, and meaning the extent of collateral circulation is not portrayed effectively. Ethical approval was sought for interobserver analysis of measurements.

Poster 15

YOUNG INVESTIGATOR

A Pioneering Five-model Machine Learning Paradigm for Metric Sex Estimation of Adult Asian Mandibles (Homo sapiens)

Sumar Chan, Abduelmenem Alashkham

Department of Anatomy, Edinburgh Medical School, University of Edinburgh, Edinburgh, UK

Sex estimation of the mandible is critical in forensic anthropology, given its high sexual dimorphism. Nevertheless, no studies have scrutinised machine learning (ML) for metric sex estimation in Asian mandibles, despite its strength of complex pattern recognition. Therefore, this pilot study aims to explore the multivariate metric sex estimation performance of ML by deploying a five-model machine learning framework on an Asian mandible sample. A historic mandible data subset from the Anatomical Museum Skull Room, University of Edinburgh, was analysed, comprising 103 Indian and Malay adult mandibles (80 males, 23 females) mainly from the late 19th century, with 16 parameters assessed. After a four-feature receiver operating characteristic (ROC) filter pre-processing, the dataset was subjected to a sex-stratified 80/20 train/test split protocol with five-fold cross-validation. Using the R tidymodels package, five distinct ML architectures (Support Vector Machines, Random Forest, Elastic Net Regression, K-Nearest Neighbours, Naïve Bayes) were examined across three sampling environments – baseline, synthetic minority over-sampling technique (SMOTE), random over-sampling (ROS) – to mitigate class imbalance. Model performance was evaluated by ROC, balanced accuracy, precision-recall curve, F1-score and precision. Outcomes across environments were compared by paired repeated-measures ANOVA and post-hoc paired-t test. Variable importance analysis was performed to identify the top sex-predictive parameters. Elastic Net Regression by SMOTE, Random Forest by SMOTE, Support Vector Machines by ROS, Random Forest by SMOTE and Support Vector Machines by baseline sampling yielded the highest ROC (0.87), balanced accuracy (0.86), precision-recall curve AUC (0.76), F1-score (0.80) and precision (0.9) respectively. There was no significant difference in outcomes across sampling environments. Bi-antegonial notch breadth was the most sexually dimorphic parameter, followed by maximum mandibular body height. This study successfully executed a rigorous ML paradigm with multi-dimensional tuning and a comprehensive assessment benchmark, contributing significantly to a nuanced understanding of ML utility for Asian mandibular sex estimation, relevant in medicolegal and forensic application. Ethical statement: this statistical study analysed a human mandible dataset in the Anatomical Museum Skull Room, University of Edinburgh (AMERGE no. 24-AM-014), with samples included having a time-since-death of over 100 years. Following Human Tissue (Scotland) Act 2006, no ethical approval was required.

Poster 16

Effects of Pranayama (yogic breathing) on undergraduate medical student stress and autonomic regulation: A mixed methods study

Karuna Katti, Fidelis Chibhabha, Lawrence Hayes, Elliott Dexter, Kai Van Winkelen

Faculty of Health and Medicine, Lancaster University, Lancaster, United Kingdom

Medical students face chronic stress, necessitating evidence-based interventions aligned with General Medical Council (GMC) well-being guidelines. This convergent mixed-methods study evaluated the efficacy of a daily 7-minute Pranayama (yogic breathing) intervention over two months on students' psychological distress, autonomic biomarkers, and lived experiences. First- and second-year medical students (N=13) participated in a Pranayama practice with an initial week of teaching and then a video guidance if needed. Quantitative metrics tracked Perceived Stress Scale (PSS) scores, blood pressure, heart rate, heart rate variability (HRV), and galvanic skin response (GSR) pre- and post-intervention. Qualitative data from focus group discussions were stratified by year of study and analysed for themes to explore compliance dynamics and perceived utility. Mean PSS scores dropped from 30 to 23 showing highly significant reduction in stress perception ($p = 0.0008$). Autonomically, mean HRV High-Frequency (HF) power tripled, indicating substantial vagal enhancement and Galvanic Skin Response (GS Total Score) decreased by 19 points reflecting reduced sympathetic arousal. However, these changes were not statistically significant (HRV (HF) $p= 0.290$ and GSS $p= 0.371$). This may be due to a small sample size. Qualitatively, thematic analysis revealed that Year 1 students experienced deep interoceptive awareness and viewed the practice as a refreshing daily routine. Conversely, Year 2 students approached it pragmatically as a bedtime sleep aid, reporting greater structural friction, routine disillusionment and academic fatigue. Quantitative subgroup findings mirrored these patterns: males and first-year students exhibited superior autonomic relaxation (vagal tone), with Year 1 total power expanding from 2908 ms2 to 8911 ms2. Conversely, females and high-frequency practitioners (>3 sessions/week) excelled at sympathetic electrodermal suppression. Notably, practicing three times weekly served as a physiological "sweet spot" for overall autonomic volume. Both cohorts emphasised a critical demand for external accountability, regular check-ins, and communal support to maintain long-term compliance. Pranayama is an effective tool for mitigating medical student stress, meeting GMC well-being guidelines. Significant psychological relief is supported by objective physiological shifts toward parasympathetic dominance. However, maximizing long-term adherence requires transitioning from mostly an autonomous model to an accountability-driven, institutional framework. The project is approved by FHM ethics committee, Lancaster university (FHM-2025-5439-RECR-2).

Poster 17

Repeatability and Reproducibility of Deep Learning-assisted MRI-Derived Iliopsoas Muscle Volume and Muscle Fat Infiltration in Humans

Shona Cumming, Ella Jones, Iani Gayo, Charles Hill, Magdalena Nowak

Perspectum Ltd, Oxford, UK; Perspectum Ltd, Oxford, UK; Perspectum Ltd, Oxford, UK; Perspectum Ltd, Oxford, UK; Perspectum Ltd, Oxford, UK

The musculoskeletal system is central to metabolic health and mobility. Given concerns over muscle loss with weight-loss pharmacotherapies, muscle assessment is increasingly sought in cardiometabolic trials. Assessment of individual muscles may provide greater sensitivity to regional patterns of muscle loss. The iliopsoas is of interest due to its role in mobility. While cross-sectional psoas area is commonly used as a surrogate marker, it does not capture whole-muscle volume, spatial heterogeneity, or muscle quality. Abdominal MRI is the gold standard for body composition assessment, yet isolated psoas segmentation can be inconsistent as the boundary between the psoas and iliacus muscles becomes indistinct where they merge. Combined iliopsoas segmentation avoids this limitation, while muscle fat infiltration (MFI) complements volume as a marker of muscle quality. Here, we evaluate scan–rescan repeatability and inter-scanner reproducibility of iliopsoas muscle volume and MFI. Twelve participants underwent same-day imaging across three clinical MRI scanners (GE 3T, Siemens 3T, Siemens 1.5T) using a ~4-minute 3D-Dixon (fat-water separated) abdominal acquisition to assess repeatability and reproducibility (subset size varied by analysis). Iliopsoas metrics were quantified using deep learning-assisted volumetric MRI segmentation with manual correction. The iliopsoas were segmented from origin to insertion, including the psoas major originating from T12–L5 and the iliacus originating from the iliac fossa, with the combined muscle belly inserting onto the lesser trochanter of the femur. MFI was calculated as the mean signal fat fraction (sFF) of voxels in the iliopsoas where sFF <50% to determine intra-muscular fat. The study cohort (mean age 47±12 years, 42% male, BMI 28±6kg/m2) had mean iliopsoas volume of 695±176mL, and MFI of 11.2±1.8%. Iliopsoas metrics demonstrated high scan–rescan repeatability (CoV 1.5–3%) with low repeatability coefficients (27mL for volume and 0.9% for MFI). Iliopsoas volume measurements demonstrated high inter-scanner reproducibility (CoV 0.9–1.8%). As these metrics are repeatable and can be derived from routine abdominal MRI, they may enable opportunistic muscle assessment within cardiometabolic and geriatric care pathways, while also providing robust quantitative biomarkers for weight-loss trials. Data were obtained from two studies with prior ethical approval (21/WS/0066, 20/SC/0185); with informed consent obtained from all participants.

Poster 18

YOUNG INVESTIGATOR

A preliminary study investigating the accuracy of an image-based subject-specific biomechanical model of the flexor group of the human forearm.

Charlie Cunnane[1], Ana Constanza Hernandez-Romero[2], Karl T. Bates[2].

1: School of Biosciences, Institute of Systems, Molecular and Integrative Biology, Faculty of Health and Life Sciences, University of Liverpool, Liverpool, UK; 2: Department of Musculoskeletal and Aging Science, Institute of Life Course and Medical Sciences, University of Liverpool, Liverpool, UK.

Biomechanical modelling of the musculoskeletal system is a useful approach for non-invasively studying the mechanical interactions of different structures in vertebrates. At present, most biomechanical models have focused on locomotion and the functional anatomy of the lower limbs. Within this body of work, it has been shown that subject-specific anatomical input data can improve model accuracy and reliability. However, 'generic' models based on mixed cadaveric data sets from the literature may still be valid in specific circumstances. Similar sensitivity studies have not yet been conducted for models of human upper limbs. Therefore, it remains uncertain how much subject-specific, rather than 'generic', anatomical input data is required to achieve desired thresholds of accuracy. Here, we present preliminary results from a new subject-specific model of the flexor group of the human forearm, built using MR imaging data from a young, healthy volunteer. Preliminary predicted isometric torque values for individual wrist flexors ranged from 0.99-6.48Nm, resulting in a total predicted torque of 23.06Nm. This value considerably over-estimates maximal wrist torque measured in the same participant (6.295Nm: a percentage difference of 266.25%). Interestingly, substituting subject-specific muscle input data with values from the literature lowered the percentage difference between measured and modelled maximal torque values (6.63-77.19%). This might reflect the predominance of older individuals in the existing anatomical literature, whose muscle properties may differ from those of the participant modelled here. Some of the discrepancy between modelled and measured torques may reflect limitations in the experimental data. However, future iterations of the model may reduce this error by incorporating greater physiological complexity, such as muscle force-length behaviour, as well as additional physiological data on human forearm muscles. Ethical approval was granted by the University of Liverpool Central Research Ethics Committee D (Ref 13538).

Poster 19

YOUNG INVESTIGATOR

Description and ecological inferences of a novel mustelid specimen from the Indian Siwalik Group

Chani Daly[1], Elsa Panciroli[2], Julia A. Schwab[3], Katrina Jones[1]

University of Bristol, Bristol, UK; National Museums Scotland, Edinburgh, UK; Oxford University Museum of Natural History, Oxford, UK

The Siwaliks comprises the Rawalpindi Group (20-14 Ma) and the Siwalik Group (14-0 Ma) which lie at the north end of the Indian subcontinent and yield a variety of macrofaunal fossils including large herbivores, primates, and more rarely, associated predators. This locality's importance is thanks to its well-preserved fossil assemblage and dynamic palaeo environment. The Siwalik Groups document well recorded turnovers in terrestrial and freshwater species, preserved in an alluvial floodplain that has undergone extreme tectonic and climate changes. Here Carnivore fossils are rare, so documenting a small Carnivore from this environment is crucial for understanding the ecosystem. Most Siwalik carnivorans are known principally from dental material, but limb material enables us to infer ecomorphology. We describe a historically collected mustelid specimen NMS SW628, from the Siwalik groups, comprising a distal femur and hindfoot in a sedimentary matrix. Using 3D reconstruction, body mass estimation, and comparative morphology we reconstruct the specimen, asses its taxonomic placement, and infer locomotor ecology to determine where it fit within the dynamic Siwalik ecosystem. Early results indicate our specimen was a large terrestrial mustelid between 15 to 20 Kg, similar in size to a wolverine (Gulo gulo) and honey badger (Mellivora capensis). The morphology of the ankle does not indicate any derived locomotor mode. This suggests it was a medium-sized generalist predator. Our findings provide a unique window into the rarely documented predatory niches of mustelids withing this dynamic ancient ecosystem. No live animals were used in this research, fossils were accessed responsibly, and data will be archived in an open-source database after publishing.

Poster 20

Dietary reconstruction and disparity through time of South American fossil metatherians using dental topography and machine learning methods

Dorien de Vries[1,2,3], Jessica Cadby[3], Alex Hall[3], Ellie Markham-Halliwell[3], Laura Smith[3], Amy Gao[4], Darin Croft[4], Russell Engelman[4], Laura Chornogubsky[5,6,7], Robin Beck[3]

1-Department of Earth and Environmental Sciences, University of Manchester, Manchester, UK; 2-Earth, Life, Time group, Naturalis Biodiversity Centre, Leiden, the Netherlands; 3-School of Science, Engineering & Environments, University of Salford, Salford, UK

South American metatherian diversity was high during the Eocene but dropped during the Oligocene. Besides global climate change at the Eocene-Oligocene Boundary (EOB), the arrival and diversification of platyrrhine monkeys during the Oligocene is another potential factor for the decrease in metatherian diversity. Here, we use dental topographic methods and a training set of lower molars of extant marsupials (43 species, 12 families) and primates (52 species, 13 families) of known diet to reconstruct the diet of 44 extinct "primate-like" metatherians from Paleocene to Miocene South American localities. Our goal is twofold: 1) test whether South American metatherian dietary adaptations and breadth changed from pre-EOB to post-EOB; and 2) test whether fossil metatherians filled dietary niches currently occupied by platyrrhines. We compared training accuracy of the extant sample using molar curvature, relief, and molar size between three machine-learning algorithms: linear discriminant analysis; quadratic discriminant analysis, and random forest (RF). RF performed the best based on overall accuracy (74%) and F1-score (70%) and was used for fossil reconstructions. The pre-EOB metatherian sample (n = 31) is reconstructed as including folivores, insectivores, frugivore-insectivores, and hard-object feeders. The smaller post-EOB sample (n = 13) includes only insectivores and insectivore-frugivores, reflecting the disappearance of species that have large molars with low curvature and relief. When comparing this to extant platyrrhine monkeys, platyrrhine frugivores and hard-object feeders occupy this vacated dental niche previously occupied by pre-EOB metatherians. However, as our post-EOB sample is limited, further sampling is needed to ensure our results are not sample-specific. No ethical approval was required. This research was funded by the Natural Environment Research Council (NERC, NE/T000341/1) and the Dutch Research Council (NWO, VI.Veni.232.136). We thank Alan Mappin (University of Salford, UK) for help scanning specimens.

Poster 21

YOUNG INVESTIGATOR

How does the ability to form mental images impact anatomy learning in veterinary students?

Daniel Dineen, Sarah B Channon

Department of Comparative Biomedical Sciences, The Royal Veterinary College, London, UK

The ability to form mental images varies between individuals, existing as a spectrum from aphantasia (absent imagery) to hyperphantasia (extremely vivid imagery). Anatomy is a highly visual and spatially challenging subject, requiring learners to visualise and explore the orientation and organisation of organs and structures. This becomes particularly important in clinical contexts and when working with live animals, where internal structures are not visible and mental representations may support locating them within the body. This mixed-methods study investigated the relationship between mental imagery vividness in veterinary students and their approaches to learning veterinary anatomy. Ethical approval was received from the Royal Veterinary College Social Sciences Research Ethical Review Board (URN SR2025 – 01851601). A questionnaire combining two validated instruments - the Vividness of Visual Imagery Questionnaire (VVIQ) and the Approaches to Studying Inventory for Students (ASSIST) - was completed by 380 veterinary students. Spearman's rank correlation was carried out to determine the relation between VVIQ scores and student approaches to studying anatomy. Semi-structured interviews were conducted, exploring student experiences, preferences and strategies when learning anatomy, with 16 students whose VVIQ scores fell at the extreme ends of the mental imagery ability spectrum. Interview data were analysed through thematic analysis. Mental imagery ability varied substantially between veterinary students, but in line with VVIQ scores reported in general population studies, suggesting that it may be a significant individual difference for anatomy educators to consider. There were significant ($p<0.05$) negative correlations between VVIQ score and specific items from the ASSIST inventory, indicating that mental imagery ability impacted approaches to learning in veterinary students. Qualitative data provided student insight into this relationship between mental visualisation and approach to learning. Five themes were identified: Lived Experiences of Mental Imagery; Sequence and Pace in Image formation; Recall and Comprehension; Dynamic Strategies for Learning Anatomy; and Strategies to Optimise Visual Recall. Our findings provide insight into how students incorporate mental visualisation within their anatomy learning, and inform inclusive pedagogical approaches and interventions to support students with lower imagery ability.

Poster 22

YOUNG INVESTIGATOR

Anatomical variability of the acromion and its clinical significance - a systematic review with meta-analysis

Grzegorz Fibiger [1,2,3,4] , Ignacy Jastrzębski [2], Kamil Możdżeń [1,2,3], Maciej Topa [2] , Krzysztof Kawiak [2], Kacper Stolarz [2], Jerzy A. Walocha [1,3], Przemysław Pękala [1,3]

1 Department of Anatomy, Jagiellonian University Medical College, Kraków, Poland; 2 Jagiellonian University Medical College, Faculty of Medicine, Kraków, Poland; 3 International Evidence-Based Anatomy Working Group, Kraków, Poland; 4 ARTROMED Orthopedic and Rehabilitation Center, Kraków, Poland;

The acromion is the most superior process of the scapula, forming part of the acromioclavicular joint and the roof of the subacromial space. Variation in its shape and dimensions may influence shoulder biomechanics and is clinically relevant in chronic shoulder pain, subacromial impingement, and rotator cuff pathology. This study aimed to systematically synthesize anatomical and radiological data on acromion morphometry and the prevalence of its morphological variations. A systematic search of five major medical databases (PubMed, Embase, SciELO, Scopus, and Web of Science) was conducted to identify studies on the clinical anatomy of the acromion. The initial search yielded 4430 records. After screening and full-text assessment by four independent researchers, 168 studies were included in the meta-analysis. Study quality was assessed using the AQUA tool, and PRISMA guidelines were followed. Overall, in our study 27,524 limbs were analyzed. According to the Bigliani classification, Type II, the curved acromion, was the most prevalent type, with a pooled prevalence of 55.0% (95% CI: 51.6–58.3; I^2 = 90.9%). In studies using Gagey's classification, Type II was also the most common type, with a prevalence of 42.1% (95% CI: 38.1–46.2; I^2 = 80.6%). The mean anteroposterior acromial length was 43.72 mm (95% CI: 42.88–44.57; I^2 = 97.7%), and the mean width was 25,13 mm (95% CI: 23.97–26.30; I^2 = 98.5%). The gleno-acromial distance was 32.80 mm (95% CI: 28.95–36.65; I^2 = 99.0%), while the lateral acromial angle was 78.81° (95% CI: 77.35–80.27; I^2 = 99.2%). Acromial tilt and slope measured 33.72° (95% CI: 32.26-35.18; I^2 = 99.8%) and 24.71° (95% CI: 22.43-26.99; I^2 = 99.0%), respectively. The acromion was located 7.81 mm from the humerus and 32.09 mm from the coracoid process. The critical shoulder angle was 34.01°. This meta-analysis showed that the curved acromion is the most common morphological type and provided pooled benchmarks for clinically relevant acromial parameters. These data may support shoulder imaging interpretation and preoperative planning for acromioplasty by defining the expected anatomical range and encouraging careful, limited bone removal, especially in patients with relevant rotator cuff related shoulder symptoms. Authors declare no conflict of interest, due to study type, Ethics Committee approval was not sought. This research was funded by the Ministry of Science and Higher Education (Republic of Poland) under the program "Support for students in enhancing their competitions and skills" (Konkurs pn. Wsparcie studentów w zakresie podniesienia ich kompetencji i umiejętności), grant number [MNiSW/2025/DPI/648].

Poster 23

Developing a library of digitally reanimated human mitral valves

Giampietro Daniele [1,2], Abraha Mehari Hyab[1], Curtin Caroline[1,2,3], Conway Claire[1,2]

1- Tissue Engineering Research Group (TERG), Royal College of Surgeons in Ireland (RCSI), Dublin; 2- Trinity Centre for Biomedical Engineering, Trinity College Dublin & RCSI; 3)Advanced Materials and Bioengineering Research Centre (AMBER), RCSI and TCD, Dublin, Ireland

Mitral regurgitation (MR) is a valvular pathology affecting 24 million people globally. It arises from incomplete leaflet coaptation, resulting in retrograde blood flow into the left atrium, and poorer cardiovascular outcomes for patients. In silico modelling has emerged as a powerful approach for studying cardiac function and mitral valve mechanics in healthy and pathological states. However, existing computational models of the left ventricle lack detailed population specific information on mitral apparatus and ventricular microstructure fibre orientation in aged human cardia. Here, we present multimodal imaging techniques that serve as input for digital reanimation of left ventricular and mitral function. Use of ex-vivo human cardia in imaging complied with the RCSI Anatomical Museum Committee regulations. Five aged human cardia were imaged with high-resolution micro-computed tomography (µCT) and diffusion-tensor magnetic resonance imaging (DT-MRI). Five mitral valves were explanted and re-imaged at higher resolution µCT. DTMRI data processing protocol was first tested on a known fibre orientation with a Q-Ball crossing phantom. The same protocol was applied on a porcine heart to assess the impact of fixation and staining on DT properties, before translating the methodology to the ex-vivo human hearts. Using 3D slicer software, left ventricle, papillary posts and mitral apparatus of five cardia were segmented to create high-resolution, digital, anatomical representations. Successful validation of the DTMRI analysis protocol was performed with Q-Ball crossing phantom to visualise expected fibre directions, per design of phantom. DTMRI datasets further underwent denoising and subsequent tractography in ExploreDTI software, enabling extraction of myofiber architecture as it relates to the first eigenvector of the tensor fit to DTMRI. Using Large Deformation Diffeomorphic Metric Mapping (LDDMM) technique 3D myocyte architecture is then morphed from DTMRI to µCTbased 3D volumes. The resulting platform of patient-specific computational models will be electrically and mechanically activated using finite element analysis (FEA). The digital cardiac library created as part of this project will provide concrete insights into how inter-subject anatomical variability in an aged population modulates cardiac mechanical function. This will contribute to the development of more effective device treatments for MR.

Poster 24

YOUNG INVESTIGATOR

Morphological Relationships Between Hard and Soft Tissue in the Domestic Chicken Cranium (Gallus gallus)

Kat Gregory, Ryan Felice, Ryan Marek, Andrew Knapp

UCL, London, UK

@morpho-kat.bksy.social

The avian cranium is a complex, highly integrated structure under the effects of many selective pressures. Of the studies that attempt to interrogate these intracranial relationships, most are large interspecific studies, studies through ontogenetic growth, or focus on either soft tissue or hard tissue. Therefore, there is a lack of understanding of how cranial tissues covary within adult populations of birds. Here, we collected data on size, shape, and volumetric data collected from paired CT and diceCT scans of 50 domestic chicken specimens (Gallus gallus). Shape data was collected using 3D geometric morphometric quantification of the endocast, neurocranium, and adductor mandibulae externus (mAME) & depressor mandibulae (mDM) attachment sites using both fixed and sliding semilandmarks. This shape data was then combined with centroid size of the landmarked tissues, orbit size measurements, and volumes across 6 key jaw muscles for opening and closing. Volumes were collected via assisted segmentation of diceCT scans using BioMedisa and NNInteractive. There is a high degree of shape and size integration between both soft and hard tissue elements in the chicken cranium. However, there is no significant correlation between muscle attachment site shape and muscle volume. This suggests that muscle attachment sites do not accurately represent muscle volume variation, which has major implications for avian palaeontological reconstruction. Additionally, although there is no significant relationship between muscle attachment site shape or skull shape and muscle volume, there is a significant correlation between muscle volume and endocast shape, suggesting a high degree of integration between soft tissues. This underscores the need to assess both hard and soft tissues in situ to better understand the links between soft tissues and their associated osteological proxies. No animals were killed for the purpose of this research; research was conducted on animal by-products of the meat industry and thus no ethical approval was required.

Poster 25

YOUNG INVESTIGATOR

Integrating Point-of-Care Ultrasound into Undergraduate Musculoskeletal Anatomy Teaching: A Pilot Study at UCL Medical School

Dylan Patel, Kevin Gunawardena, Rohan Peacock, John Dardha, Wendy Birch,

UCL Medical School, University College London, London, UK

Point-of-care ultrasound (POCUS) is increasingly being integrated into clinical practice. Real-time visualisation of structures complements anatomy lab and lecture-based learning. Early exposure during pre-clinical training may support the development of image interpretation skills and spatial anatomical reasoning that underpin safe clinical practice. This study evaluated the feasibility and perceived educational value of the Butterfly iQ3 handheld ultrasound probes in musculoskeletal anatomy teaching at UCL Medical School, assessing student-reported usability, engagement, and support for broader curriculum integration. Six drop-in sessions were held, with a total of 50 participants (Year 1: n = 26; Year 2 n = 24). Each session includes a short demonstration on operating the device, teaching on interpreting images and tracing anatomical structures. Participants then used the probes to independently identify key forearm structures including arteries, tendons, peripheral nerves and skeletal muscle bellies. A structure feedback questionnaire was completed immediately following each session. Fisher's exact test was used to compare response between year groups and a reflexive thematic analysis for qualitative responses. Forty-nine of 50 students (98%) reported the probes and software to be easy to use. All participants agreed POCUS would be a valuable addition to anatomy teaching and would also use the probes to support independently learning if given the opportunity. No significant differences were observed between year groups ($p > 0.05$). Qualitative responses highlighted the value of real-time visualisation, appreciation of anatomical variation and the engaging nature of the technology. Students identified the limbs, in particular carpal and tarsal tunnel regions, and also neck areas as priority areas for future integration. These findings demonstrate strong and consistent student acceptance and perceived educational benefit of handheld ultrasound in pre-clinical anatomy teaching. Additionally, embedding POCUS early may foster the anatomical literacy and image interpretation skills increasingly demanded in modern clinical training, supporting a case for formal curricular integration. This study was conducted with the full understanding and written consent of all participants. Ethical approval was not required, as confirmed by the UCL ChangeMakers Project Ethics Team.

Poster 26

YOUNG INVESTIGATOR

When Do Children Become Capable of Processing Mechanically Challenging Foods? An Ontogenetic Analysis of Human Masticatory Performance

Lucy R. Handford, Alana C. Sharp, Philip G. Cox, Laura C. Fitton

1) Department of Archaeology, University of York, York, UK, 2) Centre for Integrative Anatomy, Department of Cell & Developmental Biology, UCL, London, UK, 3) Department of Musculoskeletal and Ageing Sciences, Institute of Life course and Medical Sciences University of Liverpool, UK, 4) Centre for Anatomical and Human Sciences, Department of Archaeology and Hull York Medical School, University of York, York, UK

www.linkedin.com/in/lucy-handford-UoY

Human children begin transitioning to solid foods whilst undergoing substantial changes in craniofacial form, muscle size and dentition. Yet it remains poorly understood at what age they become biologically capable of processing mechanically challenging foods, or how this capability is achieved despite continuous changes in the masticatory apparatus. This study investigates how developmental changes in muscle size, leverage and dentition influence masticatory performance during ontogeny. A mixed-methods approach was employed using a developmental sample of 94 female CT scans from the New Mexico Decedent Image Database. Muscle size and leverage were quantified throughout growth and used to estimate bite force capability. In a separate sample, deciduous, mixed and permanent dentitions were digitised using intraoral scanning to quantify tooth morphology. Three-dimensional resin-printed models were then used in food fracture experiments to assess fracture force, fragmentation and displacement during the breakdown of hard, brittle foods. Mechanically challenging foods required approximately 300 N to initiate fracture regardless of dentition type, with deciduous teeth producing fracture forces and displacement values largely equivalent to permanent teeth despite morphological differences. However, permanent dentitions generated greater fragmentation at the molars, suggesting that although juvenile dentitions are capable of initiating fracture, adult dentitions may process foods more efficiently. Developmental bite force analyses revealed a rapid increase in force capability during early childhood, driven primarily by increases in muscle size. By 3-5 years of age, estimated bite forces exceeded the fracture threshold of these foods, indicating that children had acquired the biomechanical capacity to process mechanically challenging items despite not yet attaining adult craniofacial morphology or maximal bite force capability. These findings suggest that morphologically distinct juvenile and adult masticatory systems can achieve similar functional outcomes through different combinations of muscle size, leverage and dental morphology. The biomechanical capacity to process mechanically challenging foods appears to be achieved surprisingly early in childhood, raising the possibility that young children are capable of processing a broader range of foods than is often assumed. This has implications for developmental feeding behaviour, dietary transitions and craniofacial growth. Ethical approval was obtained from the University of York and informed consent was obtained from participants.

Poster 27

YOUNG INVESTIGATOR

Investigating embryonic movement as a regulator of spinal ligament development in the embryonic chick.

Sarah Hennigan, Majid Akbarzadeh Khorshidi, Rebecca Rolfe,

Trinity College Dublin, Dublin, Ireland; Dublin City University, Dublin, Ireland

Abnormal lateral curvature of the spine, called scoliosis, affects approximately 3% of the population, with more than 80% of cases labelled as idiopathic, meaning that the cause is unknown. The most common type of idiopathic scoliosis is adolescent idiopathic scoliosis (AIS). Evidence shows that mechanical imbalances in the growth of vertebra, interverbal discs, and ligaments during adolescence can lead to AIS. To understand ligament changes during adolescent growth, and contribution to AIS, we must understand the morphological, molecular and mechanical aspects of ligament development and maturation. Spinal ligaments hold bony vertebrae together and stabilise and protect the spine; maintaining a functional axial skeletal system, though the origins of the mechanical properties allowing these tissues to perform this function are poorly understood. It has been shown that a lack of embryonic movement results in scoliotic spinal phenotypes and malformation of tendons in limbs. However, until now no research has investigated the role of embryonic movement during spinal ligament maturation. Here, I have used the chick as a model organism for this research as it is amenable to this manipulation, developing in ovo allows for administration of chemical movement inhibitors during development, enabling investigation of how spinal ligaments develop in the absence of forces generated by muscle contraction. We performed mechanical, molecular and morphological analysis comparing immobilised and non-immobilised spines. We performed uniaxial mechanical testing finding a reduction in stiffness in immobilised ligaments. Computational models from the literature show that reduced stiffness of ligaments results in an increased severity of scoliosis. We have also shown, via histological profiling, a reduction in alignment of collagen fibres in immobilised ligaments, reducing stiffness and increasing risk of degradation. We are in the process of investigating changes in the size of ligaments and levels of gene expression across treatments. Our results demonstrate that embryonic movement is an is important regulator of spinal ligament development, and further work will explore changes during adolescence and in scoliosis. All work has been approved by the Animal Research Ethics Committee of our host institution and is not subject to further approval as embryonic birds are not protected under national legislation.

Poster 28

YOUNG INVESTIGATOR

Repurposing Ion Channel Modulating Drugs to Enhance Axon and Synaptic Regeneration in a Mouse Model of Nerve Injury

Ernie Ho, Inga Partlova, Jennie Gabriel, Lyndsay Murray

1 Institute for Neuroscience and Cardiovascular Research, University of Edinburgh; 2 Euan Macdonald Centre for Motor Neuron Disease Research, University of Edinburgh

Axons possess the capacity to regenerate and reinnervate to targets after peripheral nerve injury but the regeneration can be slow and incomplete. Previous studies have shown that manipulation of ion channels can generate more permissive environments for axon regeneration. Further, it has been shown that this effect can be recapitulated by using the clinically approved drugs Lamotrigine (LTG) and Zolmitriptan, which target HCN2 and 5HT1B/D channels respectively. Here we hypothesize that these drugs can accelerate nerve regeneration and promote neuromuscular junction regeneration. In this project, we have therefore investigated whether lamotrigine and zolmitriptan can promote axonal and synaptic regeneration following peripheral nerve injury. Sciatic nerve injury was performed on Thy1-YFP mice, followed by intraperitoneal injections with either LTG, zolmitriptan or placebo, combined with voluntary rehabilitation for 10 days. At 11 days after injury, a range of proximal and distal hind limb muscles were examined for innervation status. Axon number was also quantified in tibial nerves expressing YFP. Following LTG treatment, the percentage of endplate which were innervated was increased significantly in a wide range of muscles including hamstrings (94.4% in lamotrigine vs 82.4% in placebo-treated mice), tibialis anterior (29.2% in lamotrigine vs 8.7% in placebo-treated mice) and extensor digitorum longus (36% in lamotrigine vs 8.8% in placebo-treated mice). In terms of axon regeneration, there were no significantly differences in the number of axons in tibial nerve between LTG and placebo group. Conversely, following zolmitriptan treatment, there were no significant differences in endplate reinnervation between treatment group and placebo group. In conclusion, our work demonstrated that LTG significantly accelerates synaptic regeneration in nerve injury mouse model, which was not driven by increase in axon numbers. In contrast, zolmitriptan does not improve synaptic regeneration. Our work provide insight into identifying new pro-regenerative treatments for motor neuron diseases. All experiments were performed in accordance with the UK Animal Scientific Procedures Act (1986) and approved by the University of Edinburgh Bioresearch and Veterinary service.

Poster 29

YOUNG INVESTIGATOR

Development of a pro-angiogenic hyaluronic acid hydrogel decorated with vascular cell-derived ECM

Louise Hosty[1], Yu-Yin Joanne Chang[1,2], Fabio Quondamatteo[1], and Shane Browne[1,2,3]

1-Tissue Engineering Research Group, Department of Anatomy and Regenerative Medicine, Royal College of Surgeons in Ireland, Dublin, Ireland; 2-CÙRAM, Centre for Research in Medical Devices, University of Galway, Galway, Ireland; 3-Trinity Centre for Biomedical Engineering, Trinity College Dublin, Dublin, Ireland

Diabetic foot ulcers (DFU) are a debilitating and life-threatening complication of diabetes mellitus, affecting 19-34% of diabetic patients. The current standard-of-care is insufficient to stimulate re-vascularisation and healing, ultimately leading to wound recurrence and the need for lower limb amputation. In vitro-generated extracellular matrix (ECM)-derived biomaterials constitute an innovative approach to DFU healing, as cell-deposited ECM contains a diverse range of bioactive components which support cell function. We hypothesise that human induced pluripotent stem cell (hiPSC)-derived vascular cell ECM can be incorporated within hyaluronic acid (HyA)-based hydrogels to support the infiltration and proliferation of cells, ultimately enhancing re-vascularisation and wound healing. hiPSCs were differentiated towards a vascular lineage, yielding CD31-expressing endothelial cells (iEC), and CD31-negative stromal cells (iSC). ECM deposition by iSCs was stimulated by treatment with ascorbic acid (AA) and the macromolecular crowder carrageenan (C). Post-decellularisation, the ECM composition was analysed by immunofluorescent and histological staining. A Matrigel assay determined the capacity of decellularised-ECM to support tube-like structure formation. Finally, ECM was incorporated into a HyA hydrogel to assess its ability to support human umbilical vein endothelial cell (HUVEC) metabolic activity (AlamarBlue) and vascular network formation. iSCs were characterised by positive SM-22α and vimentin immunofluorescent staining, indicating their stromal-like nature. Treatment of iSCs with AA+C significantly increased ECM deposition over 21 days. Immunofluorescent and histological staining of this ECM showed the presence of fibronectin, fibrillar collagens, perlecan, and glycosaminoglycans, which were also retained after decellularisation. Decellularised ECM accelerated the capacity of iECs to form tube-like structures in 2D, and supported enhanced HUVEC metabolic activity and spreading when seeded on HyA/ECM hydrogels. This work demonstrates that hiPSC-derived iSCs can be used as a source of pro-angiogenic ECM. The pro-angiogenic capacity of this ECM was demonstrated by accelerated formation of tube-like structures, and increased HUVEC metabolic activity in HyA/ECM hydrogels. Future work will assess the decellularised ECM's capacity to enhance tissue repair in a pre-clinical model. Funded by The Anatomical Society. Ethical Statement: All work is done using established cell lines from consenting donors.

Poster 30

YOUNG INVESTIGATOR

Anatomical Variations of the Human Spring Ligament: A Cadaveric Study Using Combined Plantar and Dorsal Approaches

Alix Hudson [1,2], Kristiaan D'Août [1], Sebastiano Fichera [3], Lyndon Mason [4,5], Alistair Bond [1,2]

1- Institute of Life Course and Medical Sciences, University of Liverpool, Liverpool, UK; 2 Human Anatomy Resource Centre, University of Liverpool, Liverpool, UK; 3 School of Engineering, University of Liverpool, Liverpool, UK; 4 School of Medicine, University of Liverpool, Liverpool, UK; 5 Liverpool University Hospitals NHS Foundation Trust, Liverpool, UK

The spring ligament is vital for static stabilisation of the medial longitudinal arch of the foot and is comprised of three parts: the inferoplantar longitudinal (IPL), medioplantar oblique (MPO), and superomedial (SM) ligaments. Previous dissection studies have reported challenges in separating the MPO from the SM, with some unable to distinguish the MPO as a distinct ligament. This study examined both dorsal and plantar surfaces of the spring ligament to provide a comprehensive anatomical and morphological description in a UK population. 33 cadaveric feet (17 left, 16 right) from 19 donors (12 males, 7 females; age 60-95 years, mean 81.63) were dissected. Dorsal and plantar dissections were performed and ligament anatomy and morphology were recorded. Measurements were recorded using a digital calliper, with curved edges traced with malleable wire before straightening for measurement with callipers. Dorsally the IPL demonstrated typical anatomy in all but one specimen, which was bifid. Plantar dissection revealed additional features. The IPL received fibres from the cuboid in eight specimens, from the short plantar ligament in four, and two specimens had two origins. Significant differences were observed between dorsal and plantar measurements, with the dorsal surface of the IPL wider and the plantar surface longer. The MPO and SM were separate in one specimen, fused in eight, and partially fused in 24 specimens. In three specimens, the MPO had two origins only seen on the plantar surface. The dorsal surface of eight specimens had an additional fascicle that extended from either the MPO or SM and blended with the interosseous talocalcaneal ligament. Seven specimens had an intermediate ligament between the MPO and IPL. Ligament differences between feet of the same donor were observed but were not significant. Dual surface dissection allows for improved visualisation of spring ligament anatomy and revealed variations not identifiable from a single viewpoint. Differences in dimensions between surfaces highlight the value of this technique for developing three-dimensional understanding of ligament morphology. Cadaveric tissue was obtained from donors bequeathed to the HARC under regulations of the HTA. Ethical approval was obtained from the University of Liverpool's Central University Research Ethics Committees (number 12695).

Poster 31

The contribution of mechanical loading to osteoarthritis and ochronosis in Hgd-deficient mice

Daisy Quinn[1], Tayfun Dikmen[1], Peter Wilson[1], Hazel Sutherland [1], Mark Hopkinson [2], Blandine Poulet [1], Brendan Norman [1], Andrew Pitsillides [2], George Bou-Gharios [1], Juliette Hughes [1].

1 Department of Musculoskeletal and Ageing Science, Institute of Life Course and Medical Sciences, University of Liverpool, Liverpool, UK; 2 Department of Comparative Biomedical Sciences, The Royal Veterinary College, London, UK

Alkaptonuria (AKU) is a rare metabolic disorder caused by loss-of-function mutations in the homogentisate 1,2-dioxygenase (HGD) gene, resulting in systemic accumulation of homogentisic acid (HGA) and deposition of ochronotic pigment within connective tissues. Ochronosis is strongly associated with severe early-onset osteoarthritis (OA), yet the mechanisms linking pigment deposition to joint degeneration remain unclear. Current AKU mouse models develop early tissue pigmentation but do not recapitulate the extensive pigmentation and severe OA phenotype observed in patients, limiting their translational relevance. To better model AKU-associated joint degeneration, a non-invasive mechanical loading protocol was used to induce chronic OA. This study aimed to investigate the relationship between mechanical stress, ochronotic pigmentation, and OA progression in relation to Hgd genotype. We hypothesised that mechanically loaded AKU mice would develop more severe OA than non-AKU controls and exhibit increased pigmentation in loaded compared with non-loaded joints. Eleven male AKU (Hgd−/−) and ten male non-AKU (Hgd−/+) mice aged 11–13 weeks underwent a 2-week loading regime consisting of six sessions of 40 cycles of 9 N peak compressive loads applied at 0.1 Hz to the right knee joint. Tail vein blood and urine samples were collected four days before loading, four days after loading, and at six and twelve weeks post-loading. Animals were culled 12 weeks post-loading and tissues harvested. All limbs were scanned using a NeoScan N80 micro-computed tomography scanner to assess bone microarchitecture. Histological OA severity within the tibiofemoral joint will be evaluated using OARSI scoring, while Schmorl's staining will quantify ochronotic pigmentation within chondrons. Plasma and urine samples will undergo untargeted liquid chromatography/mass spectrometry metabolomic analysis to identify metabolomic alterations, including a panel of collagen breakdown products developed in our laboratory. This work aims to establish a more clinically relevant murine model of AKU and improve understanding of the interactions between mechanical stress, ochronosis, and joint degeneration. The model may facilitate identification of early pathological mechanisms underlying AKU and OA and support development of targeted therapies to delay disease progression. Ethics statement: Animal work was carried out under UK Home Office project licence PP3119883.

Poster 32

Bridging Anatomy and the Operative Field: Teaching Modality of Vertically Integrated Human Pelvic Anatomy Shapes Cognitive Load and Surgical Anatomy Interpretation in Undergraduate Medical Students

Mohammed Ismail-Khan [1, 2], Jabeen Aslam [3], Arwa Areej [4], Porfyrios Korompelis [2]

1 - School of Medicine, University of Sunderland, Sunderland, UK; 2 - Northern Gynaecological Oncology Centre, Queen Elizabeth Hospital, Gateshead, UK; 3 - Department of ENT, Peterborough City Hospital, Peterborough, UK; 4 - Department of Obstetrics & Gynaecology, Shadan Institute of Medical Sciences, Hyderabad, India

Undergraduate medical students often find it difficult to transfer anatomy learnt in the preclinical years to the interpretation of operative views. We examined whether the modality used to vertically integrate human pelvic anatomy across the curriculum, by revisiting it in the clinical years in direct relation to a specific procedure, influences cognitive load and anatomical performance during operative interpretation. In a multi-centre, three-arm cluster-randomised controlled trial across three Indian medical colleges, final-year MBBS tutorial groups received a 60-minute anatomy session aligned to total laparoscopic hysterectomy with bilateral salpingo-oophorectomy, delivered using cadaveric prosection, interactive three-dimensional digital anatomy, or slide-based instruction. One week later, students viewed a standardised laparoscopic video and completed a structured surgical anatomy assessment together with an adapted Krieglstein cognitive load questionnaire, which showed acceptable internal consistency and strong convergent validity in this sample. Of 400 students taught, 394 consented and 383 completed the primary outcome assessment. Instructional modality significantly affected intrinsic, extraneous and germane cognitive load, and surgical anatomy performance. Compared with slide-based instruction, cadaveric prosection and interactive three-dimensional digital anatomy were each associated with lower intrinsic cognitive load, markedly lower extraneous cognitive load, higher germane cognitive load, and better surgical anatomy performance. The largest differences were observed for extraneous cognitive load, suggesting substantially greater non-productive processing after two-dimensional slide-based teaching. By contrast, cadaveric prosection and interactive three-dimensional digital anatomy showed no meaningful differences in cognitive load or anatomical performance. These findings suggest that, when anatomy is vertically integrated in an explicitly operative context, preserving three-dimensional spatial relationships may be more important than whether teaching uses physical cadaveric material or a digital platform. Three-dimensional, spatially congruent anatomy teaching may therefore support transfer from anatomy learning to camera-mediated operative views more effectively than conventional slide-based instruction alone, while interactive three-dimensional digital anatomy may offer a scalable alternative where cadaveric provision is limited. Ethical approval for this educational research was granted by the Institutional Ethics Committee of Shadan Institute of Medical Sciences (19/07/SIMS/IEC/2025), written informed consent was obtained from all student participants, and cadaveric teaching was conducted in accordance with the Telangana Pathology and Anatomy Act, 1955.

Poster 33

YOUNG INVESTIGATOR

Variability of Perforating Arteries for the Design and Dissection of the Anterolateral Thigh Flap

Philippa Jewell, Jeremy Mortimer

1) Bristol Anatomy Centre, University of Bristol, Bristol, UK; 2) Edinburgh Medical School: Department of Anatomy, The University of Edinburgh, Edinburgh, UK

The anterolateral thigh (ALT) flap is commonly used in reconstructive surgery to cover soft tissue defects. Despite the flap's many advantages, a disadvantage is the variability of the supplying perforating arteries, which makes locating and dissecting out these arteries challenging, especially when medical imaging or Doppler is unavailable or inconclusive. This work aims to comprehensively review 3 key characteristics of these perforators (origin, type and location) which are essential for surgical dissection and application. Additionally, the work aims to investigate any geographical influences on variations. A systematic review and meta-analysis of the literature was conducted based on PRISMA guidelines. The results brought together data from 37 studies, from 16 countries, analysing 2143 perforators for their origin, 2885 for type, 1180 for location using the decile system, and 1167 for location when using the 'ABC' system. The most common perforator origin was the descending branch of the lateral circumflex femoral artery (77.5%), followed by the transverse branch of the lateral circumflex artery (11.6%). Musculocutaneous perforators were the most common perforator type (75.1%), whilst 2 studies noted the unusual musculoseptocutaneous type (2.4%). From the anterior superior iliac spine to the superolateral patella, there was a normal distribution of perforators with the most common location at the midpoint (36.9%). Interestingly, it was noted that there were variations in some populations, but not others (such as the musculoseptocutaneous artery type). Indeed, when analysing between grouped Western and Eastern populations, there were significantly different results for all perforator characteristics. However, it is important to consider whether the significance of these variations was due to true ethnic variation or inconsistencies in classifications. Overall, the results were in line with other less extensive papers, but this work's broad literature base and triple characterisation also highlight the range and extremes of variation. This review therefore provides a single comprehensive guide to aid surgeons in predictable and safe location and dissection of ALT flap perforators. Due to the nature of this investigation, no ethical approval was needed.

Poster 34

Assessment of the Topological Modularity of Human Wrist Skeleton

Radik Khayrullin [1, 2, 3], Aleksandr Ermolenko [1]

1- REAVIZ Private University, St Petersburg, Russia; 2- Academician Ivan Pavlov First Saint-Petersburg State Medical University, St Petersburg; 3-Osh State University, Osh, Kyrgyzstan

https://www.linkedin.com/in/radik-khayrullin-05415a183

The skeletal architecture of the human wrist is a complex system characterized by close anatomical and topographical relationships, reflecting a high degree of structural organization in the distal upper limb. The carpus plays a central role in force transmission between the forearm and hand, and its structural integrity is critical for a wide range of functional activities. Disruption of carpal organization — whether through trauma, degenerative change, or congenital anomaly — frequently results in pain, instability, and loss of hand function, underscoring the clinical importance of understanding intercarpal architecture. The objective of this study was to analyze the structural organization of the human wrist bones using AnNA applied to magnetic resonance imaging (MRI) data. MRI scans were obtained from the right hands of 100 individuals (50 men and 50 women) aged 40–50 years, referred for imaging due to upper limb trauma at locations proximal to the wrist — including the forearm, elbow, or shoulder — with no direct injury to the hand or wrist. Inclusion criteria comprised the absence of visible deformities, congenital malformations, and prior wrist or hand trauma. AnNA was performed using the «igraph» package in the R statistical environment. Network visualization employed the Fruchterman–Reingold algorithm; modularity and integration were assessed with the «cluster_spinglass» algorithm. Networks were modeled as graphs in which nodes represented individual carpal bones and edges were encoded by binary adjacency matrices, where 1 indicated a shared articular surface and 0 indicated its absence. AnNA revealed a clear topological organization of the carpal bones with a bimodular structure. The medial module comprised the triquetrum, pisiform, and hamate; the lateral module comprised the trapezium, scaphoid, lunate, trapezoid, and capitate. The lateral module exhibited greater topological complexity with more inter-node connections, whereas the medial module showed a higher modularity value, reflecting stronger internal integration. These findings are consistent with morphological integration and modularity as fundamental principles governing the development and function of complex anatomical structures, providing a quantitative topological human skeleton basis. Permission to obtain the source MRI data was granted by the Local Ethics Committee of the Private (Medical) University REAVIZ (Protocol No. 7/35, dated May 19, 2025).

Poster 35

YOUNG INVESTIGATOR

Investigating Variation in the Auriculotemporal nerve and distances between Auriculotemporal Nerve and Related Structures

Achiraya Kittiboonya, Seaneen McDougall, Manah Changmai

Centre for Anatomy and Human Identification (CAHID), School of Science and Engineering, University of Dundee, Dundee, United Kingdom

LinkedIn- Achiraya Kittiboonya

The auriculotemporal nerve (ATN), a branch of the mandibular division of the trigeminal nerve (CN V3), demonstrates anatomical relationships with vascular structures, including the middle meningeal artery (MMA), superficial temporal artery (STA), and superficial temporal vein (STV). These relationships are significant due to their relevance in surgical interventions, anaesthesia, and pain syndromes such as migraine and auriculotemporal neuralgia. This study aimed to characterize the spatial relationships between the ATN and vascular structures and determine whether a reproducible preauricular “safe zone” could be established for nerve localization. A descriptive cadaveric study was performed on Thiel-embalmed specimens (n = 46) using a preauricular approach. Ethical approval was obtained, and all cadavers were donated in accordance with relevant legislation. Linear measurements between the tragus, ATN, STA, and STV were obtained using digital calipers and ImageJ software. Statistical analyses, including independent t-tests and intraclass correlation coefficients (ICC), were performed to assess side differences, sex variation, and measurement reliability. Dye injection was used to validate the proposed safe zone. Six intersection patterns were identified, with Types 1 (27.38%) and 4 (26.19%) being most common. Mean Tragus–ATN distances ranged from 3.45 ± 0.95 mm (males, right) to 5.14 ± 1.73 mm (females, left), with females demonstrating greater distances between tragus and ATN. The ATN–STV distance showed the greatest variability, while Tragus–ATN was most consistent. Paired analysis revealed a significant side difference in Tragus–ATN distance ($p = 0.046$), although asymmetry was minimal. No significant sex differences were observed in ATN root relationships with the middle meningeal artery. Measurement techniques demonstrated excellent agreement (ICC = 0.890–0.958). Dye injection demonstrated a reproducible spread of approximately 15.8 mm, representing distribution from the tragus across the preauricular region, encompassing the auriculotemporal nerve and superficial temporal vessels. There were no significant side or sex differences in dye distribution, supporting reliability of the defined preauricular safe zone. In conclusion, the ATN demonstrates consistent yet variable relationships with adjacent vascular structures. Identification of reproducible anatomical patterns and a reliable preauricular safe zone may enhance surgical accuracy, reduce iatrogenic injury, and improve clinical management of temporal region interventions.

Poster 36

Automatic versus semi-automatic segmentation tools for microCT-based 3D modelling: a study using archaeological human bones

Csenge Koppány, Olivia González Sevilla, Rebecca Crozier, Flora Gröning

School of Medicine, Medical Sciences and Nutrition, University of Aberdeen, Aberdeen, UK

Micro-computed tomography (microCT) is considered the gold standard for 3D imaging of bone. It enables the investigation of both external morphology and internal structure. While numerous 3D image processing tools are available, segmentation remains a critical and often time-consuming step, particularly when manual or semi-automatic approaches are used. The aim of this study was to evaluate the performance of automatic versus semi-automatic segmentation techniques for generating high-quality 3D models from microCT scans of archaeological human bones. Four archaeological specimens (3 femora and 1 thoracic spine section) from the University of Aberdeen's Museums and Special Collections were scanned using an XT H 225 ST Nikon microCT scanner, producing image stacks with voxel sizes of 0.10–0.13 mm. Using Amira (version 2023.2), four automatic and two semi-automatic segmentation techniques were applied, resulting in 25 digital 3D models. Quantitative and qualitative assessments were conducted using built-in Amira tools and the BoneJ plugin in ImageJ. High-quality 3D models were successfully generated, and reproducible workflows were established. As two automatic thresholding tools received the highest scores for their performance, our results suggest that automatic thresholding can surpass semi-automatic approaches. However, automatic thresholding also showed some shortcomings when image artefacts were present in the original scan and when both trabecular and cortical bone were segmented together. In those cases, semi-automatic segmentation led to better outcomes. These findings highlight the strengths and limitations of current segmentation approaches: Future studies could explore the use of machine learning to further improve automation and model quality. The study adhered to the British Association of Biological Anthropology and Osteoarchaeology digital imaging code (2019). No ethical approval was required.

Poster 37

YOUNG INVESTIGATOR

Sex-based differences in the morphology and morphometry of the oblique popliteal ligament: a donor-based anatomy study

Pui Ting Lau, Iosif Alhendi, Tracey Wilkinson

University of Birmingham, Birmingham, United Kingdom

The oblique popliteal ligament (OPL) is a major reinforcement of the posterior knee capsule and contributes to resistance against hyperextension and rotational forces. Despite increasing recognition of its biomechanical importance, limited research has investigated potential sex-based anatomical variation of the ligament. This study aimed to examine sex-related differences in the morphology and morphometry of the human OPL using anatomy donor specimens. Ten formalin-fixed knee specimens obtained from five adult donors (2 male, 3 female; mean age 84.4 ± 9.2 years) were dissected to expose the posterior knee capsule and OPL. Morphometric measurements, including width at origin, width at insertion, and superior and inferior margin lengths, were obtained using digital vernier callipers by two independent, blinded observers. Measurements were performed in triplicate and analysed using Shapiro–Wilk testing and independent samples t-tests, with Cohen's d used to assess effect size. Male compared to female specimens demonstrated significantly greater OPL width at both the origin (23.5 ± 9.6 mm vs 11.6 ± 5.6 mm; $p = 0.036$, $d = 1.62$) and insertion (30.6 ± 3.9 mm vs 16.4 ± 5.9 mm; $p = 0.003$, $d = 2.72$). No statistically significant differences were observed in superior or inferior margin lengths, although the inferior margin demonstrated a large effect size ($d = 1.42$). Morphological variation was also identified between sexes. Female specimens predominantly exhibited a simple band-shaped morphology, whereas male specimens demonstrated greater structural complexity, including broader attachments and multi-banded or Y-shaped configurations. Intra-individual asymmetry between contralateral knees was additionally observed in several specimens. These findings provide preliminary evidence of sexual dimorphism within the OPL and suggest that posterior capsular structures may contribute to recognised sex-based differences in knee biomechanics and joint stability. Further investigation using larger sample sizes and biomechanical analysis is required to determine the functional and clinical significance of these anatomical variations. All human donor research was conducted under the University of Birmingham Human Tissue Authority Licence 12236 for Anatomical Examination in accordance with the Human Tissue Act (2004), with donor consent obtained prior to study.

Poster 38

Occipitalisation of the Atlas and Associated Craniovertebral Variations in Dry Human Skulls

Luisa Leiss[1], Jemima Chukwu Shaibu[1], Athikhun Suwannakhan[1,2]

1. Human Anatomy Unit, Department of Biomedical Sciences, School of Infection, Inflammation and Immunology, College of Medicine and Health, University of Birmingham; 2- Department of Anatomy, Faculty of Science, Mahidol University, Bangkok, Thailand

Occipitalisation of the atlas is a congenital anomaly of the craniovertebral junction characterised by partial or complete fusion of the atlas to the occipital bone due to failed segmentation between the occipital and cervical sclerotomes during embryological development. This study presents osteological cases of atlas occipitalisation identified from the historical osteological collection of the Human Anatomy Unit, University of Birmingham. A total of 178 dry human skulls of estimated sex and age were examined morphologically. Occipitalisation of the atlas was identified in three skulls, representing 1.7% of the examined sample. The first skull, estimated to belong to a late adolescent to young adult female individual, demonstrated complete fusion of the right lateral mass, partial fusion on the left side and unfused anterior and posterior arches. Marked asymmetry of the inferior articular facets was observed, together with a persistent metopic suture, numerous intrasutural bones, a supernumerary maxillary tooth, and abnormal endocranial vascular impressions. The second skull, an individual estimated to be an adult male, demonstrated complete fusion of the left lateral mass and partial fusion on the right side, bilateral accessory transverse foramina, rotational deviation of the atlas, and a left paracondylar process fused to the transverse process of the atlas. The third skull, an adult individual of indeterminate sex, demonstrated complete bilateral fusion of both lateral masses and the anterior arch to the occipital bone, together with incomplete formation of the left transverse foramen. All specimens demonstrated asymmetrical morphology associated with unilateral complete fusion and coexistence of additional craniovertebral variations. These findings highlight the considerable morphological diversity of atlas occipitalisation and suggest that this anomaly may occur as part of broader developmental alterations affecting the craniovertebral junction. Ongoing work aims to establish a more comprehensive classification system for occipitalisation of the atlas and its associated anatomical variations and conditions. Research was conducted adhering to the code of ethics of the British Association for Biological Anthropology and Osteoarchaeology (BABAO) and in accordance with the Human Tissue Act (2004) under the University of Birmingham's HTA Licence for Anatomical Examination 12236.

Poster 39

YOUNG INVESTIGATOR

Investigating Inter Hemisphereic Differentes in Cortical Thickness and Neuron Density- Examining Humans Brocas and Wernickes area to suggest an anatomical basis for lateralisation of language

Abbie Maitland, Scott Border

University of Glasgow, Glasgow, Scotland

Abbie Maitland - LinkedIn

Physiological research has challenged historical lateralisation of language to the left hemisphere. Recent research has hypothesised an expanded role of the right homologues of Brocas' area as well as Wernickes' area. This could provide an anatomical basis into a physiological language model. Neuroimaging has implied that right hemisphere Broca's' area homologue has a role in language that can be seen on a macro and microstructure scale. However, a lack of direct anatomical interhemispheric comparison has not yet been able to provide an anatomical basis for this new physiological research. Therefore, the aim of this study is to examine the interhemispheric differences in gross anatomical gyri length and to analyse the histological differences in cortical thickness and neuron count within Brocas' area and Wernickes' area. Pars Opercularis, Pars Triangularis, Pars Orbitalis, Superior Temporal Gyrus, Supramarginal Gyrus, Angular Gyrus and Cingulate Gyrus were measured at longest length and then were sectioned from two donor brains from the left then right hemispheres. Each tissue section was stained with Luxol fast Blue, for cortical thickness measurements, and Cresyl Violet for neuron density count. Measurements were undertaken using Image J. Aligned rank transformation Anova were used for significance testing with EMMEANS test used for post hoc testing, facilitated by R Studio. Pars Opercularis, Pars Triangularis, and Superior Temproal Gyrus showed increased cortical thickness within left hemisphere whereas Pars Orbitalis and Cingulate Gyrus showed increased cortical thickness within right hemisphere. Cingulate Gyrus and Angular Gyrus showed left hemisphere increase whilst Pars Triangularis showed an increase in the right hemisphere. Other regions did not show significant differences in either variable. Some aspects of this study aligned with previous work. This suggests an anatomical basis for an increased role of Wernicke's Area and right hemisphere homologue when compared to the WLG model. Further research is needed to determine stronger support for this basis due to this study having strong limitations. All tissue in this study was acquired and processed according to the regulations set by the University of Glasgow's Anatomy Department and the Anatomy Act 1984.

Poster 40

Does Resource Sequencing Matter? Evaluating the Impact of Model and Prosection Order in Anatomy Teaching for Year 2 Medical Students

Amy Manson [1], Bethany Harcourt [2], Neil P. Thomas [1], Alistair P. Bond [1]

1 Human Anatomy Resource Centre, University of Liverpool, Liverpool, UK; 2 School of Medicine, University of Liverpool, Liverpool, UK

@AmyManson13

Anatomy practical sessions often use a combination of models and prosections. While both resources support spatial understanding, the impact of how these resources are sequenced within teaching sessions remains underexplored. We investigated whether the order of use within a Year 2 MBChB endocrine anatomy laboratory session influenced confidence and attainment amongst students with prior experience of mixed-resource anatomy teaching. Two versions of an anatomy lab session were delivered between two cohorts. Sessions had identical learning outcomes, content, and duration, differing only in the sequence of resource use. Group A (n=273) followed a mixed-resource approach, using a combination of models and prosections throughout the session. Group B (n=256) used models first, before progressing to prosections. Activity booklets guided student learning throughout both sessions. Student confidence and resource helpfulness were assessed using self-reported Likert-scale ratings and free-text questions. Attainment was evaluated through immediate and delayed (1-3 weeks later) post-session assessments. Comparative analyses were undertaken between cohorts. Student confidence in endocrine anatomy and use of both models and prosections increased after the session for both cohorts ($p<0.001$), with greater confidence gains seen in Group B ($p<0.014$). Both cohorts ranked booklets as most helpful, followed by models, with prosections the least helpful. Group B rated models less helpful than Group A ($p=0.003$). Student feedback for both sessions was largely positive. Some in Group B felt the scaffolded approach allowed better focus on each resource, reduced cognitive load and improved confidence with prosections. Staff suggested that different session layouts did not affect the level of student engagement, although students were notably more self-sufficient in Group B. Analysis of immediate post-session assessment revealed that Group B scored lower overall than Group A (67%, 61%, $p<0.001$); however, there was no significant difference between cohorts in the delayed post-session assessment ($p=0.528$). Results suggest there may be benefits to scaffolding learning from models to prosections for students with experience of cadaveric tissue in terms of confidence, but there was no effect on long-term attainment. Findings may help inform evidence-based approaches to anatomy lab design and optimisation of resource use within undergraduate curricula. Ethics granted by UoL ILCaMS (Ref: 15666).

Poster 41

Enhancing understanding of ultrasound through small group teaching in Year 2 MBChB anatomy labs

Amy Manson [1], Rajiv Malhotra [2], Alexandra L. Williams [2], Marcela Cardenas-Serna [1]

1 Human Anatomy Resource Centre, University of Liverpool, Liverpool, UK; 2 School of Medicine, University of Liverpool, Liverpool, UK

@AmyManson13

Point-of-care ultrasound (POCUS) is increasingly recognized as a vital tool across a wide range of medical specialities. Its integration into undergraduate medical education reflects a shift toward more clinically relevant, applied learning that bridges basic science and clinical practice. Despite its widespread clinical application, ultrasound image interpretation remains a challenge for many students. We introduced live ultrasound demonstrations by clinical radiologists and anaesthetists into our Year 2 MBChB cardiovascular anatomy lab session. We aimed to improve students' understanding and confidence in basic ultrasound concepts, including the relationship between probe position and the resulting image, the imaging characteristics of healthy anatomical structures. The ultrasound demonstration focused on structures of the neck including blood vessels, trachea, muscles and brachial plexus. This region was selected for its relatively simple anatomy, ease of access and clinical relevance. The demonstration accompanied existing learning resources involving vascular anatomy and physiology and provided a foundation for interpretation of more difficult ultrasounds of the cardiac region, addressed in a student-led computer quiz. Observations from facilitators suggest that the demonstration was useful and students appeared engaged. Students seemed more comfortable when tackling the more challenging cardiac ultrasound questions than previous cohorts without the ultrasound demonstration. Students found the demonstration interesting and helpful for improving their understanding of how ultrasound works. Some potential drawbacks of incorporating this demonstration in the anatomy lab included the level of background noise from other students in the room, light levels affecting visibility of structures on-screen, and how well the demonstration tied in with learning outcomes and other resources in the session. A thorough grounding in the basics of ultrasound in foundational years of medical training may improve the experiences of medical students and junior doctors as they encounter this imaging modality in clinical practice. By incorporating this into the anatomy lab, clear comparisons between the anatomy of models, prosections and scans are possible, allowing students to better visualise and understand the image. Beginning with a relatively simple region provides a less intimidating starting point which will nevertheless help to pave the way for more complex regions. No ethical approval was required for this study.

Poster 42

From Anatomy to Application: Introducing Clinical Vignette-Style Small-Group Discussion Quizzes Using Whiteboards

Amy Manson, Neil P. Thomas

Human Anatomy Resource Centre, University of Liverpool, Liverpool, UK

@AmyManson13

Anatomy education often focuses on content-heavy delivery, which can limit opportunities for students to consolidate and apply their knowledge in clinically relevant contexts. To address this, a new teaching strategy has been introduced at the end of Year 2 MBChB anatomy lab sessions: a clinical vignette-style small-group discussion quiz, facilitated through the use of whiteboards. This replaced an existing end-of-session feedback quiz which students answered individually using digital handsets, and which was largely centred around pure anatomy. This new approach encourages students to work collaboratively in small groups to solve clinically oriented scenarios that integrate anatomical knowledge gained within the session with diagnostic reasoning. The case studies also serve to highlight the clinical application of the anatomy learned during that session. Each vignette is designed to prompt discussion, reinforce key concepts, and stimulate critical thinking. Groups record their answers on whiteboards, allowing for visual sharing, peer comparison, and facilitated feedback from the session leader. Observations from facilitators suggest that the students enjoyed the opportunity to discuss problems with their peers in small groups, noting that this was a particularly effective format for Year 2 students. Students appreciated the clinical application of the anatomy, as this allowed consolidation and integration of knowledge from a clinical perspective, and also highlighted the purpose of learning the specific anatomy covered in that session. The activity was designed as a formative, low-stakes learning opportunity that promotes active engagement, provides immediate feedback, and encourages the development of clinical thinking skills. Group discussion promotes interaction between peers and encourages less-confident students to take part, while mimicking the way doctors collaborate within clinical teams. By articulating their thoughts, listening to peers, and responding to questions or differing viewpoints, students practise the communication, clinical reasoning, and teamwork skills that underpin real world medical decision making, helping bridge the gap between classroom learning and professional clinical practice. No ethical approval was required for this study.

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YOUNG INVESTIGATOR

Impact of Rac1 Loss on Epidermal Proliferation and Collagen Remodeling in Mice Keratinocytes Following Inflammation

Anandita Mariappan[1], Alanna Stanley[1], Cord Brakebusch[2], Fabio Quondamatteo[1], Helen Dodson[1]

1 - Anatomy, School of Medicine, University of Galway, Galway, Ireland; 2 - BRIC, University of Copenhagen, Copenhagen, Denmark

The GTPase Rac1 is involved in regulating cellular processes, including proliferation, reactive oxygen species production, and responses to inflammation. To further explore the role of this protein in skin, we used a mouse model lacking Rac1 expression in keratinocytes. We investigated keratinocyte proliferation and collagen modeling as a response to irritant contact dermatitis. Skin samples which had been previously fixed, processed and sectioned were available for this research. Rac1 keratinocyte specific knock out (KO) and wild-type mice (WT) were treated (accordng to guidelines and with ethical approval) on the right ear with 2% croton oil for 8 hours as a model of irritant contact dermatitis (ICD) and treated on the left ear with a vehicle control (VEH). Samples from two animals were available for each of the four groups; WT-VEH, WT-ICD, Rac1 KO-VEH, Rac1 KO-ICD. Masson's trichrome staining was used to assess collagen remodeling and we explored the impact on proliferation by Ki67 immunohistochemistry. Slides were scanned, evaluated and quantified using QuPath software. The mean area of collagen relative to the total tissue was calculated as a percentage. The WT-VEH group had slightly less collagen (19.7%) compared to Rac 1 KO-VEH (20.3%). Collagen deposition decreased following ICD treatment in the control (WT-ICD, 17.6%), but was the highest of all groups in the Rac1 KO-ICD (23.7%). No statistically significant differences were detected between the groups based on an ANOVA. Ki-67 analysis revealed that keratinocyte proliferation was highest in the control groups, with 30.5% positive nuclei in the epidermis of WT-VEH and 29.5% in Rac 1 KO-VEH. Treatment with ICD reduced the Ki67 index in WT to 14.4%, however, the Rac 1 KO seemed protective with 28.3% positive nuclei following ICD treatment. These findings suggest the deletion of Rac1 plays a protective role in sustaining keratinocyte proliferation and further increasing collagen deposition in the epidermis following inflammation. Ethics statement :Mouse tissue samples were made available from a previous study. Treatments were carried out according to guidelines and with full ethical approval for the animal study.

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Inclusive 3D Model of a Uterus for Visually Impaired Anatomy Students

Anna Thomson, Jennifer Z Paxton, Victoria McCulloch

Anatomy Department, Edinburgh Medical School, Doorway 3, Old Medical School, Teviot Place, Edinburgh University, Edinburgh, Scotland

Anatomy education remains overwhelmingly visual, excluding many visually impaired students from independent participation. Affordable, functional, multisensory tools are needed in shared classrooms rather than in parallel, segregated settings. The objective of this research was to design, produce and evaluate a life-size, low-cost, multisensory uterus model that supports tactile, auditory and visual learning for inclusive anatomy education. A life-size uterus was hand-sculpted using plasticine, digitised with a structured light scanner, then segmented and edited in the 3D modelling software Blender to create modular parts; uterine body, fallopian tubes and vagina. Magnet cavities and tactile alignment markers were added; fine textures were added post-print using a 3D printing pen. Components were 3D printed in polylactic acid using high-contrast colours and assembled using magnets. Audio descriptions were embedded via the RNIB PenFriend3 audio labeller. A large-format raised-line tactile graphic with braille was produced to complement the 3D model. The average cost per model was £5.52. Usability was explored in a small survey of sighted staff and students (n=7) using Linkert scales and open responses. Participants rated the model highly for user-friendliness (mean 4.00/5.00) and for learning via deconstruction/reconstruction (mean 4.14/5.00). Colour coding (mean 4.29/5.00), audio labels (mean 3.86/5.00) and surface textures (mean 3.29/5.00) were also rated highly, with suggestions to increase contrast and prominence of texture. Fifty-seven percent reported increased confidence in female reproductive anatomy with no students reporting a decrease in confidence. Qualitative feedback praised the modular nature, colour segmentation and multisensory format; areas for improvement included shorter audio clips, and stronger tactile differentiation. A novice-produced, low-cost, life-size 3D printed uterus with tactile and audio features is feasible, usable and well received by sighted students, indicating strong potential for inclusive anatomy teaching. The approach is replicable with common desktop printers and open-source software. Limitations include a small, single-site sample and the absence of formal intended user testing. Future work should include controlled evaluations with visually impaired students, durability testing and design refinements. Overall, the project demonstrates that inclusive anatomy resources can be practical, scalable, and beneficial for all students. Ethical approval was given by Medical Education Research Ethics, approval number 2025-10.

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Creating Accessible Anatomy Teaching Resources for Visually Impaired Individuals

Victoria McCulloch

Anatomy Department, Edinburgh Medical School, Doorway 3, Old Medical School, Teviot Place, Edinburgh University, Edinburgh, Scotland

VM_Illustration [X]

It is important that everyone understands their own body. Often, the anatomy teaching resources we use are not accessible to all, including visually impaired (VI) individuals. Over the last two years we have been investigating how best to design and create anatomical teaching resources for VI individuals. A range of creative methods have been used to create the basis for the teaching resources; plasticine modelling and structured light scanning (SLS), with the result being a 3D printed model. Once the basis for the model has been created, several elements that enhance teaching models for VI individuals have been added; texture, contrasting colours and audio labels. Textures are added using Blender, a 3D modelling software before 3D printing, with each part of the model given a different texture to aid in identification of different parts of an organ. A colour contrast analyser is used on different colours of filament to identify the best combination of contrasting colours for the model to be 3D printed in. Audio labels are added after printing using the PENFriend 3. A key is created, which is printed in large format text alongside a braille key, creating a more accessible teaching resource. 3D printed models cost between £5 – £40 each to print, making them a more cost-effective way to create bespoke, accessible anatomical teaching models. Several areas of the human body have now been created, however, to date testing has only been conducted on sighted students due to awaiting ethical approval, creating a limitation to this research. However, qualitative data from sighted students has shown a positive attitude towards these models, including enthusiasm for audio labels to be used more widely in teaching resources. The next stage of this research is to gather qualitative data on these models from visually impaired individuals. This research presents the models created and what we have learnt over the past two years through research and guidance from specialists. Ethical approval was granted by the Medical Education Research Ethics and the Social Research Ethics Group, University of Edinburgh.

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Anatomy Uncovered: integrating UV light-activated labelling on anatomical models for 3D interactive flashcard creation

Ellen White, Karniga Jeyaseelan, Victoria McCulloch, Jennifer Z Paxton

1Department of Anatomy, Edinburgh Medical School, College of Medicine and Veterinary Medicine, University of Edinburgh, UK.

@Dr_JZP

Anatomical flashcards are a popular study resource adopted by anatomy students to promote rapid identification and recall using matched, unlabelled and labelled images. Despite their popularity, their reliance on 2D images limits their effectiveness in representing normal 3D anatomy. Conversely, anatomical models are commonly used for 3D learning, helping to advance spatial awareness of anatomical structures effectively. However, their separate labelling keys can make identification of structures more difficult and time-consuming. To address these opposing limitations, this study aimed to bridge the gap between 3D models and 2D anatomy flashcards by utilising a hidden labelling system via ultraviolet (UV) light-activated labelling. To achieve this, human upper and lower limb bones were digitised via Structured Light Scanning (Einscan H or Artec Space Spider) to create 3D model codes which were then 3D printed in polylactic acid (PLA) filament using Ultimaker 3D printers, producing physical bone replicas. Labels were subsequently applied to major bony landmarks using UV ink to generate the '3D flashcard' models. Various PLA filament colours were trialled to determine the best contrast for the UV ink. White and yellow PLA were chosen as the best materials for generating full upper limb bone sets. Different surface treatments and finishes were explored on lower limb bone models prior to UV ink application to optimise UV ink appearance on the model surface. A combination of sanding and priming prior to ink application was identified. Following model production, evaluation sessions were performed where colours, scales and labelling types of models were assessed. For upper limb bones, 92% of participants preferred 100% scale models and 96% preferred white PLA as the model colour of choice. Encouragingly, 100% of participants agreed that they wanted to see UV-labelled models integrated into their teaching. Overall, this study demonstrated the feasibility and workflow of model creation with hidden UV-light activated labelling for interactive anatomy learning. Further research focussing on educational utility and value is needed to further validate this approach. Ethical approval for this study was obtained from the SREG committee, University of Edinburgh (2425 SREG 021/ 2026 SREG 009).

Poster 47

Early neuromuscular synaptopathy precedes network dysfunction in ALS mice and is reversible

Alannah J Mortimer [1], Matthew R Livesey [2], Kosala N Dissanayake [1], Helena Chaytow [1], Thomas H Gillingwater [1], Richard J Mead [2]

1 University of Edinburgh, Edinburgh, Scotland; 2, University of Sheffield, Sheffield, England

@_AlannahM

Electrophysiological dysfunction at the neuromuscular junction (NMJ) is a pathological biomarker of amyotrophic lateral sclerosis (ALS), however the mechanisms underlying synaptic dysfunction remain unclear. Ex vivo electrophysiology permits precise deconvolution of ultrastructural pre- and post-synaptic NMJ components, allowing probing of mechanistic drivers of pathology. To probe early synaptic dysfunction events, we paired in vivo and ex vivo recordings from flexor digitorum brevis (FDB) muscles from the TDP-43Q331K mouse model of ALS at an early disease stage (P90). We found that in vivo network level function was preserved, as indicated by normal in vivo compound muscle action potential (CMAP) amplitudes and ex vivo evoked endplate post-synaptic potentials (eEPPs) amplitudes in response to stimulation. However, at rest, miniature endplate post-synaptic potential (mEPP) amplitudes were significantly reduced, revealing an early ultrastructural synaptic disturbance that preceded network dysfunction. Quantal content within the pre-synaptic compartment was significantly increased, raising a cause-versus-effect conundrum: which compartment drives dysfunction, and which is compensating? We hypothesised that abnormal TDP-43 in muscle drives NMJ dysfunction, and that pre-synaptic increases in quanta are compensatory. We tested this in two ways. Firstly, we utilised the hTDP-43 mouse model, with central but not muscular TDP-43 overexpression. At an early disease timepoint, no abnormalities were detected, suggesting a muscle-intrinsic role for TDP-43 in NMJ dysfunction. Secondly, pharmacological targeting with NMD670 (NMDPharma) – a skeletal muscle-specific chloride channel inhibitor – restored mEPP amplitude and normalised quantal content, indicating that post-synaptic targeting can reverse pre-synaptic disturbance. Riluzole was unable to rescue functional deficits. Post-synaptic endplate morphometrics appeared normal. Together, these data support a distal dysfunction model of ALS, where early muscle/post-synaptic abnormalities may be therapeutically reversible. All animal procedures and methods were performed in accordance with the UK Animals (Scientific Procedures) Act 1986 under a UK Home Office project license and in line with institutional guidelines and regulations.

Poster 48

Enhancing Musculoskeletal Anatomy Learning Using an Anatomage Table in Undergraduate Medical Education

Abygail Mottram [1], Viktoriia Yerokhina [2]

1 Bolton College, Bolton, United Kingdom; 2 University of Lancashire, School of Medicine and Dentistry, United Kingdom

@AbygailMottram, @vi_histo, www.linkedin.com/in/viktoriia-yerokhina-bab124b8

The teaching of musculoskeletal anatomy presents significant challenges due to the complexity of spatial relationships, functional integration, and clinical relevance. This study explores the use of the Anatomage table as an interactive educational tool and evaluates how it can be effectively integrated into teaching to enhance student learning. The intervention was implemented across two cohorts of Biomedical Science students during the 2024–2025 and 2025–2026 academic years (cohort sizes: 68 and 66 students, respectively) at the University of Lancashire and later extended to Bolton College, where the Anatomage Table plays a vital role in teaching T Level Health and Social Care students. The Anatomage table was embedded within teaching sessions through immersive and participatory approaches, including guided three-dimensional exploration of anatomical structures and virtual dissection. It was used to support formative assessment through quiz-based activities and case-based scenarios, enabling students to apply anatomical knowledge in clinically relevant contexts. The table also facilitated student-led presentations, encouraging learners to engage with content and develop communication skills, alongside comparative analysis of normal and pathological anatomy. Structured spot-test revision sessions reinforced anatomical identification under time-constrained conditions, mirroring summative assessment formats. Additional activities included rapid identification exercises, scaffolding activities, collaborative problem-solving tasks, and linking anatomical structures with medical imaging and clinical cases to enhance diagnostic reasoning. The use of targeted questioning and small-group work promoted deeper engagement, accountability, and participation. Incorporating elements of gamification, such as timed challenges and competitive quizzes, further enhanced motivation and sustained involvement. Collectively, these approaches supported student-centred active learning, while allowing for differentiation to accommodate varying levels of prior knowledge and learning preferences. Data were collected using an observational approach, supported by module evaluations and student feedback, including NSS comments. Findings suggest that the Anatomage table enhances participation, engagement, confidence, and spatial understanding, supporting the application of anatomy in clinical contexts. In contrast, limitations include restricted access to the technology, time constraints, and a learning curve for both staff and students. In conclusion, the Anatomage table is a useful addition to traditional anatomy teaching when used in student-centred, clinically focused learning.

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YOUNG INVESTIGATOR

Identifying Suitable Donors for Motor Nerve Grafting in the Thigh: A Cadaveric Study of 3 Human Thighs

Max Mulligan [1], Tahseen Chaudhry [2]

1 University of Birmingham, Birmingham, UK; 2 University Hospitals Birmingham NHS Foundation Trust, Birmingham, UK

When repairing severe nerve injuries, a large lesion site needs a graft for repair in order to limit tension on the repair site. The method for this depends on the nerve modality and lesion size. Sensory nerves are often used to repair mixed or even motor nerve lesions, as they are assumed to be easier to access and cause less donor site morbidity, although animal studies (rodents) suggest that motor nerve grafts may be more efficacious. This project aimed to identify candidates for motor nerve donation in the human thigh. An explorative study of a single cadaveric thigh aimed to identify three accessible motor nerves in the anterior and medial compartments, with the most terminal branches. Literature review then assessed existing evidence regarding terminal branches in these three nerves. Two additional specimen were studied to determine terminal branch numbers and dimensions. Secondary outcomes explored primary branch number, dimension, and maximum nerve length. MANOVA was used to assess for inter-nerve differences, and Pearson's correlation efficient for correlation with thigh length. Motor Nerves to Vastus Lateralis, Vastus Medialis, and Adductor Longus were deemed the most suitable owing to their number of terminal branches (9, 8, and 3 respectively) and accessibility. Literature review revealed 13 studies studying the terminal branches of these nerves. Further dissection revealed Motor Nerve to Vastus Medialis had the most terminal branches, and longest maximum length (<0.05). Motor Nerve to Vastus Medialis thigh length and terminal branch width were negatively correlated ($p<0.05$). These results of this very small sample size would suggest that in the anteromedial thigh, Motor Nerve to Vastus Medialis may be the strongest candidate for donation, and studies of Vastus Medialis thigh flap patients show no change in daily activities 6 months after surgery. All cadaveric research was conducted in full compliance with relevant anatomical legislation under the University of Birmingham's Human Tissue Authority Licence for Anatomical Examination 12236. All donors gave their consent in accordance with the Human Tissue Act (2004).

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Is Less Always More? Cognitive Load Implications of AI-Optimised Anatomy Images in Pre-clinical Learning.

Tamra Nathan, Ky-Leigh Ang, Geetika Ail, Paula Vickerton

Barts and The London School of Medicine and Dentistry, Queen Mary, University of London, Turnbull Centre, Bancroft Building, Mile End, London. UK

Anatomy education places substantial cognitive demands on medical students due to the complexity and spatial interdependence of anatomical structures. Student-generated drawing supports schema construction through active externalisation of knowledge. However, recent advances in generative artificial intelligence (AI) have led to the widespread adoption of highly optimised images designed to reduce visual complexity and perceived cognitive effort. Despite their increasing use, there is limited empirical evidence examining how AI-generated diagrams influence anatomical learning. Grounded in Cognitive Load Theory, this study will provide empirical evidence on whether AI-driven optimisation of anatomical visuals supports or undermines the deeper cognitive processes required for durable and transferable learning. This prospective, randomised controlled study recruited 50 pre-clinical year 1 MBBS students at Queen Mary University of London. Participants were randomly allocated to either an AI-generated diagram condition or a student-drawing condition. All participants attended a one-hour instructor-led anatomy tutorial using a standardised booklet. In the AI condition, booklets contained AI-generated diagrams with the generating prompts provided; in the drawing condition, participants created their own diagrams using the same prompts. Immediately post-intervention, participants completed a standardised anatomy spotter assessment and a subjective cognitive load questionnaire measuring intrinsic, extraneous, and germane load using the Paas rating scale. Knowledge retention has been assessed using a repeat spotter assessment up to one month later. Data collection has concluded and analysis will be completed prior to the conference. Findings will inform evidence-based integration of AI tools in anatomy education and contribute to broader debates regarding productive struggle. Ethical approval was obtained from the Queen Mary, University of London committee - reference - 2025-1887-2597.

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Kugel's Artery Revisited: A Systematic Review and Meta-Analysis of Current Literature

Ana Roberta Nita [1], Cezar Octavian Morosanu [2], Stephanie Egerton [2], Drew Worthington [2], Alistair Bond [2]

1) Department of Cardiology, Whittington Hospital NHS Trust, London, UK. 2) Human Anatomy Resource Centre, Faculty of Health and Life Sciences, University of Liverpool, Liverpool, UK

Kugel's artery, also known as the arteria anastomotica auricularis magna, is a rare intercoronary collateral vessel first described by Kugel in 1928. Despite its potential role in collateral myocardial perfusion and coronary artery disease, its anatomy remains poorly understood in literature. This systematic review aimed to synthesise the available evidence regarding the prevalence, origin, course and termination of Kugel's artery. A systematic review and meta-analysis of the literature were performed to identify studies describing the morphology and prevalence of Kugel's artery. Data relating to study design, sample size, prevalence, vessel origin, course, termination and anatomical relationships were extracted and analysed. Fourteen studies published between 1928 and 2024 were identified, comprising cadaveric, angiographic and computed tomography investigations. Twelve studies provided extractable prevalence data, representing a total of 1,155 examined hearts and coronary angiograms. The crude pooled prevalence of Kugel's artery was 13.6% (157/1,155). As Kugel's original description reported the vessel in all examined specimens (50/50), a sensitivity analysis excluding this historical outlier yielded a pooled prevalence of 9.6% (106/1,104). Individual study prevalence ranged from 4.15% to 45.4%. The proximal right coronary artery (RCA) represented the most frequent site of origin, although origins from the left circumflex artery (LCx), sinoatrial nodal artery and conus artery were also reported. The vessel most commonly coursed through the interatrial septum, frequently traversing the atrioventricular sulcus before forming anastomoses with the distal RCA, distal LCx, atrioventricular nodal artery or posterior branches of the RCA near the crux cordis. Several studies documented marked variation in both origin and termination patterns. More recent investigations highlighted the vessel's potential importance as a collateral pathway in the presence of coronary occlusive disease. Kugel's artery remains an underreported structure of the coronary circulation. Considerable variability exists regarding its origin, course and termination. Recognition of this anatomical variant may improve interpretation of coronary imaging and enhance understanding of collateral coronary circulation. Further studies employing standardised anatomical definitions are required to establish its true prevalence and clinical significance.

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YOUNG INVESTIGATOR

Exploring Distal Tendon Morphology of Tibialis Posterior and Fibularis Longus and Its Relationship with Foot Arch Structure. A Human Cadaveric Study.

Oliver Chudleigh, Natasha Noel-Barker

University of Nottingham, Nottingham, England, UK

The tibialis posterior (TP) and fibularis longus (FL) muscles play important roles in supporting the transverse arch (TA) and medial longitudinal arch (MLA) of the foot, enabling efficient load transfer and lever formation during gait. Although both muscles are implicated in the management of foot arch disorders, the relationship between tendon morphology and arch structure remains unclear. This cadaveric study aimed to investigate insertional variation, tendon morphology, and whether these structural features correlate with foot morphology. Twelve cadaveric specimens, donated for research and teaching purposes, were dissected to expose TP and FL tendon insertions. Tendon slips, insertional overlap, and plantar coverage were qualitatively mapped. Quantitative measurements included foot width, foot length, truncated foot length, navicular height, arch index, free tendon length, tendon branching angles, minimum branching distance, and tendon crossing angles. Data was obtained using ruled measurements, standardised two-dimensional photography, and three-dimensional surface scans. Spearman's correlation coefficient was used to assess structural relationships. Both TP and FL demonstrated insertions across the midfoot and forefoot with insertional overlap. Qualitative observations indicated that accessory tendon slips increased plantar coverage and produced varying regions of distal overlap within the midfoot. TP free tendon length demonstrated strong positive correlations with all anthropometric data (navicular height (rho = 0.587, p = 0.045), truncated foot length (rho = 0.843, p < 0.001), foot width (rho = 0.721, p = 0.008). FL free tendon length also correlated positively with truncated foot length (rho = 0.825, p < 0.001), and foot width (rho = 0.718, p = 0.009). FL crossing angle demonstrated significant strong negative correlations with foot width (rho = -0.766, p = 0.004) and MLA profile (rho = -0.821, p = 0.001). These findings support the concept that TP and FL function synergistically, stabilising the TA and MLA of the foot. Tendon and plantar sling morphology demonstrated meaningful associations with TA structure, while TP morphology also appeared related to MLA support. Further in vivo studies are needed to clarify functional implications and inform targeted physiotherapy aimed at improving dynamic foot arch support. Ethical approval was obtained from the School of Life Sciences Ethics Committee (A0202925NN).

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YOUNG INVESTIGATOR

Investigating the Effect of Obesity on the Human Ribs Using Geometr

Emre Arnavut, Thomas O'Mahoney

Anglia Ruskin University, Cambridge, UK

Obesity is associated with altered respiratory mechanics, yet its effects on thoracic skeletal morphology remain poorly quantified. This pilot study tested whether obesity is associated with differences in rib cage size and three-dimensional shape, and whether these effects differ between sexes, using geometric morphometrics. Chest computed tomography scans from 119 adults were segmented using TotalSegmentator, and all 24 ribs were landmarked using a multi-template ALPACA workflow in SlicerMorph, producing 440 homologous landmarks per individual. Following Generalised Procrustes Analysis, variation in rib cage size and shape was assessed using Procrustes ANOVA, Principal Component Analysis, and Canonical Variate Analysis in R, with body mass index, sex, and age included as explanatory variables. Obese individuals exhibited significantly larger rib cages than non-obese individuals, with obesity explaining 7.2% of centroid size variation ($p = 0.044$). Body mass index also had a significant independent effect on rib cage shape ($R^2 = 0.040$, $p = 0.001$), characterised by expansion and reorientation of the inferior ribs and lower thoracic aperture. Sex-specific analyses showed that BMI-related shape change was substantially greater in males ($R^2 = 0.065$) than in females ($R^2 = 0.022$), indicating differential skeletal responses to increased body mass. Age had a significant effect on rib shape independent of BMI. As a pilot analysis, these results demonstrate the feasibility and sensitivity of whole-rib geometric morphometrics for detecting obesity-related thoracic shape variation, and identify the lower rib cage as a key anatomical region of interest. The findings provide preliminary structural evidence for compromised ventilatory mechanics in obesity and establish a framework for larger, hypothesis-driven studies of thoracic skeletal plasticity. Ethics statement: This study used anonymised, retrospective clinical imaging data and was conducted with institutional ethical approval (ETH2324-5265) in accordance with relevant data protection regulations.

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YOUNG INVESTIGATOR

Cranio-caudal Patterning of Human Foetal Thoracic Vertebral Development: A 3D Geometric Morphometric Study

Toni-Davina Para-Mallam [1], Bernadette de Bakker [2], Thomas O'Mahoney [1]

1. Anglia Ruskin University, Cambridge, UK; 2. Amsterdam Reproduction & Development (AR&D) Amsterdam UMC, Amsterdam, Netherlands

Quantitative three-dimensional descriptions of foetal thoracic vertebral development remain limited, despite well-established embryological models of somitogenesis, cranio-caudal patterning, and progressive ossification of the axial skeleton. This study applied geometric morphometric methods to examine thoracic vertebral shape variation during early human development and to assess how these processes are expressed in three-dimensional form. Computed tomography data from 49 human foetuses aged 11–23 weeks' gestation, derived from clinically indicated or socially terminated pregnancies, were used to reconstruct thoracic vertebral columns. Vertebrae were segmented and processed in Slicer3D and Meshlab, and landmark-based analyses were conducted using the R packages geomorph and Morpho to quantify shape variation across gestational age and along the thoracic column. Analysis identified structured variation in vertebral shape associated with both developmental stage and vertebral level. A clear cranio-caudal pattern was observed, with the lower thoracic vertebrae showing greater shape change across the sampled gestational interval than upper levels. This pattern aligns with established embryological gradients in segmentation timing and ossification along the axial column. Overall variation decreased with advancing gestation, consistent with increasing developmental constraint. No clear evidence of sexual dimorphism was detected within this gestational range. These findings provide a quantitative link between embryological patterning and observable vertebral morphology and demonstrate that geometric morphometrics can resolve regionally specific developmental signals in the foetal thoracic spine. This study establishes a methodological framework for ongoing work aimed at refining these patterns and applying them to the identification of developmental deviation in both clinical and comparative contexts. Ethics statement: This study used anonymised foetal imaging data and was conducted with ARU ethical approval ref ETH2324-5265.

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The Human Omohyoid Muscle as a Functional Interface : Anatomical and Clinical Implications

Young Seok Park, Young Shin Hong

1. Seoul National University School of Dentistry, Seoul, Korea

The omohyoid muscle is a slender, ribbon-like member of the infrahyoid muscle group, composed of superior and inferior bellies connected by an intermediate tendon. Although it is commonly described as a depressor and stabilizer of the hyoid bone, its anatomical location suggests broader functional relevance to swallowing, respiration, phonation, and cervical fascial tension. In ageing populations, where dysphagia, aspiration risk, and airway protection are major clinical concerns, the functional anatomy of this muscle deserves renewed attention. This review aims to reassess the anatomical and clinical significance of the omohyoid muscle, with particular focus on its neural control, reflexive activation, and potential implications for swallowing and airway-related dysfunction. Published anatomical, physiological, and clinical literature related to the omohyoid muscle, infrahyoid musculature, ansa cervicalis innervation, hyoid–laryngeal movement, swallowing reflexes, and cervical fascial mechanics was reviewed and synthesized. The omohyoid is a skeletal muscle primarily innervated through the ansa cervicalis, indicating somatic motor control. However, its activity may also be incorporated into brainstem-mediated sensorimotor patterns during swallowing, mastication, respiration, and phonation. Through depression and stabilization of the hyoid bone, as well as its connection with the deep cervical fascia, the omohyoid may contribute to coordinated pharyngolaryngeal movement, fascial tension regulation, and airway protection. Abnormal or involuntary contraction of the muscle has been associated with lateral neck bulging, discomfort, and dysphagia-like symptoms. The omohyoid muscle should not be regarded merely as a minor infrahyoid depressor. Rather, it represents a clinically relevant anatomical structure linking cervical musculoskeletal mechanics, reflexive swallowing control, and airway protection.

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YOUNG INVESTIGATOR

Functional Anatomy of the Orbit Relevant to Transorbital Surgical Approaches: Reflections from Cadaveric Orbital Dissection.

Ecaterina Pogorenii [1], Isabel Samuel [1], Sharmila Saran Rajendran [2], Helen Christian[2]

1 School of Medical and Biomedical Sciences, University of Oxford, Oxford, UK; 2- Department of Physiology, Anatomy, and Genetics, University of Oxford, Oxford, United Kingdom

Surgical transorbital approaches (TOAs) utilise the orbit as a minimally invasive corridor to access the skull base and intracranial structures. Safe surgical navigation requires a detailed understanding of the spatial relationships between orbital corridors and neurovascular structures. However, the anatomical constraints, working spaces, and structures at risk vary according to surgical trajectory and remain difficult to fully appreciate without direct anatomical exploration. We performed a cadaveric dissection of the right orbit of a human specimen through superior, inferior, and lateral anatomical trajectories. We partially removed the frontal, maxillary, and zygomatic bones to access the orbital roof, floor, and lateral wall, respectively. This dissection provided near-circumferential exposure of the orbital contents, allowing the spatial relationships to be viewed from multiple angles. Orbital contents, including the globe, extraocular muscles, cranial nerves, orbital vasculature, and surrounding bony landmarks, were identified and examined in relation to each anatomical trajectory. The superior orbital trajectory traversed a constrained anatomical corridor, passing near the optic nerve, superior orbital fissure, and oculomotor neurovascular structures at the orbital apex and anterior cranial fossa. Compared with the superior trajectory, the lateral orbital trajectory offered broader access to the lateral orbit and middle cranial fossa, with greater working space and fewer nearby neurovascular structures. Lastly, the inferior orbital trajectory highlighted the confined anatomy of the orbital floor and demonstrated the relationship of the infraorbital nerve and inferior orbital fissure to inferior orbital access. Comparative visualisation across trajectories revealed distinct differences in anatomical exposure, working space, and structures that may be vulnerable during transorbital surgical navigation. These observations demonstrate the value of cadaveric orbital dissection for characterising transorbital surgical pathways and corridor-specific anatomical risks in a controlled anatomical setting. Among the anatomical trajectories examined, the lateral orbital trajectory appeared to provide the widest and most surgically navigable anatomical corridor, whereas the superior and inferior trajectories required greater consideration of the optic and infraorbital neurovascular anatomy, respectively. The findings support the value of cadaveric orbital dissection as a preparatory educational exercise for transorbital surgical planning and anatomical training. This work was conducted in an appropriately licensed Human Tissue Act (HTA) anatomy laboratory with relevant donor consent, photographic consent, and ethical approval in place. Formal research ethics committee approval was not required; however, Designated Individual (DI) approval was received on 29 May 2026 under Anatomy Licence No. 12178 prior to photography and dissemination of findings.

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Functional consequences of extremes in cranial anatomy in wild canids and domestic dogs

Tahlia I Pollock, Emily J Rayfield

1. Palaeobiology Research Group, University of Bristol, UK; 2. School of Biological Sciences, Monash University, Australia

@TIPollock

Dogs, “man’s best friend,” showcase a staggering array of skull shapes, resulting from human-driven artificial selection for desirable traits, particularly those related to aesthetic appeal. This diversity contrasts with wild species, where natural selection shapes skulls for survival. Previous research has captured the morphological breadth achieved under these evolutionary forces; however, we do not fully understand how it may impact skull function. Here we investigate how variation in cranial anatomy among domestic dogs impacts their feeding biomechanics. We quantified linear metrics to calculate proxies for feeding performance (strength, rotational efficiency, and mechanical advantage) in the crania and mandibles of over 100 domestic breeds as well as ~20 wild canid species. Results reveal greater variation in biomechanical proxies among dog breeds than wild canids, which were constrained relative to their domestic counterparts. This was primarily driven by extremes in domestic skull morphologies, with brachycephalic (short-faced) and dolichocephalic (long-faced) forms exhibiting distinct functional profiles. Our findings highlight how selection driven modifications to skull anatomy impact biomechanical performance in domestic species and more broadly, contribute to our understanding of the limits of evolution.

No ethics approval was required for undertaking this study.

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YOUNG INVESTIGATOR

Modulation of ECM Composition to Determine the Effect on Human Triple-Negative Breast Cancer (TNBC) Cells in 3D Scaffolds

Rhieya Rahul [1], Eileen Reidy [1], Caroline Curtin [1, 2, 3]

1. Tissue Engineering Research Group, Department of Anatomy and Regenerative Medicine, RCSI University of Medicine and Health Sciences, Dublin, Ireland; 2. Trinity Centre for Biomedical Engineering (TCBE), Trinity College Dublin (TCD), Dublin, Ireland; 3. Advanced Materials and Bioengineering Research Centre (AMBER), RCSI and TCD, Dublin, Ireland

● rhieya_5 – Instagram ● Rhieya Rahul – Linkedin

Triple-negative breast cancer (TNBC) is an aggressive subtype characterised by the absence of oestrogen, progesterone, and human epidermal growth factor 2 receptors, limiting therapeutic options. The extracellular matrix (ECM) within the tumour microenvironment plays a crucial role in TNBC progression through biochemical and mechanical signalling. Variations in ECM components, such as collagen and hyaluronic acid (HyA) composition, modulate invasion, adhesion, and epithelial-to-mesenchymal transition (EMT). This study investigated how ECM composition, modulated by varying collagen and HyA content in 3D collagen-hyaluronic acid (ChyA) scaffolds, influences TNBC behaviour, including migration, collagen remodelling, and N-cadherin expression. 3D ChyA scaffolds were developed according to established protocols with varying collagen-to-HyA levels: ChyA (control), HC-HyA (high collagen), and C-HyAH (high HyA), to model ECM composition. Scaffolds were seeded with TNBC MDA-MB-231 human cell line and cultured for 1, 7, and 14 days. Samples were processed for histology and analysed using Hematoxylin and Eosin staining, Direct Red 80 for collagen composition and N-cadherin immunofluorescence staining. Quantitative image analysis was conducted using FIJI, and statistical comparisons were performed using two-way ANOVA. Although no statistically significant differences were detected, consistent trends were observed across scaffold compositions. High-collagen scaffolds promoted sustained cell infiltration and elevated N-cadherin expression, indicative of EMT-associated behaviour linked to increased migratory capacity. HyA-rich scaffolds supported early infiltration but exhibited reduced migration and clustering by Day 14 due to matrix compaction. Pore size decreased over time across all scaffold types, reflecting ECM remodelling. ECM composition plays a key role in shaping TNBC cell morphology, adhesion, and invasive behaviour. Collagen-enriched environments enhanced migratory and EMT-associated phenotypes, whereas HyA-rich matrices transiently promote infiltration before stabilising into clusters. These findings highlight the utility of ChyA scaffolds as physiologically relevant 3D models for investigating tumour-ECM interactions and preclinical evaluation of anti-metastatic strategies. Importantly, this work highlights the need to consider biochemical ECM cues when interpreting TNBC behaviour in 3D models. Ethics Statement: This study used the commercially available human breast cancer cell line MDA-MB-231. Therefore, formal ethical approval and informed consent were not required.

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Evaluating Geographic Variance in Postcranial Sex Estimation in Humans.

Sharmila Saran Rajendran [1], Mohamed Fasil Ibrahim [2]

1 Department of Physiology Anatomy and Genetics, University of Oxford, Oxford, UK; 2 Nuffield Department of Clinical Neuroscience, University of Oxford, Oxford, UK

Sex estimation is a foundational step in forensic analysis, yet osteometric standards are derived from a single geographical location. In this study, we examined whether sexual dimorphism is consistent across populations using the Goldman Osteometric Dataset (Auerbach & Ruff, 2006; https://web.utk.edu/~auerbach/GOLD.htm), which comprises 1,528 documented-sex skeletons (985 male, 543 female) from 30 countries. We quantified the sex-discriminating power of 43 bilateral postcranial measurements using two effect-based metrics: Cohen's d (standardised mean difference between sexes) and the area under the receiver operating characteristic curve (AUC) from single-measurement logistic regression, evaluated by stratified five-fold cross-validation. Femoral epicondylar breadth was the strongest single discriminator (d = 2.02; AUC = 0.925), with humeral head diameter (d = 1.98; AUC = 0.921) and the femoral and tibial articular breadths performing comparably. Analyses were repeated within each adequately sampled population to assess the geographic consistency of dimorphism. Across populations, the magnitude of dimorphism varied considerably for most measurements; however, right humeral epicondylar breadth (CV of d = 0.21), femoral head diameter (CV = 0.22), and right acetabular height (CV = 0.23) remained comparatively stable, indicating population-invariant signals. These findings demonstrate that postcranial sexual dimorphism is not uniformly expressed across human populations. This study involved the secondary analysis of existing, osteometric data curated by Auerbach and Ruff, a publicly available resource. So, Ethics approval is not required.

Poster 60

Comparative anatomy of the larynx in bats, rodents and ungulates

Maria Rose-Møller[1], Thomas O'Mahoney[1], Emma Pomeroy[2], Jacob C Dunn[1]

Anglia Ruskin University, Cambridge, UK; University of Cambridge, Cambridge, UK.

Sound production in mammals is mainly generated by tissue vibrations in the larynx. While the gross morphology of the main cartilages (cricoid, thyroid, arytenoid) and hyoid bone are largely homologous across taxa variations in relative size and shape are common, and are thought to be, at least in part, related to selection pressures on vocal communication. The principle of negative acoustic allometry outlines the fundamental assumption that larger animals have bigger larynges and vocal tracts and produce sounds with lower fundamental frequency (pitch) and formants (resonance properties) than smaller animals. However, the initial assumption that acoustic parameters strongly correlate with body size have been challenged by a range of studies showing some species to have evolved adaptive differences in the relative size of their larynx and/or vocal tract with important implications for their vocal communication. My PhD project examines how the larynx morphology varies across species in bats (Chiroptera), rodents (Rodentia) and ungulates (Artiodactyla and Perissodactyla). 3D models of the main cartilages and hyoid bone are reconstructed from CT scans obtained from the database Morphosource.org, museum collections and zoos. The shape and relative size of the larynx in relation to body length will be analysed using geometric morphometrics and compared across species using phylogenetic comparative methods. Ancestral state reconstruction and evolutionary rates analysis will be used to investigate the evolution of the larynx across orders and establish potential drivers behind described variations. The most recent results from this project show that bats generally show a positive larynx allometry, whereby larynx height scales positively with body length ($R2=0.354$, $p<0.0001$). However, multiple morphological variations have been observed for the three main cartilages and hyoid bone. Further analysis will investigate any additional correlations between larynx measurements and body size in bats and significance of the morphology variations related to sound production (e.g. use and type of echolocation and sexual selection). This research was conducted in accordance with European Union Directive 2010/63/EU. Approval was granted by the Anglia Ruskin University School of Life Sciences Ethics Panel (ETH2223-0767).

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YOUNG INVESTIGATOR

A Rare Bilateral Variant of the Foramen Rotundum: A Human Cadaveric Case

Isabel Samuel [1], Ecaterina Pogorenii [1], Sharmila Saran Rajendran [2], Helen Christian [2]

1- School of Medical and Biomedical Sciences, University of Oxford, Oxford, UK; 2- Department of Physiology, Anatomy, and Genetics, University of Oxford, Oxford, United Kingdom

The foramen rotundum (FR) of the sphenoid bone transmits the maxillary division of the trigeminal nerve (V2). Anatomical variation in FR morphology is uncommon but may have clinical significance for skull-base surgery, endoscopic endonasal approaches and neuroradiology, in which the FR is an important anatomical landmark. Routine anatomical dissection of a cadaveric adult human skull demonstrated a rare bilateral variation of the FR consisting of a right-sided septate FR and a complex left-sided FR configuration associated with two osseous recesses and a sphenoidal osseous spur. Measurements were obtained using digital Vernier callipers accurate to 0.01mm. Transverse and anteroposterior diameters of each foramen were measured. On the right, the FR was divided into two distinct apertures by an oblique septum of 2.29mm width. The medial aperture measured 4.52 x 3.89mm (area 13.8mm2). The smaller lateral aperture measured 3.44 × 2.79mm (area 7.5mm²). On the left, a prominent osseous spur arising from the greater wing of the sphenoid measured 9.04mm in width and projected medially, obscuring the FR. This resulted in an angular bend in V2 as it passed from the trigeminal ganglion toward the foramen. Removal of the bone spur revealed an atypical FR complex comprising two osseous recesses and one patent aperture. The two non-patent recesses measured 4.16 x 3.32mm (area 10.8 mm²) and 1.74mm x 2.17mm (area 3.0mm²). The patent aperture, measuring 3.61mm x 4.30mm (area 12.2mm²), was the most anterior of the three and transmitted V2 in an unusual anterior trajectory. The total areas of the right (21.3mm²) and left (26.0mm²) foraminal complexes exceeded those typically reported for a single FR. These variations may be due to an embryological failure of fusion or ossification of the sphenoid bone during development. Variations in FR morphology have important clinical implications as they may alter the course of V2 and complicate radiological interpretation, maxillary nerve blockade and skull-base surgical navigation; awareness of these variants may prevent nerve injury. Formal research ethics committee approval was not required; however, Designated Individual (DI) approval was received on 29 May 2026 under Anatomy Licence No. 12178 prior to photography and dissemination of findings.

Poster 62

Reassessing the functional significance of the temporal fascia in human cranial biomechanics

Andrew R. Cuff [1], Laura C. Fitton [2], Alana C. Sharp [1]

1 Department of Musculoskeletal and Ageing Science, University of Liverpool, Liverpool, UK; 2 Department of Archaeology, University of York, York, UK.

@acsharp.bsky.social

The temporalis muscle plays a vital role in controlling jaw movement, particularly jaw closing. Previous studies of humans and macaques have suggested that the temporal fascia that covers the muscle plays an important, but understudied role, in modulating zygoma strain during feeding. It is hypothesised that the fascia counteracts the masseteric forces, based on its origin from the superior temporal line and insertion along the zygomatic arch. However, this has never been experimentally validated. Using a combination of experimental work and digital modelling we attempt to test this hypothesis for adult male and female humans. Ultrasound scans were taken at a series of locations across the temporalis during maximal voluntary biting to measure temporalis muscle bulging. MRI scans were used to create a finite element (FE) model of the temporal fossa region, including the temporalis and overlying temporal fascia. The temporalis muscle was expanded in a pattern that replicated the ultrasound measurements and the forces on the zygoma were extracted. Full FE models of the crania were then created of various biting conditions with and without the temporal fascia forces added. The temporal fascia for both male and females produces very small (<5 N) forces on the zygoma. Both FE models of incisor bites show negligible difference in strain magnitudes and patterns between the different fascia loading conditions, including applying 10 times the predicted forces. In addition, the models show that removing the temporal fascia has negligible effect on strains, either locally at the zygoma or across the cranium. Whilst soft tissues do play an important role in cranial function, such as cranial sutures, the temporal fascia does not appear to be one of them, at least in humans. However, modern humans have a comparatively reduced masticatory apparatus; therefore, in other species, the fascia may have a larger role associated with relative force contribution of the temporalis and masseter muscles relating to dietary specialisations. Ethics for this project was approved by the Hull York Medical School Ethics Committee (Ref 20 18), and the University of Liverpool Ethics Committee (Refs: 13475, 14400, 15919) with full informed consent from the participants.

Poster 63

Thomson's type 2 formation of the portal vein in a human cadaveric donor: a case report and review of portal venous variants

Sara Lonigro [1], Amber Foley [2], Samuel Snowdon [2], Rumyana Smilevska [1]

(1) School of Medicine and Biomedical Sciences, University of Oxford, Oxford, UK; (2) Department of Physiology, Anatomy and Genetics, University of Oxford, Oxford, UK; (1) Oxford Transplant Centre, Oxford University Hospital NHS Foundation Trust, Oxford, UK

Anatomical variation in the portal venous system has been studied due to its relevance to abdominal surgery and anatomical education. One of the earliest and most widely recognised classifications of portal vein (PV) tributary variation was described by Thomson in 1890. This framework remains clinically relevant as its proposed three principal patterns account for more than 90% of reported PV formation variants. Cadaveric dissection of an adult male donor was performed to expose the portal venous system. The contributing veins, site of venous confluence and relationship to adjacent anatomical structures were examined and compared with recognised descriptions of PV formation in the literature. A focused literature review was undertaken to contextualise this finding, within known portal venous variants, to understand its clinical significance. In our donor, the portal vein was formed by the direct union of the superior mesenteric (SMV), inferior mesenteric (IMV) and splenic veins (SV) at a common confluence. This pattern is consistent with Thomson type II formation, rather than the more common arrangement in which the IVM drains into the SV before forming the PV. As a result, our findings demonstrate a clinically relevant vascular variant which may be encountered during surgical procedures such as pancreaticoduodenectomy, colectomy, hepatectomy and liver transplantation amongst others in which unexpected portal venous anatomy may increase the risk of complications associated with vascular injury and prolonged operative time. Moreover, this report highlights the continuing value of cadaveric dissection in identifying clinically significant anatomical variants and supports the need to integrate those into anatomical teaching and surgical planning to optimise patient outcomes. Ethical approval request was sent to the ethics committee and it has been confirmed that no ethical approval is required for a case report study given that the donor has consented for their body to be used for science.

Poster 64

Variation in the Branching Pattern of the Axillary Artery: Third-Part Branches Arising from the Second Part

Samuel Snowdon*[1], Athena Henderson*[2], Amber Foley[1], Sharmila Rajendran[1], Rumyana Smilevska[1,3]

1 Department of Physiology, Anatomy and Genetics, University of Oxford, Oxford, UK; 2 Medical Sciences Division, University of Oxford; 3 Oxford University Hospitals NHS Foundation Trust, Oxford, UK

Variations of the axillary artery and its branches are relatively common and may have important clinical implications during surgical and radiological procedures involving the axillary region. Classically, the axillary artery gives rise to the superior thoracic, thoraco-acromial, lateral thoracic, subscapular and anterior and posterior circumflex humeral arteries. This case study describes a rare unilateral right-sided variant of the axillary artery found during a routine cadaveric dissection, consisting of a common arterial trunk branching from the axillary artery giving rise to the subscapular, anterior circumflex humeral, posterior circumflex humeral and profunda brachii arteries. A duplication of the anterior circumflex humeral artery was also observed. Morphometric measurements were gathered using a digital Vernier calliper (accuracy ±0.01 mm) and each parameter measured three times by the same observer. Data were analysed using SPSS v31. Descriptive statistics, including mean, standard deviation, minimum and maximum values were calculated from repeated measurements. The length of the axillary artery (104.41±0.83mm) was measured from the lateral border of the first rib to the inferior border of teres major. Measurements relating to the common trunk included the distance from the lateral border of the first rib (76.31±0.49mm), trunk length (18.66±1.16mm), additional branch origin distances, and external vessel diameters at origin. The results showed that whilst the axillary artery had normal arterial branching of the superior thoracic, thoraco-acromial and lateral thoracic arteries, there was a common arterial trunk branching from the second part of the axillary artery, posterior to pectoralis minor. This common trunk passed posterolateral between the medial and lateral roots of the median nerve. No additional arterial variations were identified in the contralateral left-sided axillary region. This is a rare variation of the axillary artery and has clinical relevance for surgeons, radiologists and clinicians performing procedures involving the axilla. Findings can also contribute to understanding of developmental variations that can exist within the embryological axillary artery. Formal research ethics committee approval was not required; however, Designated Individual (DI) approval was received on 29 May 2026 under Anatomy Licence No. 12178 prior to photography and dissemination of findings.

Poster 65

YOUNG INVESTIGATOR

Ecological drivers and evolutionary constraints in wild caprines

Atena Soltanian, Philip Cox, Anjali Goswami

University College London, London, UK; Natural History Museum, London, UK

The bovid subfamily Caprinae exhibits great diversity in size, morphology and ecology, demonstrated by their wide geographic range and the breadth of habitats they exploit. This project aims to capture wild caprine cranial shape variation and elucidate how ecological factors and evolutionary constraints may influence cranial shape. Differing dietary strategies (grazing, browsing or mixed) are observed across the group, a trait which is hypothesised to influence caprine skull shape. We also predict that this group will follow a known craniofacial evolutionary allometric pattern (CREA) of facial elongation associated with increased cranial size. 3D fixed-point landmarks and semilandmark curves were recorded from 130 crania of 36 wild caprine species to characterise anatomical features, shape and masticatory muscle attachment sites. Geometric morphometric methods were used for analysis of shape variation. Overall cranial shape is strongly significantly associated with dietary strategy type ($R^2 = 0.121$, $p = 0.01$), but after correcting for caprine phylogenetic relationships and centroid size, this association is lost ($R^2 = 0.068$, $p = 0.156$). Alongside Principal Component Analyses, these statistical tests indicate that exclusive grazers and browsers do typically exhibit differently shaped masticatory muscle attachments, but that this variation is phylogenetically structured rather than necessarily a result of convergent evolution. There is a common allometric trajectory across caprines ($R^2 = 0.108$, $p = 0.001$), and the group largely follows the CREA pattern of facial elongation relative to braincase size. However, the largest species (the muskox) deviates from this pattern, with an abnormally high occipital depth relative to facial length, which may be due to their disproportionately large horn bases. This is of great interest as deviation from the CREA pattern has not previously been observed in other mammalian groups. The relationship between diet and cranial morphology has not been directly tested in caprines, and this dietary divergence may tentatively be linked to the Miocene caprine adaptive radiation associated with increasing grassland. These findings will also be used to test how dietary change associated with domestication may have affected the caprine skull in future work. All work was carried out on accessioned museum specimens; therefore, no ethical approval was required.

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YOUNG INVESTIGATOR

Development of a comprehensive 3D computational musculoskeletal model of a Japanese macaque and workflow for locomotory studies using OpenSim-Moco

Kacper Starczewski[1,2], William Sellers[1], Naomichi Ogihara[2]

1 University of Manchester, Manchester, UK; 2 University of Tokyo, Tokyo, Japan

Understanding hominin locomotory biomechanics is central to interpreting the evolutionary trajectory and functional changes of our lineage; however, this remains difficult to investigate directly and non-invasively in living and fossil taxa. To better understand our locomotory biomechanics, we require quantitatively robust methods that allow model and computational environment manipulation. Musculoskeletal modelling provides this through extended insights from experimental studies, enabling investigation of internal mechanisms that are difficult to measure in-vivo such as muscle forces, activation patterns and joint torques. This allows for a more comprehensive understanding of locomotor behaviours in extant species and more grounded estimates in extinct species reconstructions. However, robust full-body non-human primate musculoskeletal models remain relatively scarce, limiting their broader application to evolutionary questions. In this study we developed and systematically evaluated a Japanese macaque (Macaca fuscata) musculoskeletal modelling framework using OpenSim-Moco and its marker tracking function MocoTrack. The macaque serves as an experimentally accessible comparative model for investigating the biomechanical constraints faced by an anatomically quadrupedal primate during the acquisition of bipedal locomotion. Our aim was to establish, validate and evaluate the methodological capabilities and limitations of both the musculoskeletal model and OpenSim-Moco for application in future non-human primate locomotory studies. To assess the model's biomechanical fidelity and capacity to produce quantitatively robust locomotor analyses, we carried out a systematic optimisation evaluation of model and solver parameters. These included global marker tracking weights, reserve actuator strength, muscle strength scaling, and passive muscle mechanics, tested across three model configurations: muscle-driven, reserve/torque-driven, and hybrid models. Simulation outputs were evaluated against experimental data consisting of marker error metrics, muscle activation patterns relative to published electromyographic recordings, ground reaction force profiles, and joint kinematics comparisons. Preliminary results demonstrated the modelling framework was robust to noisy animal motion capture data, successfully reproducing 3D kinematics without force plate or EMG inputs, with predicted muscle activations and GRF's showing qualitative agreement with published data. Parameter selection, particularly global marker weights and passive muscle mechanics most strongly influenced simulation convergence success and biomechanical fidelity. These findings show promise for OpenSim-Moco and our macaque model as a robust transferable framework, for investigating primate locomotor biomechanics. This study is entirely computational and simulation-based investigation utilising secondary data. All experimental kinematic data used in the computational biomechanics' simulations were collected by the Ogihara Lab at University of Tokyo during previous ethically approved studies. Ethical approval for the original data collection was granted by the Animal Care Committee at the University of Tokyo where all experimental procedures were adhered to as per the University of Tokyo Animal Experimentation Regulations and Animal Experimentation Manual. The Japanese macaques that were used to collect the experimental kinematic data were regularly trained macaques from the Suo Monkey Performance Association.

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YOUNG INVESTIGATOR

Measuring Morphological Semitendinosus Variation in Human Cadavers: Implications for Anterior Cruciate Ligament Grafts

Lucy Steward, Suzanne Scott, Joanna Tomlinson

Department of Anatomy, University of Bristol, England, UK

Annually, 77% of 20,200 UK-based ACL injuries undergo surgical reconstruction, often using semitendinosus-derived autografts. Insufficient graft-size frequently results in graft failure; procedural improvements are essential for patient recovery. Semitendinosus grafts replicate the biomechanics of the native ligament but may cause long-term donor-site strength deficits, most apparent at flexion angles >60° and some persisting up to 7 years post-surgery. Guidelines state grafts must be minimum 7cm in length and 8mm wide; narrower grafts frequently fail. Tendon folding increases diameter but requires sufficient length to achieve. This study aimed to assess semitendinosus anatomical variation, morphometric relationships, and potential harvest success in cadaveric legs. From the University of Bristol Prosection Catalogue, seven limbs from five donors were studied (age range 75-90; 4 right, 3 left; 3 male, 2 female). Morphometric parameters, including limb, thigh, semitendinosus, semitendinosus tendon, and extra-muscular semitendinosus tendon lengths, were measured using string and a ruler, while tendon width was measured at multiple levels using callipers. Extra-muscular tendon length (median 17.87cm; range 12.97-21.63cm) and width (median 4.60mm; range 4.23-5.37cm) of all donors was variable. Tendon width did not significantly differ between proximal, middle, and distal portions of the extra-muscular tendon. No correlations were found between extra-muscular tendon length and width at multiple levels. Similarly, no relationships between extra-muscular tendon, limb and femur lengths were detected, questioning whether graft-size could be predicted post-operatively. Findings highlight that six of seven limbs had sufficient extra-muscular tendon length to produce a double semitendinosus graft; one of seven could produce a triple-folded graft; and none a quadrupled graft. Shorter tendons may be unusable or present risk of damaging the muscle-belly during harvest, perhaps contributing to previously observed strength-deficits. The limited sample-size and lack of sample-independence introduce potential confounding variables; hence, these data must be considered as a case series. Further work should establish population-level variation related to sexual dimorphism, body size, and lifestyle factors (e.g. exercise status). Assessing graft-suitability on a case-by-case basis could reduce detrimental outcomes at the donor-site and improve graft success prediction. This project was ethically approved by the Department of Anatomy, University of Bristol, Research Quality Sub-Committee (2026-SoA-H-001).

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YOUNG INVESTIGATOR

Fibreomics in the Tumour Microenvironment – Biomarkers Concealed in Extracellular Matrix Protein Organisation

Ronja Struck [1,2,3,5], Ausrine Nestarenkaite[4], Julius Drachernis[4], Allan Rasmusson[4], Aida Laurinaviciene[4], Renaldas Augulis[4], Arvydas Laurinavicius[4], Olga Piskareva[1,2,3]

1-Cancer Bio-Engineering Group, Department of Anatomy and Regenerative Medicine, RCSI University of Medicine and Health Sciences, Dublin, Ireland; 2- School of Pharmacy and Biomolecular Sciences, RCSI, Dublin, Ireland; 3- Tissue Engineering Research Group, Department of Anatomy and Regenerative Medicine, RCSI, Dublin, Ireland; 4-National Center of Pathology, Affiliate of Vilnius University Hospital Santaros Klinikos, Vilnius, Lithuania; 5-Enthesis Enthusiasts, Medical School Berlin, Berlin, Germany.

Fibreomics is a new concept for studying tissue organisation providing and novel insights into the tumour microenvironment. The lack of studies on the TME of neuroblastoma, one of the most lethal paediatric cancers in high-risk cases, and the differences found between adult and childhood cancers demand further investigations. The abundance and organisation of extracellular matrix (ECM) proteins are fundamental to the biomechanical and consequently biochemical properties of any tissue and are known to be altered in cancer. They typically lead to a hallmark of cancer, extracellular stiffness. In neuroblastoma ultra-high-risk cases can be identified within the high-risk cohort based on their ECM organisation. Based on this, we believe additional valuable biomarkers can be extracted from neuroblastoma collagen frameworks. To detect collagen fibres 42 patient samples were stained with Sirius red. Subsequently, an artificial neural network trained on breast cancer samples extracted the collagen framework. From these collagen fibre masks 35 collagen fibre characteristics can be extracted including density, morphometry, orientation and texture. Of the 42 samples, 5 were MYCN amplified, 15 were classed as high risk, 7 are from metastatic sites. The median age at sample collection was 2 years. Qualitative analysis indicates differences in collagen distribution and abundance between high and low risk cases. Preliminary analysis found no significant differences in mean vector length or circular standard deviation between risk groups or samples from patients that survived and those that did not. Clinically relevant fibreomics biomarkers were found with the same digital image analysis including collagen fibre width, curvature and anisotropy for breast cancer. We believe that the incredibly rich fibreomics data set collected will provide numerous novel biomarkers for neuroblastoma prognosis and staging and advance our understanding of the importance of ECM composition and organisation to the TME. This study was approved by the Clinical Research Ethics Committee of Vall d'Hebron Hospital on 07.12.2020, with registration number PR(AMI)633/2020. Written informed consent was obtained from all patients and/or legal guardians prior to sample collection, in accordance with the Declaration of Helsinki.

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YOUNG INVESTIGATOR

A multi-organ morphological investigation into the consequences of reduced PPT1 using ovine models.

Zak Vincent[1], Samantha L. Eaton[2], LARIF research team[2], Mark Gray[2], Fraser Murdoch[2], Simon G Lillico[2], Stefano Guido[2], Bruce A. Whitelaw[2], Jonathon D. Cooper[3], Dominic Kurian[2], Gerard Thompson[4], Thomas M. Wishart[1,2].

1 Nottingham Trent University, Nottingham, UK, 2 The Roslin Institute and Royal (Dick) School of Veterinary Studies, University of Edinburgh, Edinburgh, UK; 3 Department for Pediatrics, Washington University in St Louis, School of Medicine, 660 S Euclid Ave, St Louis, MO 63110, US; 4 Centre for Discovery Brain Science, University of Edinburgh, Chancellor's Building, Edinburgh, UK.

The neuronal ceroid lipofuscinoses (NCL), or Batten Disease are a group of inherited neurodegenerative disorders that predominantly affect children and young adults (commonly called 'childhood dementia'). NCLs are inherited lysosomal storage disorders which are caused by genetic alterations resulting in lysosomal dysfunction. In this study, we focus on CLN1, an aggressive form of the disease with an early symptom onset developing from 6-24 months old. Clinical manifestations include blindness, psychological and motor deterioration, seizures and average life expectancy of 9-12 years old. CLN1 disease is caused by defects in the gene encoding palmitoyl-protein thioesterase(PPT1). In the absence of PPT1 function, granular osmiophilic deposits accumulate in all tissues. There is no cure for CLN1 in part due to poor understanding of regional disease nature and a lack of readily available biomarkers. We generated a CLN1 ovine model using CRISPR-Cas9 editing to bridge the translational gap from small animal models to preclinical trials. We aim to understand the differentially affected nervous system, impact on multi-organ systems and how we can track disease progression. MRI and CT imaging modalities have been used to reconstruct 3D models of organ systems throughout disease progression. Brain segmentation confirms differing regional progression within the CNS. Multi-organ volumetrics (including femur bone volumetrics and radiodensity) from full-body CT scans have highlighted no significant difference between controls and CLN1 ovine models at presymptomatic or end-disease timepoints in organs of interest. Whilst there are a lack of morphological alterations in organ systems, there may be molecular consequences seen in proteomic analysis that underpin disease progression. There is a need for further understanding of the regional impact PPT1 dysfunction has on the CNS as well as peripheral organs and tissues. We believe the results of this study will play a significant role in informing preclinical therapeutic approaches on regional targeting and timing of intervention. All experiments performed and tissues collected from the ovine model in this project has been reviewed by the appropriate Animal Welfare and Ethical Review Board (AWERB) and carried out with approval from the Home Office under PPL number: PP2318334.

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YOUNG INVESTIGATOR

Exploring medical student perceptions of 'good death' and donor motivations: Implications for the educational experience in the human dissecting room.

Joseph Biddlecombe, Laura Waller, Emma Saunders

Newcastle University, Newcastle Upon Tyne, UK

Donor-based anatomical education remains widely regarded as the gold standard, providing students with exposure to anatomical variation, tactile learning and three-dimensional relationships while fostering core professional values such as respect and dignity. This approach has however been found to elicit complex emotional responses that may impact the learning experience. Emerging literature suggests that framing body donation through the lens of a 'good death' may positively influence the student experience, though evidence remains limited. This study explored medical students' perceptions of the applicability of the concept of a 'good death' to body donation, and the potential impact of understanding donor motivations and consent processes on learning in the dissecting room. Questionnaires incorporating Likert-style and free-text items were completed by Stage 2 (n=42) and Accelerated (n=19) pre-clinical students. Thematic analysis of free-text responses identified seven themes relating to motivations for body donation. The most frequently cited were "contribution to knowledge", "connection to profession/education", and "impact after death", highlighting strong student recognition of altruistic and educational drivers. When exploring the perceived impact of greater awareness of donor motivations and the concept of a 'good death', five key themes emerged. The most prevalent themes included "humanisation and ethical awareness", "positive emotional response and regulation", and "meaningful learning". Students described that such understanding fostered greater gratitude and reduced guilt. Quantitative findings reinforced these observations. A total of 85% of students agreed that the concept of a good death could be applied to body donation, and 85% agreed that this would positively impact how they feel when learning anatomy in the dissecting room. Furthermore, students agreed that greater awareness of donor motivations and increased understanding of the donor consent process would improve how they feel when learning anatomy in this space, 90% and 80% respectively. These findings suggest that integrating discussions of a 'good death', donor motivations, and consent into anatomy curricula may represent a valuable approach to enhancing student wellbeing, ethical awareness, and engagement within the dissection room. This research was undertaken with approval via the Faculty of Medical Sciences Research Ethics Committee, part of the Newcastle University Research Ethics Committee.

Poster 71

The Language of Anatomy: An Etymological Activity to Understand and Identify the Muscles of Facial Expression.

Colin Wan, Emma Saunders.

Newcastle University Medical School, Newcastle Upon Tyne, United Kingdom; Newcastle University Medical School, Newcastle Upon Tyne, United Kingdom.

The integration of etymology to support learning in anatomical education is well recognised. Prior research suggests that understanding the origin and meaning of words can enhance comprehension in anatomical education. This study evaluated an etymology-centred learning activity designed to support pre-clinical medical students in identifying and learning the muscles of facial expression in the dissecting room (DR). This activity presented students with a comprehensive table of muscles alongside their etymological meanings and tasked them to apply this knowledge to identify these structures on models. A mixed-methods evaluation was completed by 165 medical students (Stage 2 and Accelerated-Entry pre-clinical) following participation in the activity. Quantitative data was collected using 5-point Likert scale items assessing perceptions before, during, and after the activity. Qualitative data was obtained through free-text questions. The findings demonstrate a strongly positive student response. The activity was rated as valuable by 97% of participants (54% agree, 43% strongly agree) and easy to use by 91% (44% agree, 47% strongly agree). Additionally, 98% of students reported that it helped their understanding (44% agree, 54% strongly agree). Analysis of perceived value of etymology in studies before and after intervention showed a statistically significant increase post-activity (Wilcoxon Signed-Rank Test, $p=0.003$). Thematic analysis of qualitative responses reinforced these findings, with key themes including benefits of etymology in breaking down terms, using etymology to aid learning and understanding, utilising etymology in conjunction with the elements of the activity, and ease of use/clear format of the resources used. The results indicate that this etymology-centred activity can enhance both students' learning of the muscles of facial expression and their appreciation of etymology as a learning tool. This activity framework may be transferable to other regions of musculoskeletal anatomy and could be adaptable for both further use in the DR using cadaveric material, as well as in classroom settings using models. The study was approved by the Ethics Committee of Newcastle University.

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YOUNG INVESTIGATOR

From Lab to Clinic: Comparative Heart Anatomy and Histology of Human, Porcine and Ovine Powering Translational Device Design

Ziyi Wang[1], Mya Kay Kywe Tun[2], Aamir Hameed[3]

[1]School of Medicine, Royal College of Surgeons in Ireland (RCSI), Dublin, Ireland; [2]Mahidol University, Thailand; [3]Tissue Engineering Research Group (TERG), Department of Anatomy and Regenerative Medicine, RCSI University of Medicine and Health Sciences,

Ziyi Wang: LinkedIn: www.linkedin.com/in/theziyi

Aamir Hameed: LinkedIn: www.linkedin.com/in/aamir-hameed-0aa91752/

Inter-species differences in cardiac anatomy and histology influence the translational value of large animal models in device development. However, multi-regional analyses of human, porcine and ovine hearts integrating device-relevant morphometry with comparative histology remain limited. This preliminary study compared external cardiac dimensions, intracardiac dimensions and transmural histology across human, porcine and ovine hearts to inform model selection for cardiac device testing. Eight human cadaveric hearts, four porcine hearts and three ovine hearts were dissected using a short-axis approach based on the Association for European Cardiovascular Pathology protocol. Measurements included base-apex length, atrioventricular groove circumference, interventricular septal thickness, left ventricular wall thickness and diameter, mitral and tricuspid annular diameters and apical thickness. Apical samples were fixed in 10% formalin, sectioned at 5 µm, stained with haematoxylin and eosin, and examined at 4×-20× magnification. P values are exploratory due to small sample size. Human hearts had the largest atrioventricular groove circumference (307.00±37.55 mm; porcine vs human: Δ=-38.58 mm, p=0.06; ovine vs human: Δ=-84.78 mm, p=0.02). Porcine hearts closely matched human base-apex length (vs human: Δ=+0.52 mm, p=0.93), mitral annular diameter (Δ=+0.38 mm, p=0.87) and tricuspid annular diameter (Δ=+1.11 mm, p=0.73), but had thicker interventricular septa (Δ=+5.07 mm, p=0.05) and thinner apices (Δ=-2.72 mm, p=0.01). Ovine hearts were smaller globally and at the atrioventricular annuli but demonstrated thicker interventricular septa (vs human: Δ=+4.72 mm, p=0.05) and comparable left ventricular wall thickness (Δ=+0.57 mm, p=0.55). Histologically, human and ovine apices showed prominent epicardial adipose tissue with a sharp epicardial-myocardial transition, whereas porcine apices showed sparse epicardial fat and a more gradual interface. Porcine myocardium more closely resembled human myocardium than ovine myocardium in muscle density and fibrous tissue distribution. These findings suggest that porcine hearts may be more suitable for myocardial stress studies, whereas ovine hearts may better replicate human epicardial conditions due to their similar epicardial fat pattern. Future device testing should account for species-specific differences across regions and tissue layers. Animal hearts were obtained from commercial butchers as food-chain by-products, and ethical approval for human cadaveric material was granted by the Department of Anatomy and Regenerative Medicine, RCSI.

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YOUNG INVESTIGATOR

The association between mode of birth and long-term pelvic floor dysfunction: A systematic review of the literature

Miriam Wassell

University of Nottingham, Nottingham, UK

In 2021, changes in National Institute of Health and Care Excellence (NICE) guidelines made caesareans more accessible, increasing the importance of determining the link between birth mode and subsequent pelvic floor disorder (PFD). PFD is an umbrella term encompassing: pelvic organ prolapse (POP), urinary incontinence (UI), faecal incontinence (FI) and sexual dysfunction. This review aims to determine the link between mode of birth and future PFD, and evaluate the suitability of current NICE guidelines for counselling about PFD. 1. Systematic review - a literature search was performed using three databases, following the Preferred Reporting Items for Systematic Reviews and MetaAnalyses guidelines. Next, papers were relevance screened and assessed for bias using the Critical Appraisal Skills Program checklists. 2. Prosection displaying the superficial perineal pouch. Twenty-four papers across eleven countries, representing 42,003 patients were selected. In three categories caesarean births were found to be protective against future PFD, compared to spontaneous vaginal deliveries (SVD) and operative vaginal deliveries (OVD). In POP the incidence following caesareans ranged from 4.5 - 9.1%, compared to SVDs (9.2 - 29.4%) and OVDs (14.9 - 30.3 %). For UI, caesareans reported an incidence of 5.2 - 40.0%, compared to SVDs (12.4 - 47.8%), and OVDs (37.5 - 48.8%). For FI, incidence following caesareans ranged from 0.0 - 38.2%, compared to SVD (4.6 - 31.1%), and OVD (9.3 - 46.9%). In sexual dysfunction a higher incidence was found following caesareans (28.4 - 66.7%) compared to SVDs (21.3 - 38.4%). A geographical skew in the data made it unlikely to be globally representative, owing to differences in post-partum care, education and parity. Current NICE guidelines do not advise discussion of future PFDs, meaning people in the UK may not be appropriately informed when deciding on how to give birth. Ethical approval was gained through the University of Nottingham's anatomy department.

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YOUNG INVESTIGATOR

The influence of island evolution on size-shape relationships in the anatomy of Myotragus balearicus and its relatives

George Watts[1], Jesse Hennekam[2], Anjali Goswami[3], Philip Cox[1]

1- UCL, London, UK; 2-Maastricht University, Maastricht, Netherlands, 3-Natural History Museum UK, London, UK

Insular dwarfism is a component of island syndrome, where insular species tend to reduce in size comparative to their mainland counterparts. In addition to a reduction in size many insular species also possess unique morphological adaptations, however these adaptations may just be a result of normal scaling relationships. Therefore, understanding clade specific scaling is necessary if we are to uncover if the anatomical differences we see in dwarfs are adaptive or simply an extrapolation of normal scaling trajectories. Myotragus balearicus is an extinct insular dwarf caprine (sheep, goats and relatives) with extreme insular adaptations, notably forward-facing orbits and severe shortening of the distal limb bones. Here we aim to quantify the morphological disparity of the metacarpal of M. balearicus compared to its extant relatives and assess how far it falls off the 'normal' scaling trajectory of living caprines. We compare over 100 individuals representing ~30 caprine species. The size and shape of the caprine metacarpal was assessed using landmark based geometric morphometrics; fixed and semi landmarks were placed on the elements. Principal component analysis of these landmarks reveals the main directions of shape change among Caprinae. Calculation of the common allometric component (CAC) reduces shape change to a single metric, allowing the analysis of how metacarpal shape changes with increasing size. M. balearicus was found to not conform to the general size/shape relationship of Caprinae, suggesting its morphology is not a consequence of smaller size and is likely linked to its insular environment. The shape of the metacarpal of Myotragus was the most disparate of all caprines, with the most extreme scores for both PC1 and PC2, separating itself from all other species in the morphospace. Despite this M. balearicus shared similar PC1 scores to Budorcas taxicolor, one of the largest extant members of the subfamily (~350kg). The other largest caprine Ovibos moschatus also occupies space away from the main cluster of species. These results suggest that although size is an important aspect of caprine distal limb morphology the unique circumstances of M. balearicus has produced a dwarf species with the distal limb morphology of a giant.

No ethical approval was requred.

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Testing the efficacy of a bioengineered drug eluting synthetic dural patch for spinal cord injury repair applications

Louis Mulville [1], Adrian Dervan [1], Ian Woods [1, 2]

1 Royal College of Surgeons in Ireland, Dublin, Ireland; 2 Research Ireland FutureNeuro Centre, RCSI, Dublin, Ireland

@iwoodsie

Following spinal cord injury, primary tissue damage is exacerbated by a secondary injury cascade, driven in part by glutamate (Glu)-mediated excitotoxicity, promoting progressive neuronal loss. Repair of the damaged dural membrane surrounding the spinal cord may be undertaken using a polymer patch. Such patches offer a novel drug delivery pathway directly to the underlying damaged tissues. This project aimed to test the capacity of a polymeric drug-eluting dural patch loaded with a neuroprotective drug, Riluzole (Ril), to alleviate glutamate-induced excitotoxic neuronal injury. Neuronal cell viability assays were conducted using SH-SY5Y neurons grown in DMEM/F12 (+10% FBS). Cells were seeded in 24 well plates (50,000 cells/well), allowed to settle for 24 hrs and then incubated with Ril (0.01 µM to 100 µM) and Glu (0.1 mM and 100 mM) for 72 hours to assess toxicity using the Presto blue assay. For rescue experiments, SH-SY5Y cells were incubated with either 55- or 100-mM glutamate and different Ril concentrations (0.1 – 100 µM) added 24 hours later and then tested 72 hrs later. Patch mechanical properties were assessed using uniaxial tensile testing. For patch elution experiments media was collected from dural patches (8 mm) preloaded with different concentrations of the drug (0.125-4%) and added to Glu-exposed (24 hr) SH-SY5Y neurons and assessed 72 hrs later. Cell viability experiments demonstrated that SH-SY5Y cells tolerated all tested concentrations of Ril, bar 100 µM. Similarly, after 24 hr culture, 55 and 100 mM Glu concentrations were considered optimal for cell injury. Next, drug rescue experiments demonstrated that with 0.1 µM and 10 µM Ril concentrations were sufficient to rescue SH-SY5Y neurons exposed to Glu after 72 hrs exposure. Mechanical testing of drug-loaded patches demonstrated a Young's modulus between 5-12MPa. Finally, Ri-loaded patches (0.25 – 0.5 wt%) optimally supported survival of Glu-exposed neurons over 72 hrs. These findings demonstrate the ability of Ril-loaded dural patches to rescue neurons, grown in 2D and 3D, from Glu-induced toxicity. These data demonstrate patch-mediated delivery as a promising approach to ameliorate Glu-induced excitotoxicity in the injured spinal cord. Ethics: Established SH-SY5Y cell lines used; no human or animal studies; ethics approval not required.

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Morphometric Analysis of the Suprascapular Notch and Superior Transverse Scapular Ligament Ossification in Human Scapulae from a North Indian Skeletal Collection

Jitendra Singh Yadav

Human Anatomy Unit, Department of Biomedical Sciences, University of Birmingham, Birmingham, UK

The suprascapular notch (SSN) is an anatomically variable structure located on the superior border of the scapula through which the suprascapular nerve passes beneath the superior transverse scapular ligament. Variations in SSN morphology and ligament ossification have been associated with suprascapular nerve entrapment, a recognised cause of chronic shoulder pain and dysfunction. This study aimed to investigate the prevalence and morphometric characteristics of SSN variations in a North Indian skeletal collection and evaluate their potential clinical relevance. Eighty adult human dry scapulae (42 right and 38 left) from the osteological teaching collection of the Department of Anatomy, Dr BSA Medical College, India, were examined. Specimens demonstrating damage to the superior border were excluded. The SSN was classified according to the Rengachary classification system. Maximum notch width and depth were measured using digital callipers, and the presence of partial or complete ossification of the superior transverse scapular ligament was recorded. Type III (U-shaped) notches were the most common morphology, accounting for 38.8% of specimens, followed by Type II (22.5%), Type IV (18.8%), Type I (7.5%), Type V (7.5%) and Type VI (5.0%). Complete ossification of the superior transverse scapular ligament resulting in a suprascapular foramen was observed in four specimens. Mean notch width and depth were 11.8 ± 2.6 mm and 6.7 ± 1.9 mm, respectively. No significant differences were identified between right and left scapulae. Narrow V-shaped notches and ossified foramina may reduce the available space for the suprascapular nerve and represent potential anatomical risk factors for nerve compression. These findings demonstrate substantial variation in SSN morphology within a North Indian skeletal collection and provide morphometric data that may assist anatomists, radiologists and orthopaedic surgeons in understanding anatomical factors associated with suprascapular neuropathy. This study utilized dry human bones from the existing institutional teaching collection. No new human remains were obtained, and no living human participants or students were involved. In accordance with institutional guidelines, formal ethical approval was not required for research conducted on these existing teaching specimens.

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YOUNG INVESTIGATOR

Comparative evaluation of fixatives for histological preservation of testis tissue from fresh-frozen human cadavers

Ellie Christina Yates, Caroline Margaret Allen.

Anatomy Facility, School of Medicine, Dentistry and Nursing, University of Glasgow, Glasgow, Scotland, UK

Fixation is the first step of histological tissue preparation which prevents decomposition of tissue. Poor fixation can lead to issues including morphological changes or poor antigen availability making it key for accurate histopathological analysis. There are many fixatives available for commercial use. 10% Neutral Buffered Formalin(NBF) is a well investigated and commonly used fixative known to cause tissue shrinkage. Variations such as Modified Davidson's(MDs) and Form-Acetic(FA) which include additions such as ethanol or acetic acid to mitigate the effects of tissue shrinkage are currently being investigated but there is a lack of research on human tissue. The purpose of this study was to compare NBF, MDs and FA by evaluating the impact on testicular tissue morphology and protein availability using human tissue from fresh-frozen cadavers(n=4). Morphological comparison was based on analysis of seminiferous tubule area following H&E staining and antigen availability using H-score of DAB staining intensity following immunohistochemistry using Smooth Muscle Actin. Analysis was performed on testis tissue sections from the middle and start of the paraffin blocks and the average taken to investigate overall effect. Due to high level of variation in the data, a robust mixed linear effects model was used, and significance was defined as $p<0.05$. There were significant differences in the seminiferous tubule area between NBF and MDs. These differences were also observed at the start of the block when comparing NBF to both MDs and FA. Additionally, significant differences were seen within the NBF block, when comparing the start and middle sections. Based on the data, FA or MDs is suggested for morphological analysis. No significant differences were found in H-Score data, however, the general trend suggested FA may be the best fixative for IHC. Current research in this area is limited, particularly in human tissue. Therefore, comparisons of different fixatives are essential to identify the best approach for research and clinical purposes. The cadaveric material used in this project was made available via the University of Glasgow body donation programme in line with the Anatomy Act (1984) and Human Tissue (Scotland) Act 2006. Permission for tissue use and micrograph imaging was granted.