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The Conrad Lewin Prize for the best presentation by a young Member was awarded to Mohammad Turki for the poster presentation "Langer's axillary arch, a rare variant, and prevalence among Caucasians: A case study".

ABDEL MEGUID EIMAN, AMY DORAN, AND MARK WORTHINGTON Centre of Biomedical Sciences Education, School of Medicine, Dentistry and Biomedical Sciences, Queen's University Belfast, United Kingdom. Royal Victoria Hospital Belfast, Belfast United Kingdom **Anatomical study of the arterial supply of the extrahepatic biliary system**

Anomalous extrahepatic arterial supply to the biliary system is frequently encountered by surgeons. This study aimed to identify the arterial anomalies of this region and their clinical implications. Twenty cadavers, 10 digital subtractions and a CT image were included in this research. Regarding the cadaveric cases, accessory left or right hepatic arteries were noted in 15% of the sample; a middle hepatic artery was noted in 10%; the cystic artery was either anterior or posterior to the cystic duct in 21 and 79%, respectively. Double cystic arteries were seen in 5%. Angiographic results demonstrated that in 22.2%, the left hepatic artery was replaced, and originated from the left gastric artery. In 11.1%, a replaced right hepatic artery originated from the superior mesenteric artery. In another 11.1% a replaced gastroduodenal artery arose from superior mesenteric artery. The cystic artery branched from the right hepatic artery in 88.8% of the angiographic images. However, it originated from the left hepatic artery in 11.1% of the images. The CT image demonstrated that a common hepatic artery abnormally originated from the aorta. In conclusion, there are wide arterial variations of the extra-hepatic biliary tree. These findings will help to minimize the likelihood of postoperative complications during hepatobiliary surgeries.

AKDEMIR AKTAS, HILAL, MINE FARIMAZ, SINEM SELVI, ILKAN TATAR, AND MUSTAFA FEVZI SARGON Department of Anatomy, Faculty of Medicine, Hacettepe University, Ankara, Turkey **Demonstration of the clinically important structures in orbital dissection of fresh frozen specimens**

The orbits are complex structures containing eyelids, extraocular muscles, nerves, vessels, orbital fasciae, and fat. The aim of this study was to reinforce the clinical importance of the orbit by fresh-frozen cadaver dissections. In the study, three adult hemisectioned heads were used. Dissections were done under 3× to 40× magnification. The orbital roof was removed and the periorbita was dissected. The course of the frontal nerve and its supratrochlear and supraorbital branches was observed above the levator palpebrae muscle. The lacrimal nerve coursed above the lateral rectus muscle with the lacrimal artery. The lacrimal gland was found toward the distal part of the lacrimal nerve. The trochlear nerve crossed medially above the levator muscle to reach the superior oblique. In the next step, levator palpebrae was separated from superior rectus. Under levator palpebrae and superior rectus muscles, the superior division of the oculomotor nerve was found. There was a fibrous septum extending along the lower border of superior rectus. To expose the optic nerve, the fibrous septum was opened and orbital fat removed. Secondly, ethmoidal air cells were removed in the medial wall of the orbit; the optic nerve, eyeball, and inferior division of oculomotor nerve were then observed. These structures found within the orbit create a complicated field, requiring considerable care to avoid damaging structures.

AKDEMIR AKTAS, HILAL, SINEM SELVI, MINE FARIMAZ, AND MUSTAFA FEVZI SARGON Department of Anatomy, Faculty of Medicine, Hacettepe University, Ankara, Turkey **An anatomical study of the bicipital aponeurosis in embalmed and fresh frozen cadavers**

The bicipital aponeurosis is important for the protection of the median nerve and brachial artery. In this study, the bicipital aponeurosis of two fresh-frozen and seven embalmed cadaveric upper extremities were examined, both for the course and morphometry of this clinically important anatomical structure. The age of the cadavers varied between 60 and 86 years. Three different morphological types of bicipital aponeurosis were observed. In type I, the bicipital aponeurosis was found to be fusiform in shape (observed in three of the upper extremities). In five of the upper extremities, it was found to be quadrangular in shape and classified as type II. In one of the upper extremities, it was membranous in structure and it was difficult to separate it from the antebrachial fascia; it was named as type III. Type III was not sufficient for the protection of brachial artery and median nerve. Additionally, the morphometric measurements of the bicipital aponeurosis were performed in every upper extremity. In conclusion, the morphometry and shape of the bicipital aponeurosis has a clinical importance for the protection of median nerve and brachial artery. In some cases, it was found to be insufficient for this protective function.

HELEN L ANSCOMB College of Medicine and Dentistry, James Cook University, Townsville, Australia **Approaches to improve student academic success in a mixed year 1 anatomy and physiology subject**

In a first-year allied health subject (anatomy and physiology) academic results have varied over the last 3 years (2012–2014), with approximately 20% of students failing to pass the year. The cohort is mixed, with students studying physiotherapy, occupational therapy and sport and exercise science all attending the same lecture/practical schedule. However, the requirements for each discipline vary and there is a large variation in the academic preparedness of students in each discipline to study these subjects (i.e., passing year 12 biology). In 2015, blended learning study materials (digital content) for human anatomy were made available, to allow students (n = 279) to control the time, place and pace of their learning in this area of study. This resulted in a significant increase in students passing the human anatomy exam, when compared to 2014 data. In a parallel study, human physiology content was presented in a "flipped classroom" format. This resulted in increased student performance in on-course assessment. However, no significant difference in exam performance was recorded from 2014. This study highlights the need to provide highly scaffolded, supported and interactive learning content for mixed year 1 cohorts in order to improve student performance.

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HELEN L. ANSCOMB College of Medicine and Dentistry, James Cook University, Townsville, Australia **Can teaching delivery mode lead to ongoing changes in student performance within human anatomy?**

In a 6-year MBBS course, students can undertake optional "selective" study in human anatomy during year 3. This subject is an advanced regional and applied study of human anatomy taught through cadaveric dissection. Recently, the offering of this subject has changed from a traditional semester offering (internal study, 13 weeks, 5 h per week) to an intensive "block mode" offering, where students engage in ~60 h of dissection over 2 weeks, outside of semester. No change in student assessment has occurred, only the timeframe of teaching and assessment activities. The block mode study option for this subject has led to a significant increase in student performance within the subject (38% attained HD grade), whilst no significant change in student demographics has been identified (i.e., student GPA, prior study). Preliminary investigations (n = 27) into the change in student performance has demonstrated continued improved performance (using anatomy assessment tasks aligned to the dissection subject) 6 months after finishing study, when compared to a control group (n = 25). Students were also surveyed to determine their reflections and perceptions of the subject. Students reported that the combination of mode of delivery and teaching method allowed a deeper study of the subject and greater achievement.

JONATHAN BARTLETT AND JOHN LAWRENCE Department of Anatomy, University of Cambridge, Cambridge, United Kingdom **The course of the lateral femoral cutaneous nerve and its implication for supine hip arthroscopy**

The lateral femoral cutaneous nerve (LFCN) is the main neurovascular structure at risk during placement of the anterior portal (AP) in supine hip arthroscopy (SHA). In this cadaveric study, we aimed to quantify this risk by examining the course of the nerve and its branches in the lower limb. Forty-five hemipelves from 39 cadavers were dissected. The LFCN was identified proximal to the inguinal ligament (IL), and its path in the thigh identified. The position of the nerve and its branches in relation to the site of AP placement were measured using Vernier callipers. The AP intersected with the path of the nerve on 38% of occasions. The nerve took an oblique path, and when found not to intersect with the AP portal, was located 5.7 ± 4.5 mm from the portal's edge. We observed a reduction in risk if the portal was moved medially or laterally by 15 mm from its current location. The LFCN is at high risk during SHA and our study emphasises the need for careful dissection during this procedure. We suggest that relocation of the AP 15 mm more laterally or medially will reduce the risk posed to the LFCN.

FAYE BENNETT, DAVID ROBERTS, AND TRUDIE ROBERTS Leeds Institute of Medical Education, School of Medicine, University of Leeds, Leeds, United Kingdom **Do medical students want to know more about the lives of body donors? A pilot study**

In the United Kingdom, body donors commonly remain anonymous to medical students, with little, or no information about an individual shared. Providing more information has numerous potential benefits, but it is unclear whether it would be welcomed by students. To determine whether medical students would like to learn more about those who donate their bodies to medical education, three focus groups were carried out with a total of 15 medical students. First years (n = 6), second years (n = 4) and intercalating students studying for a BSc in Clinical Anatomy (n = 5), took part in this study. Each focus group lasted approximately 60 min. All sessions were audio recorded, transcribed and subjected to thematic analysis. Overall, students expressed a wish to know more about the lives of body donors. The nature of the information students wished to receive was influenced by their prior experience of dissection. Students with more experience (intercalating students) focused on medical history, whereas students relatively new to dissection (first years) were interested to learn more about donors as people. In conclusion, medical students want to receive personal information about body donors. Providing students with detailed donor information could facilitate development of key humanistic values, such as empathy, compassion, and respect.

SEAN J. BOTHAM,[1,2] THOMAS S. GRANT,[1,2] HARVEY DAVIES,[1,2] CHARLES HUTCHINSON[1,2], AND RICHARD TUNSTALL[1,2] [1]Warwick Medical School, the University of Warwick, Coventry, United Kingdom; [2]University Hospitals Coventry and Warwickshire, Coventry, United Kingdom **Age-related changes in pelvic and inguinal region anatomy from 0 TO 18 years**

This is the first study assessing changes in inguinal region anatomy from 0 to 18 years, which is essential in paediatric urological and abdominal surgery. Anonymised contrast-enhanced CT DICOM datasets of 115 patients (0–18 years, 72 male, 43 female, at least 4 in each age group) had left and right sides analysed in triplicate using Osirix MD. The positions of inguinal region structures and inguinal ligament length were assessed relative to bony landmarks. Positions of the deep inguinal ring and femoral vasculature are represented as a % distance along the inguinal ligament, starting at the ASIS. From 0 to 18 years, the pelvis grew by 114 ± 1% (5.1 cm) vertically and 86 ± 2% (10.7 cm) transversely, and the inguinal ligament grew by 234% (from 4.7 to 15.6 cm). With increasing age, the medial border of the deep inguinal ring moved laterally, with respect to the inguinal ligament, toward its midpoint, whereas the femoral artery and vein both moved medially from a starting position of the midpoint of the inguinal ligament. No left-right side differences were observed. From 0 to 18 years of age the soft tissue anatomy of the inguinal region changes in position as the bony frame of the pelvis grows around it.

DIMITRIS CHALLOUMAS, FIDEL PEAT, AND CECILIA BRASSETT The Human Anatomy Teaching Group, Department of Physiology, Development and Neuroscience, University of Cambridge, Cambridge, United Kingdom **Discrepancies in descriptions of dermatomal distribution in the shoulder and upper back**

A good knowledge of dermatomes is key to accurate localisation of nerve lesions. However, descriptions of dermatomal distribution in the shoulder and upper back vary considerably. In this study, dermatome maps in 30 anatomy textbooks and 18 medical websites were reviewed to elucidate the extent of such discrepancies. The "regimental badge" area on the superolateral aspect of the arm is clinically significant, as sensory loss in shoulder dislocation is indicative of axillary nerve injury. In 28/48 (58%) diagrams, this was shown to be supplied by C5, whilst C4, C6, and C7 were indicated in 3, 12, and 5 diagrams respectively. However, the accepted root values of the axillary nerve comprise only C5 and C6. A similar lack of clarity exists in the depiction of upper back dermatomes, which were described in only 41/48 (85%) sources. Among several variations, the cutaneous distribution of the posterior primary rami of C5–T1 was drawn as narrow transverse bands in 15 (37%) diagrams; and in 13 (32%) maps, the dermatome for C4 adjoined that of T2, with no intervening dermatomes. While confirming the ambiguity surrounding dermatomes of the shoulder and upper back, this study highlights the need for further investigations to achieve more specific delineation.

LAUREN CLUNIE, NEIL P. MORRIS, AND JAMES D. PICKERING Division of Anatomy, Leeds Institute of Medical Education, School of Medicine, University of Leeds, Leeds, United Kingdom **Evaluation of technology-enhanced learning resources in anatomy education: Are we doing enough?**

An increasing number of educators are utilising a variety of technology enhanced learning (TEL) resources to supplement traditional

anatomical teaching methods, including videos, eBooks and virtual models. Although an increase in availability and integration of TEL resources into blended learning curricula has been observed, there remains a paucity of meaningful evaluation to measure their efficacy. In addition, the lack of a suitable evaluation framework has resulted in a disparity between the types of investigation being carried out within medical education. This systematic review assesses published data on anatomical education using TEL resources against a recently proposed evaluation framework. This 4-level framework intends to support investigators to move away from superficial discussions about student perceptions, toward an evaluation of learner gain, and cost benefit. A total of 129 papers met the inclusion criteria, with the majority (106) basing all or part of their evaluation on student satisfaction surveys. Half (65) achieved more than one level of evaluation in accordance with the framework and none reported all four levels of evaluation. This systematic review reflects the current level of evaluation of TEL resources in anatomy education and hopes to stimulate a discussion on the meaningful impact of TEL resources in anatomical education.

SARA CORDONI,[1] ANGUS MACDONALD[2], JOHN SHAW-DUNN[1], AND STUART MCDONALD[1] [1]School of Life Sciences, University of Glasgow, Glasgow, UK; [2]Monklands Hospital, Airdrie, United Kingdom **Wall thickness and peritoneal cover in the large intestine: Their relevance in colonoscopy**

Colonoscopy carries a risk of perforation of the colon, especially when biopsies are taken. We reasoned that perforations into the peritoneal cavity with consequent peritonitis are most likely where the cover of extraperitoneal fat is least and the wall thinnest. To find these regions, we took, with appropriate consent, six different transverse sections of the large intestine from three embalmed cadavers. On each section, we used AxioVision digital software to measure the surface exposed to peritoneum and the minimum wall thickness. The mean values showed great variation. For example, on a transverse section of the sigmoid colon 71.7 ± 14.4% of the circumference might be covered by peritoneum, and the minimum wall thickness might be 0.8 ± 0.4 mm, but if the individual measurements were plotted on an outline of the colon 9 of the 10 regions most exposed to peritoneum and 11 out of the 17 with thinnest walls were in the rectum, sigmoid colon, ascending colon, and cecum. These are known as common areas for perforation and, because the cover of extraperitoneal fat is low and the walls thin, the risk of peritonitis is also high.

MINE FARIMAZ, SINEM SELVI, HILAL AKDEMIR AKTAS, AND MUSTAFA FEVZI SARGON Department of Anatomy, Faculty of Medicine, Hacettepe University, Ankara, Turkey **Comparison of the expectations of medical faculty and health sciences students in anatomy education**

Anatomy education is a matter for debate. Methods developed in recent years have made these discussions popular. In this study, expectations of medical students were compared with health sciences (HS) students. The study was performed in 302 medical faculty and 139 HS students. Questions were grouped into better education with visual materials, conditions of rooms, lecture and practical hours, number of cadavers and models, clinical importance of subjects, contents of lectures, learning anatomy without memorizing, and rotation of lecturers. Twenty percent of medical and 1.5% of HS students wished to have more visual materials; 45% of medical and 29.5% of HS students preferred education in lecture halls with fewer numbers; 10% of medical and 16% of HS students wanted more lecture hours; 62% of medical and 51.5% of HS students mentioned their need for more cadavers and models. Additionally, a few students in both groups wanted to attend lectures with more clinical contents, wished to obtain more benefits from lectures, and preferred to learn anatomy without memorizing. Of the two groups, a higher number of medical students wished to have better learning conditions, increased number of cadavers and effective models. However, a higher number of HS students wished to minimize memorizing and increase clinical anatomy knowledge.

MINE FARIMAZ,[1] HILAL AKDEMIR AKTAS,[1] SINEM SELVI,[1] AYCA AKGOZ,[2] AND MUSTAFA FEVZI SARGON[1] [1]Department of Anatomy, Faculty of Medicine, Hacettepe University, Ankara, Turkey; [2]Department of Radiology, Faculty of Medicine, Hacettepe University, Ankara, Turkey **An anatomic study of the angulations of internal carotid artery in CT angiographies**

The internal carotid artery is divided into cervical, petrous, cavernous, and cerebral parts. In this study, angulations formed between petrous–cavernous parts and cavernous–cerebral parts of the internal carotid artery were examined bilaterally in mid-sagittal reformatted CT angiographies of 60 anatomically normal patients (31 males, 29 females). Mean value of angulation between petrous and cavernous parts on the left side was 101.18 ± 19.77 mm in females, and 99.63 ± 22.7 mm in males. On the right side, it was 103.45 ± 21.75 mm in females and 99.99 ± 22.19 mm in males. Mean value of angulation between cavernous and cerebral parts was 75.07 ± 12.79 mm in females, and 68.94 ± 13.55 mm in males on the left side. On the right side, it was 79.41 ± 20.56 mm in females and 70.21 ± 15.71 mm in males. No statistically significant differences were observed in between angulations and sex in petrous–cavernous parts and cavernous–cerebral parts of the artery. Additionally, there were no statistically significant differences between angulations of right and left sides. Results obtained in this study will have an importance in surgery of internal carotid artery and its branches. Additionally, during the planning of surgical interventions, these results will help the surgeons have a better understanding of vessel morphology.

FERRO ASHLEY, SHADI BASYUNI, CECILIA BRASSETT, AND VIJAY SANTHANAM Human Anatomy Teaching Group, Anatomy Building, Department of Physiology, Development and Neuroscience, University of Cambridge, Downing Street, Cambridge, United Kingdom **Determination of reliable reference points to prevent zygomaticofacial neurovascular damage in procedures of the zygoma**

Maxillofacial procedures for trauma, deformity and cosmesis commonly require dissection onto the facial aspect of the zygoma. These procedures carry a risk of injury to the neurovascular structures exiting the zygomaticofacial foramen (ZFF). The aim of this study was to determine a "ZFF zone" to enable accurate identification of the ZFF both pre- and perioperatively. Measurements were made on 429 dry skulls, i.e., 858 zygomas. A crossline laser was superimposed on each zygoma to create consistent landmarks for precise mapping of the ZFF. The number of ZFF on each zygoma was also documented. Results showed that the number of ZFF per zygoma ranged from 0 to 4, with a single foramen being the commonest finding (49.8%). With regard to location, 81% of all ZFF on the left, and 83% on the right zygoma were found within a circular "ZFF zone" of 15 mm diameter. In clinical practice, surface landmarks can then be used to allow the surgeon to identify this zone in preoperative planning. In conclusion, this study proposes a novel method to delineate a "ZFF zone" which will be instrumental in preventing injury to the ZFF neurovasculature during zygomatic procedures and in locating the ZFF for nerve blocks.

FURNESS, HUGH, GEORGE MILLER, OLIVER PUTT, AND THOMAS LEWIS St George's University of London, London, United Kingdom **Publication fate of abstracts presented at the American Association of Clinical Anatomists (AACA) annual meetings (2003–2010)**

A recent study examined the rate of full-length research article publication following abstract presentation at the British Association of Clinical Anatomists (BACA) annual meetings. The accepted standard

for dissemination of research is peer-reviewed publication following presentation at a national meeting. The primary objective of this study was quantitative assessment of the abstracts presented at the American Association of Clinical Anatomists (AACA) annual meetings with regards to the rate of subsequent full-length publication, and comparison to BACA. All abstracts presented at the AACA annual meetings between 2003 and 2010 were analysed. MEDLINE was searched to identify peer-reviewed publications arising from each presented abstract. In total, 1120 abstracts were presented with 22.9% (n = 257) subsequently published as full-length research papers. The median time to publication was 16 months. It was noted that 11.3% (n = 29) of abstracts were published ahead of presentation at AACA. This study showed the publication rate of abstracts presented at AACA (22.9%) is similar to BACA (20.6%). These rates are lower but comparable to surgical specialty meetings. Further work should try identify any concerning reasons for the reduced rate of abstract publication in anatomy research.

JONATHAN GABRIEL, TITUS MURPHY, JAMES BRITTAIN, MICHAEL REID, JAMIE KRISHNAN, AND CLAIRE SMITH Brighton and Sussex Medical School, Brighton, United Kingdom **Hyperostosis frontalis interna: An underappreciated phenomenon?**

Eighteen cadaveric specimens were dissected at Brighton and Sussex Medical School in 2016 with three skulls out of eighteen found to have morphology consistent with hyperostosis frontalis interna (HFI). HFI is a benign, excessive growth or thickening of cancellous bone on the deep surface of the frontal bone of the skull. Estimates of the prevalence of HFI in the general population range from 5 to 12%, however it is believed to be significantly more common in post-menopausal females (due to an association with prolonged oestrogen exposure), with the prevalence rising to between 16 and 84% in women over the age of sixty. HFI is usually detected incidentally on CT or at autopsy. While HFI is frequently under-reported and has been believed to be of little clinical significance, associations with clinically significant pathology such as Morgagni–Stewart–Morel Syndrome have been suggested. Even in the absence of clinical sequelae it remains important to appreciate the presence of HFI radiologically, in order that it can be differentiated from other significant pathology such as hyperostosis secondary to malignancy, fibrous dysplasia and Paget's disease. Our recommendation is improved record-keeping and teaching in order to increase awareness of this poorly understood phenomenon.

FERHAT GENECİ,[1] MERT OCAK,[1] MUHAMMET BORA UZUNER,[1] İLKE MANOLYA ÖZDEMİR,[2] SENA GÖRMAN,[2] AND HAKAN HAMDI ÇELIK[1] [1]Department of Anatomy, Faculty of Medicine, Hacettepe University, Ankara, Turkey; [2]Faculty of Dentistry, Hacettepe University, Ankara, Turkey **The evaluation of the effects on tooth enamel of the solutions that are used to store tooth samples, by using micro CT**

In this study, the effect of physiological saline, thymol, and formaldehyde solutions, which are some of the chemicals that are used to conserve tooth samples, on tooth enamel was evaluated with micro-CT. The enamel layer is composed of 95% hydroxyapatite crystals, 4% organic components and 1% water. Only a few chemical solutions have an effect on the enamel layer, due to its structural features. The tooth samples were scanned with micro CT before and after they were immersed in formaldehyde (5%), thymol (0.2%), and NaCl (0.9%) for a week. The tissue volume, bone volume and percentage bone volume data were collected from CTAn program and images with 24 micrometre resolution, taken from micro CT, were evaluated. It was found that none of these three solutions made any change to the enamel layer, while some symptoms of rotting and putrefaction appeared on the organic components of the samples that were kept in NaCl (0.9%) solution.

DANIEL HAY, MICHAEL MICHAEL, STEPHANIE COZENS, AND ALISTAIR HUNTER Department of Anatomy, Kings College London Medical School, London, United Kingdom **An unusual right hepatic and cystic artery: A case report**

Routine dissection was carried out on a 78-year-old female cadaver. During examination of the vessels originating from the coeliac trunk, a fourth vessel was noted that ran parallel with the common hepatic artery. At a position proximal to the common hepatic duct, the vessel passed posterior to the left hepatic artery, before passing into the substance of the liver. Prior to entering the liver, it gave off the cystic artery. The anomalous vessel was thought to be the right hepatic artery with an abnormal origin, as the proper hepatic artery did not bifurcate and we believe this is a previously unreported variation in the hepatic/biliary vasculature. The arterial anatomy of the gall bladder and liver is a topic of considerable importance as cholecystectomy is a very commonly performed procedure. It is vital that surgeons are aware of the potential variants, to avoid damaging or removing the incorrect vessel. Interestingly, the cystic artery maintained its position within Calot's triangle, highlighting the importance of this anatomical landmark. This study shows that in addition to common variants, other vascular arrangements exist, and surgeons must be particularly careful when operating in this highly variable region

SOPHIE HOWLES, SAJJAD ATHAR, AND NEIL ASHWOOD Queen's Hospital Burton, Burton on Trent, United Kingdom **Case report: An inverted palmaris longus accessory muscle**

The palmaris longus muscle arises from the medial epicondyle of the humerus and inserts into the palmar fascia. It usually consists of a short muscle proximally and a long tendon distally, although in some cases this arrangement is inverted. The palmaris longus may also be entirely muscular, duplicated, digastric, or absent altogether. We present the case of a 40-year-old man initially presenting with a swelling in his left wrist. Ultrasound (and subsequent MRI) confirmed the presence of an inverted, accessory palmaris longus muscle. An accessory palmaris longus is an extremely rare variant, arising from the subcutaneous fascia of the forearm and inserting into the superficial palmar aponeurosis. There are reports of this variation causing pain and median nerve compression, and symptomatic cases have been successfully treated with surgical excision of the accessory structure. In this case the accessory structure was noted to be inverted, with the muscular section distal to the long tendon. Whilst there have been reports of accessory palmaris longus muscles causing pain and symptoms of nerve compression, they are generally benign structures, and in some cases may have a function in any future tendon grafting/transfer surgery.

SOPHIE HOWLES, SAMANTHA MCBRIDE, CHRISTOS KITSIS, AND NARESH CHACHLANI Queen's Hospital, Burton upon Trent, United Kingdom **Case report: Osteoma of a sesamoid bone as a rare cause of hand pain**

Sesamoid bones are usually ovoid shaped bones found within tendons on palmar and plantar articular surfaces, where tendons run in close proximity to joints. They are variable in size, shape and location, but in the hand they are most commonly found at the metacarpophalangeal joint of the thumb, interphalangeal joint of the thumb and the metacarpophalangeal joints of the index and little fingers. A 72-year-old gentleman presented with a painful lump in his right hand over the palmar aspect of his 5th metacarpophalangeal joint. The pain had become so severe that it impaired his grip strength causing functional difficulties. X-ray imaging demonstrated the presence of a sesamoid bone, which was excised under local anaesthetic and sent for histology. Macroscopically, the excised lump resembled a mixture of fatty and nodular bony tissue. Microscopically, it showed dense lamellar bone surrounded by collagenized fibrovascular stroma, with morphologic features suggestive of an ivory osteoma. The patient ultimately recovered well from surgery, and to date has had no further

symptoms or functional impairment. Osteoma of a sesamoid bone is a rare cause of hand pain. In this case excision proved to be successful in relieving the pain and improving function

RACHEL HUNTER AND INGRID GOULDSBOROUGH Faculty of Biology, Medicine and Health, University of Manchester, Manchester, United Kingdom **Anatomical variation in the branches of the axillary artery: A dissection study**

The axillary artery (AA), which is a continuation of the subclavian artery, supplies the anterolateral chest wall and shoulder girdle. It is divided into three parts by the overlying pectoralis minor muscle: the first part gives rise to the superior thoracic artery (STA); the second part gives rise to the thoracoacromial (TA) and the lateral thoracic (LTA) arteries; and the third part gives rise to the subscapular (SA), the posterior (PCHA) and the anterior (ACHA) circumflex humeral arteries. However, this arrangement is quite variable, and this study aimed to investigate these differences. Twenty-eight upper limbs were dissected and the AA was exposed. Diagrams of the AA and its branches were drawn and documented. Variations were seen in 23 specimens. These included small extra vessels branching off the AA (9 specimens); no branches arising from the second part of the AA (5 specimens); the TA arising from the first part of the AA (2 specimens); and the SA arising high in the second part of the AA (5 specimens). In 3 specimens, a bifurcation of the axillary artery within the axilla was observed. These findings could have surgical implications such as changing procedural technique when carrying out reconstruction of the chest wall.

KIM MATTHEW, LISLEY SALIMIN, NIMALAN SANMUGALINGAM, AND ARNE JUETTE Norfolk and Norwich University Hospital Foundation Trust Radiology Department, Norfolk and Norwich University Hospital, Norwich, United Kingdom **Adult nonrotation of intestinal tract: A case report**

Nonrotation of the midgut is a congenital condition when there is disruption in the normal embryological development of the bowel. The incidence is around 1 in 500, and is often an incidental finding in late childhood and adulthood. We report a case of an adult patient who presented with a 2-day history of left sided abdominal pain with no other associated symptoms. A computed tomography (CT) abdominal scan study demonstrated small intestinal loops located in the right side of the abdominal cavity with large intestinal loops in the left side. A thick walled appendix with fatty stranding was arising from the caecum that was located within the left abdominal cavity. Laparoscopic appendicectomy was performed, confirming a gangrenous appendix with pelvic collection. This case demonstrates a patient who presented with appendicitis who incidentally was discovered to have nonrotation of the midgut on CT scan.

THOMAS LLOYD, WEN PENG YONG, AND CECILIA BRASSETT Human Anatomy Teaching Group, Department of Physiology, Development and Neuroscience, University of Cambridge, Cambridge, United Kingdom **Comparative analysis of limb anatomy as depicted by da Vinci and Vesalius, with reference to a modern curriculum**

In recent years, there has been growing interest in the anatomical illustrations of Leonardo da Vinci and their relationship to those published by Andreas Vesalius, often known as the founder of modern human anatomy. In this study, drawings of the upper and lower limbs in Leonardo's *Anatomical Manuscripts* and Vesalius' *De Humani Corporis Fabrica* were examined. Comparison was made to current anatomical atlases and texts using a similarity index. A similarity percentage was calculated to give an overall percentage similarity score. The analysis was then presented according to the dissection sequence used in our anatomical curriculum. Results showed that the overall similarity percentages for Leonardo's *Anatomical Manuscript A* were 73 and 65% for upper and lower limbs respectively, compared to 86 and 93% in Vesalius' *Fabrica*. The greatest discrepancies between their works were found in deeper muscle layers and neurovascular structures. Despite previous suggestions that Leonardo's sketches depicted anatomical features more accurately, the current study would indicate that Vesalius' work on the limbs was more comprehensive and portrayed a greater detail of morphological anatomy. As many previous comparisons were qualitative in nature, analysis by similarity index is a useful tool that can also be applied to other body systems.

SAMANTHA MCBRIDE, SOPHIE HOWLES, AND NEIL ASHWOOD Queens Hospital, Belvedere Road, Burton-upon-Trent, United Kingdom **Case report of failure of transcondylar humeral fracture fixation resulting in pseudoarthrosis**

Fractures of the distal humerus account for 2% of fractures in adults, often due to a fall or direct blow to the back of the arm while the elbow is flexed. Surgical management may involve ORIF with K-wires and plates however stable fixation may be challenging. We present a case of fixation following transcondylar fracture of the distal humerus which failed after fixation breakage. There was dislocation and superior retraction of the radius and ulna with fragmentation of the compression plate and screws at the distal humerus. Fragments migrated as the joint remodeled into pseudoarthrosis with a cystic mass posterior to the joint containing fragments. K-wire breakage is a complication of ORIF procedure. In this case, further falls onto the affected arm may have exacerbated the failure. Despite the disorganised joint the patient remained pain free and retained some useful function of the arm for the duration of monitoring, which discouraged further surgical intervention. This is a case where joint fixation failed and rather than further surgical intervention, the joint was monitored over several years while the patient retained useful movement of the limb and was pain free. The joint reorganized after fragmentation of metalwork.

SAMANTHA MCBRIDE, SOPHIE HOWLES, AND NEIL ASHWOOD Queens Hospital, Belvedere Road, Burton-upon-Trent, United Kingdom **Case report: *Wii fit*-related Jones fracture**

Injuries caused while playing Nintendo Wii games have been described since this games console was released for sale in 2006. This report highlights a *Wii fit* variant involving the balance board, used to step on and off during aerobic exercise-related games. We present the case of a 50-year-old female who stepped awkwardly from the balance board, developing pain and swelling over the left forefoot and inability to weight-bear. Neurovascular status was intact. X-ray imaging revealed an undisplaced fracture of the proximal zone 2 of the fifth metatarsal—a Jones fracture. Jones fractures involve zone 2 of the fifth metatarsal bone, a watershed area for vascular supply, falling between the proximal metaphyseal arteries and distal nutrient artery. This gives potential for avascular necrosis and nonunion after fracture. In this case the fracture healed after four months in plaster. *Wii fit* injury involving the foot is discussed. A twisting injury to the foot when stepping from the platform resulted in a Jones-type fracture of the fifth metatarsal.

STUART W. MCDONALD,[1] JENNIFER MILLER,[2] AND JOHN WILLIAMS[3] [1]Laboratory of Human Anatomy, University of Glasgow, Glasgow, United Kingdom; [2]Forensic Science, Nottingham Trent University, Nottingham, United Kingdom; [3]Forensic Medicine and Science, University of Glasgow, Glasgow, United Kingdom **Skull fragments in a forensic case**

During investigation of a possible clandestine burial, skull fragments were found at the locus. They were soon identified as pieces of sheep

skull. This demonstration shows the fragments and the corresponding sites on reference sheep skulls. The main learning point for us was that the orbital margins of sheep are irregular, unlike the smooth margins of the human skull, and can easily be mistaken for sutures. Irregular orbital margins are also seen in cattle, deer and horses. It seems to be a feature of orbital margins that project from the general contour of the face. The case reinforced for us the care that is also needed when identifying individual skull bones of animals, as details of their anatomy and their relative contributions to the cranium vary considerably between species. For example in the sheep the frontal bone is extensive and the parietal bone relatively small. The midline frontal suture persists but the sagittal suture between the right and left parietal bones closes soon after birth. In addition, the lacrimal bone forms part of the sheep orbital margin and the anterior part of the palate on each side is formed by a premaxilla.

RICHARD MCLELLAN AND JOANNA MATTHAN Anatomy and Clinical Skills Department, Faculty of Medical Sciences, Newcastle University, Newcastle, United Kingdom **Pursuing a career in oral and maxillofacial surgery: A medical student's experience of head and neck cadaveric dissection**

Pursuing a career in oral and maxillofacial surgery (OMFS) requires dual qualification in dentistry and medicine. During the author's second degree (medicine), the opportunity arose to undertake a 6-week self-selected module in cadaveric dissection, a diminishing resource in both undergraduate and postgraduate education. Using a newly donated cadaver, a portfolio of head and neck dissection specimens was produced using conventional surgical equipment. All dissection was undertaken with a superficial to deep approach, ensuring greatest exposure to the intricate anatomical structures of the head and neck. Progress was regularly reviewed and documented with an annotated photographic journal. Specimens produced highlighted superficial muscles of the face and neck, the insertions of platysma, the parotid gland, branches of the facial nerve, and the superficial and deep neck; including the strap muscles, submandibular glands, carotid sheath and recurrent laryngeal nerve. Step-by-step photographic dissection guides were produced that will be used to teach future medicine and dentistry students the anatomy of the head and neck. Research has shown the positive benefit cadaveric dissection can have on the outcomes of surgical trainees. Undoubtedly, the opportunity to undertake hands-on cadaveric dissection and produce teaching-quality specimens will assist in pursuing a career in OMFS.

NICHOLAS MULCHAN,[1] PAUL AGUILERA,[1] FATIMA JAITEH,[1] CORBIN MAH,[1] AUDREY LAM,[1] JAMES COEY,[2] AND SARA SULAIMAN[3] [1]St. George's International School of Medicine Keith B. Taylor Global Scholars Program at Northumbria University, Newcastle upon Tyne, United Kingdom; [2]Department of Anatomy, St. George's International School of Medicine, Faculty of Health and Life Sciences, Northumbria University, Newcastle upon Tyne, United Kingdom; [3]Department of Applied Sciences, Faculty of Health and Life Sciences, Northumbria University, Newcastle upon Tyne, United Kingdom **Haemodynamic asymmetry of the common carotid arteries and hand proficiency: An ultrasound study**

Cerebral hemispheres are mainly supplied by the ipsilateral carotid arteries. The influence of arterial asymmetry on handedness development has been cited but remains unclear. A recently published study suggests that hand preference is related to common carotid (CC) arterial asymmetry. This study investigates the relationship between the haemodynamic characteristics of the CC arteries and hand preference/proficiency using Doppler ultrasonography. Fifty participants (26 male, 24 female; mean age 2 $\pm$ 4.7) completed Edinburgh Handedness Inventory and Target Speed and Accuracy Tests to quantify their hand preference/proficiency. Participants were subjected to 10 min of supine rest prior to commencing ultrasound assessment. The CC arteries were visualized using GE Logic e ultrasound system with a 12L-RS transducer. Peak-systolic velocities, end-diastolic velocities, and arterial cross sectional areas were measured. There was a significant difference in hand proficiency between body side and sexes in left-and right-handed participants (P value < 0.05). Hand preference/proficiency; however, was not influenced by the CC arteries peak-systolic velocities, end-diastolic velocities or cross sectional areas. No significant correlation between arterial flow and hand preference/proficiency was found. Further studies are needed to examine the lateral differences in the blood supply to the brain accounting for the effect of sample size, anatomical variations, and noncarotid sources of blood.

JANICE NIX, TARYN KALAMI, STUART CURRIE, JEREMY MACMULLEN-PRICE, IAN CRAVEN, AND DANIEL WARREN Leeds General Infirmary, Great George Street, Leeds, United Kingdom **The pterygopalatine fossa—An anatomical and pathological imaging review**

This educational poster demonstrates the anatomical detail of the pterygopalatine fossa, through a series of multiplanar and 3D reconstruction CT and MR images. The pterygopalatine fossa is a lipid-filled space that lies between the posterior wall of the maxillary sinus and the pterygoid process of the sphenoid bone. The maxillary division of the trigeminal nerve branches within it. Nerve branches exit via their respective foramina, which are clearly demonstrated on cross sectional CT and multi-planar reconstruction. The anatomy of the pterygopalatine fossa is complex, but detailed knowledge and careful radiological review is vital to identify pathology within this region. Knowledge of normal fat planes is key to radiological identification of pathology within many anatomical sites. This is clearly demonstrated in the pterygopalatine fossa, and is highlighted through images of normal anatomy and pathology. The poster includes advanced imaging techniques, such as inverted CT and fat saturation MR, that allow us to take advantage of the presence of fat. Case examples from our institution, including lymphoma, adenoid cystic tumour, nerve sheath tumour, meningioma, metastatic disease and fibrous dysphasia, are included to demonstrate key pathologies related to this site.

MERT OCAK, FERHAT GENECI, MUHAMMET BORA UZUNER, AND HAKAN HAMDI ÇELIK Department of Anatomy, Faculty of Medicine, Hacettepe University, Ankara, Turkey **Colorful three-dimensional reconstruction of micro-CT images of the primary teeth and permanent molar teeth**

In the last 50 years, there have been huge developments in the scanning methods used both in teaching and in recognizing diseases. The spatial resolution of computed tomography (CT) is 1–2 mm, i.e., 1–10 mm^3 voxel (three-dimensional pixel). Meanwhile, micro-tomography (micro-CT) enables a spatial resolution smaller than 10 μm (μm), which reaches down to 1×10^{-6} mm^3 voxel. In this research, after taking micro-CT views of the primary teeth and permanent molar teeth, we evaluated them in the sagittal, coronal and axial planes. The samples were scanned in micro-tomography (micro-CT) (Skyscan1174, Skyscan, Kontich, Belgium) at 800 microamperes (μA), 50 kilovolt (kV), and 15–21 μm pixel. The rotation step of the micro-CT was arranged as 0.7° and each of them was arranged to scan at 4000 ms exposure time and 180° rotation. The reconstruction of data that were gathered from the scanning was conducted via NRecon software. During reconstruction, the beam hardening correction was adjusted at 20%, ring artefact reduction at 6% and images were processed with the CTvox and Dataviewer software. Colorful three dimensional images were digitally obtained. It is thought that these images will be useful both in anatomical and dental research, as well as in teaching.

JAMES PARKER AND DAVE ROBERTS Faculty of Medicine and Health, University of Leeds, Leeds, United Kingdom **The subclavian–axillary arterial tree (in relation to rotator cuff perfusion and reconstructive perforator flap formation)**

The aims of this study were to review the typical anatomy of the subclavian–axillary arterial tree, discuss variations and its purpose as a nutrient vessel to the plexus of the skin, thereby understanding the formation of perforator flaps and investigating their nomenclature and classification. A male and a female cadaver were dissected displaying the subclavian–axillary branching pattern and its relationship to surrounding structures. The dissections were photographed and studied to assess any variability in branching patterns. A review of previous studies showed common variable branching patterns. The history of the perforator flap was analysed to provide an insight into its development. Literature detailing variations of the subclavian–axillary arterial tree highlighted both common and rare variations. Perforator flap classification and nomenclature received input from many authors. The 'Gent' consensus was held, in an attempt to standardise terminology, a series of definitions was produced to aid this. Standardising both anatomical vasculature and perforator flap nomenclature will improve communication between surgeons and consequently develop surgical understanding, and help to avoid difficulties in inter-study comparisons.

EDGARDO PICARDI,[1,2] ENRICO EDOARDO,[1] VERONICA MACCHI,[1] ANDREA PORZIONATO,[1] VINCENZO FICARRA,[2] AND RAFFAELE DE CARO[1] [1]Institute of Human Anatomy, University of Padova, Padova, Italy; [2]Urologic Unit, University of Udine, Udine, Italy **Brödel's line: An anatomo-radiological study of the kidney's avascular plane**

The division of the renal artery into anterior and posterior branches implies the existence of an avascular plane: Brödel's line. This longitudinal zone is described along the convex renal border or just posterior to the lateral aspect of the kidney. The aim of this study was to describe the extension of Brödel's line with reference to the renal segments. Twelve kidneys were injected with acrylic resin to obtain vascular corrosions casts that were analyzed with computed tomography. We observed the presence of a relative avascular plane in all vascular casts, located on the posterior surface, ascribable to the Brödel's line. In 33% of cases the line extended from the apical to the inferior segments, in 33% of cases it extended from the superior to the inferior, and in 33% of cases it was limited to the superior and middle segments. Since Brödel's line corresponds with the plane of the anterior surface of the posterior hilar calyces, knowledge of its extension is relevant from the surgical point of view: this area permits a relatively safe access route to the pelvicalyceal system for nephrostomy insertion, and incision within this plane results in significantly less blood loss than outside this plane.

MARCUS RAULT AND TOM MARSHALL Norfolk and Norwich University Hospital, Norwich, United Kingdom **Bilateral synostosis of capitate and trapezoid, a rare case in a 47-year-old female**

Synostosis of the carpal bones is the rare occurrence of fusion of two adjacent carpal bones. This may be congenital as part of a genetic syndrome (such as Ellis–van Creveld Syndrome), a sporadic idiopathic case or acquired secondary to an inflammatory, neoplastic or traumatic process. Bilateral hand radiographs were taken of a 47-year-old woman's hands from the rheumatology clinic. Clinical information: 'known myeloma, generalised joint pain' (bilateral foot and left knee and patella radiographs were also obtained contemporaneously and were normal). A symmetrical appearance of complete bone fusion of the capitate and trapezoid was seen bilaterally with no other abnormalities. In this case it's unlikely that the patient's more generalised joint pain is related to the synostosis, particularly as the appearances suggest the fusion has been present for a very long time. Symptoms of synostosis are more typically to do with movement limitation or are positional. Although it is possible to have fusion of any two adjacent ossification centres in the wrist, it is most commonly lunate-triquetral with capitate-hamate (particularly in Apert syndrome), trapezium-trapezoid, scaphoid-trapezium, and scaphoid-lunate also occurring more frequently. There have only ever been a few cases of capitate-trapezoid synostosis recorded.

JOSEPH ROTHSTEIN,[1] CONNOR SMITH,[1] ERENE ABDELMESEEH,[1] MICHAEL SALVIAN,[1] ARJUN PALIWAL,[1] LAUREN PARR,[1] JAMES COEY,[2] AND SARA SULAIMAN[3] [1]St. George's International School of Medicine Keith B. Taylor Global Scholars Program at Northumbria University, Newcastle upon Tyne, United Kingdom; [2]Department of Anatomy, St. George's International School of Medicine, Faculty of Health and Life Sciences, Northumbria University, Newcastle upon Tyne, United Kingdom; [3]Department of Applied Sciences, Faculty of Health and Life Sciences, Northumbria University, Newcastle upon Tyne, United Kingdom **Ultrasonographic investigation of ulnar nerve cross-sectional area in musicians and non-musicians**

Ultrasonographic assessment of the ulnar nerve (UN) is used to diagnose various UN entrapment neuropathies, however, there is a lack of consistency in the techniques described in the literature. Prolonged repetitive use of the upper limb, such as in playing music, has been associated with an enlarged UN. This study aims to (i) identify the effect of elbow position on ultrasonographic measurements of the UN; and (ii) evaluate the cross-sectional area (CSA) of the UN in musicians and nonmusicians. Ulnar nerve CSA was measured bilaterally at the level of the medial epicondyle using a GE LOGIQ e system with a 12L-RS transducer, in 32 musicians and 35 nonmusicians (mean age: 24.20 $\pm$ 6.9 years). Measurements were taken following two established techniques with different elbow positions (fully extended; 90° flexed). There was no significant effect of the elbow position on the measurements of the CSA of the UN. No significant difference was found between musicians and non-musicians; however, body mass index and sex were shown to affect the CSA measurements of the UN ($P < 0.05$). Our study supports the validity of two distinct techniques for visualizing the UN using ultrasonography. Future studies are needed to investigate obesity as a risk factor for UN neuropathy.

HANNAH RUSSELL King's College London, London, United Kingdom **Case report and review: Irreducible hiatus hernia**

The author considers a case of irreducible hiatus hernia in a ninety-two year old male cadaver. Hiatus hernia is a common finding with a range of potential clinical sequelae. Many patients report no symptoms; others may suffer with the consequences of lower oesophageal sphincter and peristaltic incompetence or gastrointestinal obstruction should the hernial sac become incarcerated. The individual in question reportedly died from pneumonia. An increased risk of aspiration pneumonia is observed in patients with hiatus hernia. No causal link is explored here. At dissection, there was no evidence of surgical intervention. The pyloric antrum and a short length of stomach body were observed inferior to the diaphragm; approximately 2/3 of the gastric sac lay in the thoracic cavity alongside a shortened oesophagus. This herniation was irreducible. All major vessel groups relating to the supradiaphragmatic stomach (left gastric, left gastroepiploic, and short gastric) were markedly distorted with apparent constriction on passing through the oesophageal hiatus and increased longitudinal tension most notable in the left gastric vessels. Vessel lengths were taken for histological examination; mural hemosiderin an assumed marker of vascular injury in life. The case raises interesting points of anatomical variation and potential clinical sequelae of hiatus hernia.

MARELIZE SCHOEMAN, ALBERT VAN SCHOOR, AND PEET DU TOIT Department of Anatomy, School of Medicine, Faculty of Health Science, University of Pretoria, Pretoria, South Africa **The creation of an arterial anatomy reference data set for a South African population**

Arterial pathology contributes to cardiovascular diseases and mortality. During the process of ageing, the structural and functional properties of arteries are altered. The arterial lumen increases with age and thus the arterial diameter could be used as an indicator for the overall ageing process. Researchers have also reported sexual dimorphism in arterial dimensions for several arteries. The aim of this study was to evaluate the influence of different demographic variables on variations in arterial anatomy in a South African population. Arteries were measured at 19 different sites on 190 cadavers and reference data sets were compiled regarding these variations. As expected, females had smaller arteries than males. The coronary arteries also showed a statistically significant difference between left and right, with the left coronary artery being larger than the right. It was also found that arterial size increased with increases in body size and age, which could have serious clinical consequences. Data on normal dimensions for this population is scarce, but essential when evaluating arterial pathology. Knowledge of the normal dimensions at specific arterial sites could therefore contribute to early diagnosis and intervention for a variety of cardiovascular conditions.

ADAM SCIACCA AND BIPASHA CHOUDHURY Faculty of Life Sciences, University of Manchester, Manchester, United Kingdom **Entrapment of the sural nerve in the medial head of the gastrocnemius**

The sural nerve (SN) is a sensory nerve of the posterolateral leg, foot, and fifth toe. Pathology of the SN has been previously documented and there are many different causes, including: increased calf muscle mass, local scar tissue, and external pressure. The aim of this cadaveric study was to establish the most common formation of the SN, which is frequently described as the union of the medial sural cutaneous nerve and the peroneal communicating branch of the common peroneal nerve, and to document any anatomical variations encountered. In 28% of the 18 cadavers used in the study (n = 5) the MSCN pierced the medial head of the gastrocnemius muscle. The nerve entered the muscle and was encased in muscle fibres before exiting the distal end of the muscle. In the remaining 72% of cadavers, the MSCN coursed superficially to the medial head of the gastrocnemius. The high proportion of cadavers found with this variation in which the SN passed through the gastrocnemius may explain the paraesthesia experienced by some athletes who complain of calf pain. Although the condition is considered uncommon, they may be suffering from SN entrapment.

ADAM SCIACCA AND BIPASHA CHOUDHURY Faculty of Life Sciences, University of Manchester, Manchester, United Kingdom **Trifurcation of the sciatic nerve: A case study**

The sciatic nerve arises from the sacral plexus and travels distally in the posterior thigh before bifurcating into the tibial and common peroneal nerve at the superior angle of the popliteal fossa. Having a sound knowledge of the sciatic nerve is important for many clinical procedures, for example, when performing a nerve block. The aim of this study was to investigate the level of bifurcation of the sciatic nerve in 18 cadavers. In 44% (n = 8) of the cadavers the sciatic nerve bifurcated in the gluteal or thigh region proximal to the superior angle of the popliteal fossa. In the remaining 54% of cadavers the sciatic nerve bifurcated at the superior angle of the popliteal fossa as expected. In one cadavers a trifurcation of the sciatic nerve was seen. The terminal end of the nerve divided into the tibial nerve, the common peroneal nerve and the peroneal communicating branch. The peroneal communicating branch normally arises from the common peroneal nerve. The peroneal communicating branch coursed distally in the posterior leg and united with the medial sural cutaneous nerve to form the sural nerve. Trifurcations of the sciatic nerve are considered rare and may have important clinical consequences.

SINEM SELVI,[1] HILAL AKDEMIR AKTAS,[1] MINE FARIMAZ,[1] MUSTAFA FEVZI SARGON,[1] AND EMRE CAN CELEBIOGLU[2] [1]Department of Anatomy, Faculty of Medicine, Hacettepe University, Ankara, Turkey; [2]Section of Radiology, Karabük University, Karabük, Turkey **Morphometric analysis of anterior, middle, and posterior cerebral arteries in computed tomographic angiographies of anatomically normal patients**

The anterior and middle cerebral arteries are branches of the internal carotid, while the posterior cerebral artery is a branch of the basilar artery. The anterior and posterior cerebral arteries are important vessels in the formation of the circle of Willis. The aim of this study was to examine the morphometry of these vessels. In total, 60 computed tomographic angiographies (30 males and 30 females) were examined. Diameters of the vessels were compared according to side and sex. In males, the mean diameter of the posterior cerebral artery was 1.78 ± 0.07 mm on the right and 1.81 ± 0.14 mm on the left side. In females, it was 1.76 ± 0.10 mm on both sides. The mean diameter of the middle cerebral artery was 2.23 ± 0.12 mm on the right and 2.47 ± 0.18 mm on the left side in males. In females, it was 2.26 ± 0.09 mm on the right and 2.54 ± 0.12 mm on the left side. In males, the mean diameter of the anterior cerebral artery was 1.43 ± 0.08 mm on the right and 1.66 ± 0.12 mm on the left side. In females, it was 1.45 ± 0.06 mm on the right and 1.66 ± 0.08 mm on left side. In conclusion, knowledge of the morphometry of these vessels may have great importance for surgical procedures. An enlarged diameter of them must always be considered for the possible presence of dolichoectasia, aneurysm, and atherosclerosis.

SINEM SELVI, MINE FARIMAZ, HILAL AKDEMIR AKTAS, AND MUSTAFA FEVZI SARGON Department of Anatomy, Faculty of Medicine, Hacettepe University, Ankara, Turkey **Electron microscopic examination of fresh frozen cadaver samples: Analysis of tissue ultrastructure**

Electron microscopy is one of the most important methods used in the examination of the ultrastructure of biological tissues. In this study, different tissue samples of 10 fresh frozen cadaver head and neck specimens were examined ultrastructurally in order to determine the ultrastructural differences among tissues. The tissues taken from the fresh frozen head and necks were fixed in 2.5% glutaraldehyde, and routine transmission electron microscopic tissue preparation technique was performed to all of the tissues. The transmission electron microscopic examination of peripheral nerves and brain samples showed serious degrees of ultrastructural pathological changes. In the brain tissue, swollen mitochondria, and large intracellular and intercellular vacuoles were the most prominent findings. In the peripheral nerves, separations in myelin configuration were observed in all of the samples. This pathological finding was most prominent in large-sized myelinated axons. In addition, the quality of soft tissues was not good enough for taking transmission electron micrographs. For scanning electron microscopic examinations, the most suitable tissue was found to be the bone tissue. In conclusion, only bone samples of fresh frozen cadavers can be examined by scanning electron microscopy. None of the fresh frozen tissues was suitable for transmission electron microscopic examination because of the ultrastructural pathological changes.

BENJAMIN SEPHTON AND JENNY CLANCY University of Leeds, Leeds, United Kingdom **Extracervical approaches to thyroid surgery**

Advances in thyroid surgery over the last three decades have led to the development of minimally invasive and extracervical approaches predominantly to improve cosmesis. This study aims to demonstrate

the complex anatomy of the thyroid region and to explore the anatomical structures related to two extracervical approaches, the axillary approach and the anterior/breast approach. Three cadaveric dissections were undertaken to reveal the surgical anatomy of the thyroid gland and the surgical pathways related to the axillary and anterior/breast approach. The first dissection demonstrated the anatomy of the thyroid gland and its relation to structures/landmarks important in thyroid surgery. The second dissection showed the surgical pathway and anatomy associated with the axillary approach to thyroid surgery and the third dissection demonstrated the anterior/breast approach. A flawless anatomical knowledge of the thyroid gland is essential for successful surgical outcome and to minimise the risk of complications. The extracervical axillary approach and the anterior/breast approach have been found to have good surgical outcomes and improve cosmesis. They are however associated with increased expense, longer duration of operative time and the need for surgical training. The widespread application of such approaches is therefore limited, however the drive to improve cosmesis is desirable in some patients, particularly in cultures where visible scarring is socially stigmatised. Whether universal adaptation of these techniques will occur in the future remains questionable.

ALEXANDER SHARP, ELEANOR OWEN, ALISON LEDGER, JAMES PICKERING, AND RICHARD WAKEFIELD Leeds School of Medicine, Leeds, United Kingdom **What is the value of ultrasound in anatomy teaching?**

Developments in ultrasound technology have interesting prospects for teaching anatomy. This study aimed to assess the value of introducing ultrasound teaching into the MBChB anatomy curriculum at Leeds Medical School. This was a mixed-methods study utilising questionnaires, teaching observation and focus group. Questionnaire data showed students were overwhelmingly positive about the experience. Students in the focus group noticed greater appreciation of the anatomical variation between individuals and the mobile aspect of anatomy that ultrasound provides. Participants attending the ultrasound session at the beginning of their anatomy block reported struggling to gain as much from the session when lacking a solid understanding of the underlying anatomy and ultrasound theory. This suggests that ultrasound is a tool to reinforce and contextualise knowledge, and should be utilized toward the end of an anatomy module, following other teaching modalities. Findings suggested significant variation between aims and structure of teaching between facilitators. Some focused on ultrasound skills whilst others demonstrated the anatomy with varying levels of student participation. This highlights the importance of aligning the objectives of the curriculum developers, facilitators and students and having a structure in place to achieve those objectives in order to maximise the value of ultrasound in anatomy teaching.

ISABELLE LOUISE TERRY, CECILIA BRASSETT, AND JAI CHITNAVIS Human Anatomy Teaching Group, Department of Physiology, Development and Neuroscience, University of Cambridge, Cambridge, United Kingdom **Clinical and magnetic resonance imaging correlations in patients with symptomatic meniscal tears of the knee**

Meniscal tears are among the most common knee injuries presenting to orthopaedic clinics. The data from 104 patients who presented with knee pain and who sequentially underwent clinical assessment, magnetic resonance imaging (MRI) and arthroscopy to treat symptomatic meniscal tears were reviewed. This study aims to identify potential predictors of meniscal tears in order to obviate the need for imaging. Presenting symptoms and signs from clinical examination were quantitatively analysed to determine their association with a final diagnosis of meniscal tear. A logistical regression model was constructed to determine the strength of the relationship between each independent variable and an accurate diagnosis of meniscal tear. A positive McMurray's test was the only statistically significant variable that correlated with a meniscal tear ($P = 0.011$). These results show that the McMurray's test, originally developed in the 1940 s, appears to still be clinically relevant today. Of those patients with a positive McMurray's test, 82% were confirmed as having a meniscal tear on MRI and at arthroscopy. However, in view of the above findings, it is recommended that MRI should still be used in the diagnosis of suspected meniscal tears, in order that unnecessary surgery is not undertaken.

MOHAMMED TURKI AND PHILIP J. ADDS Institute of Medical and Biomedical Education (Anatomy), St George's, University of London, London, United Kingdom **Langer's axillary arch, a rare variant, and prevalence among Caucasians: A case study**

During the dissection of a 79-year-old Caucasian female cadaver, a variant of Langer's axillary arch was found unilaterally in the left axilla. While Langer's axillary arches are not uncommon, this particular variant, attaching to the biceps brachii, is much rarer with a reported prevalence of only 0.25%. The case reported here, however, is only the third example of a Langer's axillary arch that has been found in the last 14 years in the Dissecting Room at St George's, University of London, giving it an overall prevalence of approximately 1.0% amongst a population of around 280 Caucasian cadavers, much lower than the reported frequency of 7%. Langer's axillary arches can be completely asymptomatic in life, but may also cause a variety of issues both clinically and surgically.

MUHAMMET BORA UZUNER,[1] MERT OCAK,[1] FERHAT GENECI,[1] ISMAIL DALDAL,[2] ALPARSLAN SENKOYLU,[2] AND HAKAN HAMDI ÇELIK[1] [1]Department of Anatomy, Faculty of Medicine, Hacettepe University, Ankara, Turkey; [2]Gazi University Faculty of Medicine Department of Orthopaedics and Traumatology, Gazi, Turkey **Three-dımensıonal micro-CT evaluation and reconstruction of the posterolateral spınal fusıon ın rats**

Posterolateral spinal fusion (PLSF) is one of the most frequently used procedures in surgeries related to instability and deformation of the spine. In order to obtain a successful spinal fusion, among all biological factors, grafting is pivotal. Materials such as hydroxyapatite and tricalcium phosphate (TCP), which are synthetic ceramic grafts, are among the reliable materials that are used nowadays. In this study, ten Sprague-Dawley rats were used with the aim of evaluating the PLSF of the L3–L4 segment. The study involved one TCP and one control group. Rats in the first group, after decortication and facetectomy, were treated with TCP as a graft material. Rats in the control group were only applied decortication and facetectomy with no graft material. Eight weeks later, after sacrificing the rats, the fusion rates of the L3–L4 lumbar segment were observed via micro CT. Images were processed in the NRecon program, ossification areas were observed by making a 3D reconstruction with the CTvox program. In conclusion, whilst clear ossification areas could be observed in the images that were gained via micro CT in the TCP group, no ossification was observed in the control group.

ALPER VATANSEVER, DENİZ DEMİRYÜREK, HAKAN ÖZSOY, AND BURCU ERÇAKMAK Faculty of Medicine, Hacettepe University, Ankara, Turkey **The anatomic relation between the subclavian artery and the clavicle**

Clavicle fractures are very common in shoulder injuries. Although neurovascular damage during closed fractures of the clavicle are rarely seen, acute subclavian artery pseudoaneurysm, and injuries to subclavian vessels have been reported. The aim of this study was to determine the location of the subclavian artery with relation to the sternoclavicular joint and body of the clavicle. One hundred and twenty-seven patients (66 females, 61 males) were evaluated using reconstructed three-dimensional CT angiographies. The distance

between the point that the subclavian artery crosses the clavicle and the sternoclavicular joint were measured. The antero-posterior distance between the clavicle and the subclavian artery in sagittal images, and the diameter of the artery at the level of the first thoracic vertebra (T1) were also measured. Our results showed that the mean distance between the sternoclavicular joint and where the subclavian artery crosses the clavicle was 3.9 cm and mean diameter was 7.49 mm. At the level of T1, the anteroposterior distance varies from 0.91 to 4.3 cm. The subclavian artery travels further in men than women until it crosses the clavicle. Information gathered from this study will be useful to reduce injuries to the subclavian artery during management of clavicle fractures.

ALPER VATANSEVER, DENİZ DEMİRYÜREK, MİNE ERGUN, AND HAKAN ÖZSOY Faculty of Medicine, Hacettepe University, Ankara, Turkey **ATTENTION: Flexor carpi radialis has been removed from the carpal tunnel**

The carpal tunnel is located between the flexor retinaculum and the carpal bones and has clinical importance due to its contents. Carpal tunnel syndrome, caused by compression of the median nerve in the carpal tunnel, is the most common diagnosed clinical syndrome worldwide. Although it is studied widely, there is no consensus about contents of the carpal tunnel. Well-known anatomy textbooks also differ regarding its contents. It is common knowledge that flexor digitorum superficialis, flexor digitorum profundus and the median nerve pass through the carpal tunnel. There is, however, discussion about the presence of the tendons of flexor pollicis longus and flexor carpi radialis inside the tunnel. Some orthopaedic and anatomy textbooks accept them as part of the contents, some do not. The aim of this study was to identify the structures inside the carpal tunnel by using MRI images of the wrist. One hundred and eighteen patients (74 females, 44 males) were evaluated. Our results showed that the tendon of flexor carpi radialis was above the flexor retinaculum within its own septal compartment while tendon of flexor pollicis longus was in the carpal tunnel in all patients.

ABIGAIL WARD AND BIPASHA CHOUDHURY School of Medical Sciences, University of Manchester, Manchester United Kingdom **Variation in shape and size of the femoral triangle, with relation to femoral hernias: A cadaveric study**

In femoral hernias, abdominal viscera protrude into the femoral canal through the femoral ring, they have the potential to strangulate and often present as surgical emergencies. The dimensions of the femoral triangle may have a bearing on the occurrence of femoral hernias, as it can alter the size and shape of the femoral ring. The aim of this study was to assess the shape and size of the femoral triangle in male and female cadavers. Forty bilateral cadaveric dissections (20 males and 20 females) were performed, and measurements between the anterior superior pubic spine, pubic symphysis, and femoral triangle apex were taken. The femoral triangles were then drawn from these measurements, and overlaid. There was little difference in shape or area between genders or sides, although the male and left sided triangles where slightly larger (88.69 vs.81.12 cm^2). One theory for the differences in femoral hernia development was the difference in femoral triangle shape and size between male and female, which may alter the size and shape of the femoral ring, however we have shown that there is no significant difference in these groups.

JOSEPH WHEATLEY,[1] DAVID ROBERTS,[1] AND ANDREW BODENHAM[2] [1]Department of Anatomy, School of Medicine, University of Leeds, Leeds, United Kingdom; [2]Department of Anaesthesia, Leeds General Infirmary, Leeds, United Kingdom **An anatomical study of the brachial plexus and surrounding structures with regard to ultrasound-guided pectoral and intercostobrachial nerve blocks**

This study explored the anatomy and assessed the efficacy of novel pectoral nerve blocks. Further, it explored the anatomy of the intercostobrachial nerve and its contribution to proximal, medial arm innervation, with a view to improving the precision and reliability of the intercostobrachial nerve block. Three cadavers were dissected to exhibit the relevant anatomy and allow anatomical variation to be explored, alongside conducting a comprehensive literature review. The relationship between the pectoral branch of the thoracoacromial trunk and lateral pectoral nerve formed a consistent and reliable landmark for pectoral block when using Doppler ultrasound. The lateral cutaneous intercostal nerves emerged closer to the anterior axillary line than previously described. The anatomy of the intercostobrachial nerve was variable, as was innervation to the medial arm. Connections from the brachial plexus to the intercostobrachial nerve were noted, most commonly via the medial cutaneous nerve of the arm. The Pecs II block is a reliable and innovative way to supply perioperative analgesia for breast surgery. Intercostobrachial nerve block failure rates were attributed to imprecise needle insertion. A new method of blocking the intercostobrachial nerve near its origin using ultrasound guidance, as a modification of Pecs II block, was designed.

AMIR ZAREI[1] AND SAMIN AMIN[2] [1]Leeds Radiology Academy, Leeds Teaching Hospitals NHS Trust, Leeds, United Kingdom; [2]Sheffield Teaching Hospitals NHS Foundation Trust, Sheffield, United Kingdom **Case study: Unilateral absence of the ovary and distal uterine tube without malformations of the uterus and/or urinary tract**

Unilateral absence of the ovary and distal uterine tube without malformations of the uterus and/or urinary tract is a rare anatomical finding. This study presents a case of a 72-year old nulliparous woman with this incidental observation during laparoscopic hysterectomy for endometrial malignancy. A literature review illustrated several reports of this rare anatomical variant since the advent and adaptation of diagnostic laparoscopy, indicating this variant is likely to be underdiagnosed due to its widely asymptomatic nature. In contrast to this case, all previous reports are incidental detection in principally premenopausal women investigated for abdominal pain, dysmenorrhea, or infertility. The significance of this variant on fertility is unknown, with cases of fertile and infertile women being reported. Possible aetiologies include congenital agenesis secondary to defective paramesonephric duct development and/or disruption of germ cell migration to the embryonic gonadal ridge, foetal or childhood ovarian torsion with subsequent avascular necrosis, or an acquired ipsilateral vascular anomaly. Acute symptoms would be expected with ovarian torsion, however, lack of previous gynaecological history in the current case supports congenital or an early childhood anomaly as the most likely aetiology for this anatomical variant.

ZEINATI ALEXANDER, YIN YING SIA, FREDERICK BARBER, OLAKUNBI SEGILOLA, AND NICHOLAS CLARKE Norfolk and Norwich University Hospital NHS Trust, Colney Lane, Norwich, United Kingdom **"A case of the mirror image": Case report demonstrating the radiological findings of Kartagener's syndrome**

Primary cilliary dyskinesia (PCD) also known as Kartagener's syndrome, is an uncommon autosomal recessive disorder that results in neonatal respiratory distress, chronic oto-sino-pulmonary disease and male infertility. Situs inversus is present in 50% of individuals with the condition. Initially identified as a triad of chronic sinusitis, bronchiectasis, and situs inversus by Kartagener in 1933, later findings of

uncoordinated ciliary movement in those with the disorder led to the attribution of the name of PCD. We describe the case of a 75-year-old man who underwent a Nuclear Medicine Parathyroid MIBI (Technetium sestamibi) scan due to hypercalcaemia and raised parathyroid hormone, which, as well as identifying a parathyroid adenoma, displayed an incidental finding of Kartagener's syndrome (chronic sinusitis, bronchiectasis, and situs inversus). Although undiagnosed, the only previous imaging included chest X-rays that noted dextrocardia with no lung pathology. PCD is usually confirmed through genetic testing with the clinical signs and symptoms described above. Despite this, only 5% of patients with PCD have a well-established diagnosis. Through this case, we would like to highlight the importance of imaging findings in suggesting the diagnosis in individuals with mild symptoms who are not diagnosed in childhood.