A1: An anatomical approach to congenital anterior abdominal wall anomalies

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The abdominal wall forms during the fourth week of gestation when the embryo undergoes folding in craniocaudal and mediolateral directions. During the sixth week, rapid intestinal and liver growth leads to herniation of the midgut into the umbilical cord. By week ten, the midgut returns to the abdominal cavity and portions assume their fixed, retroperitoneal positions. There are three main presentations of these anomalies, namely omphalocoele, gastroschisis and congenital umbilical hernia. The proposed aetiology for an omphalocoele is that this develops due to a failure of the viscera to return to the abdominal cavity. The sac, which may be ruptured, consists of the covering layers of the umbilical cord and includes amnion, Wharton's jelly, and peritoneum. The aetiology for gastroschisis relates to failure of the mesoderm to form in the anterior abdominal wall by migration of the lateral folds. The differing causative factors for both conditions will be explored. Omphalocoeles are present in approximately 1 per 1,100 pregnancies with a high rate of spontaneous abortion. The incidence of gastroschisis has nearly doubled during the past few decades, currently approximately 2 to 5 per 10,000 live births. Congenital umbilical hernias occur when the umbilical ring is weak or large and may resolve spontaneously. The antenatal detection of abdominal wall anomalies will be described and the treatment and management of these cases will be explained, including the use of a bowel bag, silo, encouraging epithelialisation and covering the staged procedures, including the management of a range of complications and any associated anomalies.

A2: Embryology of Cardiac Septation: New trends

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The past decades have seen immense progress in the understanding of cardiac development. Although gene expression patterns and transgenic phenotypes have been described using transgenic models, appreciation of cardiac anatomy, with regard to formation of the septal structures has yet to be fully explained given the changing structure of the developing heart, remodelled from a single-channel to a dual-channel consisting of a four-chambered heart externally. Cardiac looping brings the contributing structures into position to engage in partitioning of the heart between 4 and 7 weeks. The role of extracardiac mesenchymal tissue from neurocrestal cells and regression of myocardium originating from the anterior heart field have all significantly enhanced our understanding of the morphogenetic processes that contribute to septation. Neural crest cells are of specific importance for outflow tract septation. The first indication of septation is formation of the primary atrial septum. This muscular structure grows toward the endocardial cushions formed within the atrioventricular canal, carrying on its edge a mesenchymal cap. Its cranial attachment breaks down to form the secondary foramen by the time the mesenchymal cap has fused with the cushions, the latter fusion obliterating the primary foramen. The muscular ventricular septum develops concomitant with the membranous part of the septum derived from the rightward margins of the atrioventricular cushions. The proximal outflow cushions fuse with the muscular septum and become the pulmonary infundibulum as the aorta is committed to the left ventricle. Disturbances of these processes explain the phenotypic variants of deficient atrial and ventricular septation.

A3: Exploring the Most Effective Combination of Drawing Approaches for Observation and Understanding Three-Dimensional Anatomy

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Critical observation is crucial for appreciating the three-dimensional (3D) form and spatial complexity of anatomical structures. The incorporation of different art-based approaches, including drawing, can be found in the academic literature. The process of observing and drawing anatomical features using any drawing approach is likely to support student learning due to increased time-on-task, attention and focus on the structures under observation. However, recent studies have shown varying success when employing drawing to support students in their learning of anatomy. The authors propose that the elementary essence of 'drawing', has not been investigated or discussed. 'Drawing' is an umbrella term which incorporates several drawing approaches that include photorealistic drawing, shading, contour drawing, cross-contour drawing, and gesture drawing. We propose that the application of a specific combination of drawing approaches in anatomy education, can result in alternative pedagogic outcomes. Here we explore why some drawing approaches are inherently more capable of supporting 3D observation and representation of the form of an anatomical structure. We examine why the combination of cross-contour and gesture drawing approaches employed in the established Haptico-visual observation and drawing (HVOD) method, are most effective for 3D observation and memorization of the form of anatomical structures. Our definition, and analysis of this drawing approach for anatomical learning will have wide-ranging implications for educators seeking to introduce drawing as an art-based technique into their teaching and will in turn support their students in the critical observation of three-dimensional anatomy. Ethical approval was not required for this work.

A4: 3D Printed anatomical models in training: adding another dimension

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Although not new, 3D Printing technology is becoming a very powerful tool in medical and anatomical training because of gradually decreasing cost and increased accessibility despite becoming more and more refined.
Haptic Perception has always been a large part of anatomical education, using dissection, studying prosected specimens or the study of dry bone models. Haptically exploring an object forms complex, long-term memories that complement visual perception and provides much deeper insight than a picture in a textbook could produce. Having physical representations of digital imaging data, however, has influenced the way we teach and train in many ways. Copies of unique specimens can now be distributed digitally and repeatedly 3D printed. Physical representations of patient imaging allow surgeons to plan and rehearse procedures multiple times before operating. Usage at our unit is illustrated with case examples and the design and manufacturing process is elaborated on.
It is critical to actively engage with new technologies, like 3D Printing, to fully explore the benefits to teaching and learning.

A5: Multimodal art-based learning enhances holistic anatomical understanding and 3D spatial awareness

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The incorporation of diverse interactive resources and remote independent learning methods are crucial for the evolution of anatomy education. We have designed Haptic Surface Painting (HSP) as a novel and accessible art-based learning approach to

support understanding of clinically relevant 3D spatial anatomy. Previous studies have identified value in body painting for anatomy learning, and we have shown considerable benefits for learning and memorisation achieved via combined visual and haptic drawing techniques. We evaluated HSP in the context of an optional extra-curricular virtual workshop for undergraduate medical students. We then explored learner experiences and perspectives within a focus group (n=7). Thematic analysis showed that HSP was perceived as a valuable supplement to undergraduate anatomy education. Participants highlighted the engaging practical nature of the approach and reported improvements in memorisation. Palpation was identified as a factor in supporting a deeper and more holistic understanding of anatomy when compared to curricular learning. Furthermore, participants found educator instructions and peer group support to be essential for enhanced anatomical understanding and 3D spatial awareness. Participants requested modifications to painting materials, and additional guidance and structure for future workshops. We propose that HSP can provide an accessible and engaging approach for consolidation of anatomical understanding, and we plan to integrate HSP within our *Exploring 3D Anatomy* massive open online course. Our work has implications for educators seeking to enhance student spatial understanding remotely and provides an alternative to traditional anatomical body painting. Research was approved by the Newcastle University Faculty of Medical Sciences Ethics Committee.

A6: On the prospect of blended learning with immersive technologies for anatomy education

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Owing to several factors including increased student numbers, limited number and cost of models and cadavers, and limited anatomy educators, anatomy education currently embraces advanced technologies in combination with more traditional teaching and learning methods as part of blended learning. Immersive technologies (e.g. augmented and virtual reality) have shown to greatly enhance teaching and learning in this field, however, the cost of software licenses and equipment are high and out of reach for many institutions. Therefore, it was the aim to explore the usefulness of a cost-effective immersive technology tool for learning the muscular system (upper and lower limb). A mobile application for learning the muscular system was developed by postgraduate Medical Bioscience students. The application was developed to support Android mobile devices, and to function offline. Application development included 3D graphics with animation, sound and touch input, and additional components (e.g. glossary with anatomical terminology, and a quiz). The application was launched to students undertaking anatomy modules during 2021 and a voluntary google survey was provided to receive feedback on user experience. Majority of students regarded their experience with the application as excellent. Despite, navigation and absence of features highlighted as problems encountered, students particularly liked the 3D mode (69.8%) and quiz (47.2%), but not the automated voice (23.3%) and augmented reality mode (26.4%). All the students indicated that they would use this application for studying. Thus, immersive technologies seem to be a useful anatomy education tool, and with the necessary improvement of this application, it has the potential to enhance student learning.

A7: The anatomical basis of multiple meningiomas: A case series

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Meningiomas are the most common primary intracranial tumors arising from the arachnoid cap cells of the arachnoid villi. These tumors are generally benign, highly vascularized and may be caused by a host of factors consisting of genetic mutations, hormonal imbalances and exposure to ionizing radiation. In most

cases, the meningioma forms as a single tumor; however, rare cases of multiple meningiomas have been reported. Multiple meningiomas represent less than 10% of diagnosed meningiomas and may form simultaneously or at different times. This study aimed to investigate the anatomical parameters of multiple meningiomas within a select South African population. A retrospective chart review was conducted using Magnetic Resonance Imaging and Digital Subtraction Angiographies obtained from the data bank at a central regional hospital in KwaZulu-Natal, South Africa over the period of 2011 to 2020. Five cases of multiple intracranial meningiomas were found primarily in females and in the supratentorial region. A high incidence of meningiomas within the right hemisphere was observed. The meningiomas were calculated to have an average volume of 43.9 cm^3 (range: 9.1 cm^3 – 127.5 cm^3). Regarding its arterial supply, the external carotid system of arteries was noted to be the most common primary arterial feeder to these tumors. Findings of this study have described the anatomical features of multiple meningiomas within a select South African population adding to the scarce literature available. Additionally, this study investigated the arterial supply using a proportionality methodology to quantify the vascular contributions.

A8: **Facial Canal Morphometry: A Technical Report**

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The facial canal lies in the petrous part of the temporal bone and contains the facial nerve (CN VII) as it travels through the canal to become extracranial. The facial canal is divided into three segments, namely the labyrinthine, tympanic and mastoid segments, each travelling in a different plane and of varying importance. Interest is placed on the tympanic segment as it lies in close proximity to the middle and inner ear structures. It is for this reason that the facial canal and nerve is of concern to otologists during electrode placement for a cochlear implant, as it is so closely related to the cochlea and any damage to the nerve may result in untreatable paralysis. Not many studies have been conducted on a cadaveric population, with most being carried out on CT images of the cochlea and facial nerve. Thus, there is no standard or clear methodology that one can follow in order to visualize the facial canal and nerve. We propose a detailed dissection technique to span this gap in research. With the use of drilling tools and medical cutters, the facial canal can be exposed in the temporal bone. Once exposed, morphometric analyses and relationships of the facial canal can then be conducted. Knowledge of the facial canal may assist otosurgeons to safely dissect the region without injuring vital structures within this area.

A9: The clinical significance of the corona mortis within a South African sample.

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The Modified Stoppa approach to the pelvis offers an extensive exposure to the anterior column of the pelvic bone which is especially vital during the repair of pelvic ring and acetabular fractures. Definitive pitfalls of this procedure are the adverse effects resulting from the inadvertent severing of the Corona Mortis (CM) vessels, a clinical term referring to the anastomosis between the obturator vessels and the external iliac vessels typically via an accessory obturator vessel. This study investigated the incidence and variations of the CM in a South African sample using 63 adult cadavers from the Department of Anatomy, University of Pretoria and 73 patient computed tomography (CT) angiograms from the Department of Diagnostic Radiology, Universitas Hospital. The cadaver study involved careful dissection of the pelvic blood supply, thereafter, incidence and distances of the CM in relation to bony landmarks encountered during anterior approaches to the pelvis were documented. These landmarks included the pubic tubercle, pubic symphysis and the anterior inferior iliac spine. The angiogram study consisted of precise observation of pelvic CT scans at the superior

pubic ramus in order to record the incidence and distances of the CM to the abovementioned bony landmarks. These distances were evaluated to create 'safe zones' for pelvic exposure during orthopaedic procedures. The accuracy of the safe zones were then validated via a cadaver simulation of the Modified Stoppa approach on two adult cadavers from the Department of Anatomy, University of Pretoria to prove the CM lies outside of the safe zone. The incidence of the CM was observed as 67.5% of the cadaver study sample and 33.1% of the angiogram sample. The CM safe zones related to the pubic tubercle resulted in 60.3 mm for the cadaver study and 49.1 mm for the angiogram study. Discrepancies between the anatomical and clinical study were evident as a significant difference between the results of the cadaver and angiogram studies was calculated. Therefore, it is recommended that angiogram study of the CM should be limited to diagnostic purposes when confirming the presence of the CM. The high incidence and compromising location of the anastomosis proves it is clinically significant.

A10: Morphology of the tail of the African lion (*Panthera leo*)

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There is little known on the tail of the African lion (*Panthera leo*), a species of increasing veterinary and palaeontological importance. Wild felids, together with their domestic counterparts, use their tails for communication and balance. The tail from a lioness (± 3 years culled on a private game farm and immediately embalmed in the field) was dissected. After transport to the Faculty of Veterinary Science, the lion was stored in 10% neutral-buffered formalin. There are 20-21 caudal vertebrae (Cd 1-21) which lack a spinous process. The transverse, mammillary, cranial and caudal articular processes of Cd 1-5 are prominent and taper drastically to become rudimentary from Cd 6-12. There is 7 hemal arches and the median caudal artery runs through the hemal arches of Cd 2-8. Cd 13-20/21 diminish distally and are relatively featureless cylinders. Blood vessels are paired and more superficial dorso- and ventro-laterally. Six paired, segmented muscles form a cylinder around the tail, and are more fleshy cranially and more tendinous caudally. Thick, limb skin makes intravenous access challenging and the tail may provide an alternative site to the limbs. Understanding the anatomical position of the hemal arches in relation to major blood supply in the tail can enable better access in emergency medicine. In addition, the osteology and specifically the hemal arches, are significant in identifying Pantherine cats in the palaeontological record. Hemal arches are discussed at length in dinosaur literature but outside of brief mentions in veterinary manuals little is published on mammalian hemal arches.

A11: Pelvic floor thickness in relation to bladder volume and bony dimensions in South African women

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Pelvic floor disorders are clinical conditions affecting many women around the world. Impaired pelvic floor function is the leading etiology of these conditions. The aim was to investigate the relationship between pelvic floor thickness, bladder volume and bony dimensions in South African women. Computerized tomography scans belonging to black and white South African women were sampled from Steve Biko Academic Hospital. The data was reconstructed using Mevislab and Avizo software to measure pelvic floor thicknesses, bony parameters and bladder volumes. White women presented with greater bony dimensions when compared to black women except the interspinous and antero-posterior pelvic outlet. The bony dimensions increased with parity except the subpubic angle. There were no significant correlations between bony parameters and age except the antero-posterior pelvic outlet which increased significantly with age. Black

women had thicker pelvic floors when compared to white women. The pelvic floor became thinner with increasing parity and age in both population groups. There were no correlations between the pelvic floor thickness and the bony parameters measured. Significant correlations did not exist between pelvic floor thicknesses and the bladder volumes measured. According to literature, pelvic floor disorders are associated with wider bony pelvic dimensions, thinner pelvic floors and increasing parity. The variations noted in our study should therefore be considered in clinical practice, noting that white parous women of advancing age stand a higher risk for pelvic floor disorders. Further studies are required to verify whether there is any significant correlation between increased bladder volume and pelvic floor thickness.

A12: Variations in the morphology of human lungs in terms of lobes and fissures

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Various studies have reported that lung fissure variations are increasingly common. These variations are said to have a variety of anatomical and clinical implications. In South Africa, there is a large gap in knowledge in this area and if bridged could lead to advances in the treatment or diagnosis of some respiratory diseases. This study aims to report and highlight the prevalence of variations in lung fissures and lobes. This observational, descriptive study consisted of human lungs obtained from adult bodies (18 female and 21 male) that were fixed in formalin. These bodies were previously dissected in the Department of Human Biology, University of Cape Town by the medical undergraduate and honours post-graduate students as a part of their training. Incomplete horizontal lung fissures were the most common fissure variation (69.2%) compared to the incomplete oblique lung fissures of both the right and left lung, 59% and 38.46% respectively. Complete oblique fissures in both lungs were less prevalent when compared to previous studies. Additionally, the occurrence of absent lung fissures was substantially low recording at 2,6% for both left oblique fissures, and right horizontal fissures, and 0% for right oblique fissures. Undefined lung fissure prevalence was relatively high ranging from 20.5% to 23.1% overall. Understanding lung fissure anatomy and lung fissure variations is extremely important as there is significant clinical implications. Further studies with increased sample size are needed for more insight into how lung fissure variations, especially incomplete lung fissures, play a role in a clinical environment.

A13: Anatomical features of the iliocapsularis muscle: a dissection study

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Iliocapsularis muscle overlies the anteromedial hip capsule and is an important landmark in anterior approaches to hip arthroplasty. Previously believed to be part of iliacus, few publications describe the prevalence, attachments, fibre direction, blood supply, innervation, and size of iliocapsularis. This study aimed to determine these anatomical features using embalmed bodies and whether they vary between sides, sex, and age. Thirty-eight formalin-fixed adult bodies (66% male; mean age 45.0±14.0 years) were dissected and the prevalence, presence of a connective tissue raphe, attachments, fibre direction, blood supply, and innervation, were documented. Length and width of iliocapsularis were measured, and significant differences were investigated with t-tests. Iliocapsularis was present in all bodies examined, originating from the inferior border of the anterior inferior iliac spine and inserting 20mm distal to the lesser trochanter in 54 muscles (71%). Iliocapsularis was supplied by a thin branch from the femoral nerve, and by branches of the lateral circumflex femoral and deep femoral arteries and veins. Muscle fibre direction was from superolateral to inferomedial. Mean length was 116.8±11.2 mm and width was 12.8±3.1 mm, with no significant differences between sides, sex, and

age. This was the first study to document the venous drainage and compare the dimensions with sides, sex, and age, using adult bodies. However, the true anatomical and biochemical function of iliocapsularis is still not well understood and is largely unknown. Iliocapsularis is a constant muscle, distinct from iliacus, which is relevant to orthopaedic surgeons and physical rehabilitation therapists, particularly for postoperative patient care.

A14: Dimensions of the orbital and periorbital regions for the use in forensic facial approximations of South Africans

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Facial approximations are published in the media in an attempt to identify the deceased. Eyes are important in recognition and are the first structures to consider when approximating the face. The virtual sculpture method is used by the South African Police Service (SAPS), which is based on a North American cadaver sample. The aim of this study was to determine the dimensions of the orbit and periorbital structure and the variations observed among two South Africa population groups Two hundred and six Cone Beam Computed tomography scans (CBCT) of South Africans were collected from the Life Groenkloof Hospital, Oral and Dental Hospital and Medunsa Oral Health Care Centre. These scans included male and female, black and white adults between 18 - 84 years Scans were resliced according to the Frankfort Horizontal Plane and landmarked using the MeVisLab © v.3.0.2 software programme. Thirty-four landmarks were placed on the 2D Dicom files as well as the 3D segmented surfaces to calculate the dimensions of the orbital and periorbital structures and the position of the eye within the orbit. Black females had significantly smaller orbits (35.73 x 40.10 mm) compared to white females (37.39 x 40.58 mm), black males (37.64 x 42.30mm) and white males (38.15 x 74.74 mm). Male eyes projected statistically significantly further (p=0.001) and

had wider palpebral fissures (p=0.001) compared to females. As the findings are based on a local sample, the noted sex and population variations in eye shape have important relevance for facial approximations by the SAPS.

A15: Variations of the iliolumbar veins in a South African Population

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The iliolumbar veins (ILVs) and their variations are crucial to lumbosacral spine surgical interventions. Their damage during surgery may result in significant haemorrhage. The purpose of the current study was to describe the variations of the ILVs and determine their tissue composition. Eighty-nine adult cadavers were dissected for the ILVs following standard dissection methods. The variations, morphometries, and topography of ILVs were studied. Nineteen harvested (ten proximal, nine distal) ILVs were processed for Hematoxylin and Eosin, Masson's trichrome and Verhoeff's histological stains to reveal the tissue composition. There was a 100% presence of ILV trunks. Forty-five percent of ILVs anastomosed with each other bilaterally. ILVs terminated into the posterior surfaces of the iliac vessels on the right (p=.001) and the lateral surfaces on the left side (p=.001). Left-sided proximal ILVs had higher elastic fibre composition (p=.030). ILV elastic to collagen fibre Area Ratio was 1:9. Sixty percent of cadavers exhibited classification type 1 of ILV pattern. Forty-two percent of ILVs lied at the level of the S1 vertebra. The ON coursed anteriorly to ILVs in most cases (96.4%). Thirty percent of ILVs lied between L4 and L5 spinal nerve roots of LST. Reported ILV variations are comparable to other populations. ILVs have more collagen fibres than elastic fibres in their walls, posing a risk for avulsion during surgery. The left side retroperitoneal surgical approach

is recommended for L4/L5 intervertebral disc space interventions. Identifying and ligating variant ILV patterns during surgical interventions may minimize inadvertent haemorrhage and damage to adjacent structures.

A16: Anatomical variations of hepatic veins in a cadaver sample – a South African perspective

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A preoperative understanding of the anatomy of the hepatic veins and any variation thereof is pivotal for successful hepatic surgeries as these vessels serve as a hepatic field guideline in living donor liver transplantations (LDLT) and hepatic resections. To date, numerous morphological variations in different populations other than a South African population have been published and thus the following research study was conducted to investigate and document morphological variations in a South African population. The study aimed to contribute to a better preoperative understanding of hepatic vein anatomy impacting surgeries conducted in South Africa. This research study was conducted on 40 livers from donated bodies of 20 females and 20 males, used for academic purposes in the Department of Human Biology, at the University of Cape Town. The age range was between 33 to 105 years old with an average age of 75. The livers were removed, and liver tissue was scraped away to expose hepatic veins from their origin of the inferior vena cava (IVC) to their terminating branching points within the various hepatic segments. All livers presented all three major hepatic veins, 90% of the livers had a common trunk ($n = 36$), and the remaining 10% had no common trunk ($n = 4$). The major and minor hepatic veins were observed for all livers. This study found various morphological variations in a South African population that are of clinical significance and offers the opportunity for further research in this field of study.

A17: An Anatomical Investigation into the Popliteal Artery and its Variants

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It is common for surgical and radiological procedures to be performed at the knee joint. Therefore, it is important for clinicians to be aware of the arterial anatomy of this area as it may aid in preventing intraoperative iatrogenic injury and misdiagnosis. The aim of this study was to describe the morphology and morphometry of the popliteal artery and its variations in a select South African population. The lower limbs of 20 bodies were dissected to enable a study of the anatomy of the popliteal artery and its branches. The arterial course, terminal branching, diameter and length were investigated. Statistical analyses of these anatomical features were done in terms of laterality and sex. The standard course, as described in most textbooks of anatomy, was found in 39/40 limbs (97.5%) and a variant course was found in 1/40 limbs (2.5%). The standard terminal branching pattern, namely that the popliteal artery first divides into the anterior tibial artery and tibio-peroneal trunk followed by further divisions, was found in 35/40 limbs (87.5%). The posterior tibial artery was the first branch in 1/40 limbs (2.5%). Trifurcation, when all three terminal branches branch off within 5mm of each other, was found in 4/40 limbs (10%). Raw data (uncorrected for body size) showed that popliteal artery diameter differed according to sex, with males having a larger arterial diameter than females.

A18: A radiological and endoscopic (cadaveric) study of anatomical landmarks for localisation of the anterior ethmoidal artery.

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The anterior ethmoidal artery is a major surgical landmark susceptible to iatrogenic injury during surgery of the skull base, frontal sinus, and anterior ethmoidal sinus. This study aimed to define the location of the anterior

ethmoidal artery in a South African population, using radiological imaging and endoscopic (cadaveric) dissection. The sample comprised of 43 computed tomography scans and 20 cadaveric specimens, analysed bilaterally. The distance from the anterior ethmoidal artery to specific anatomical landmarks (viz. the skull base, anterior nasal spine, anterior axilla of the middle turbinate, and nasal axilla) was measured and analysed. The distances to the skull base, anterior nasal spine, and nasal axilla displayed statistically significant differences according to sex and laterality. All four landmarks displayed excellent reliability (ICC values ranged from 0.94 to 0.99) as anatomical landmarks for the localisation of the anterior ethmoidal artery. The middle turbinate axilla was the most reliable landmark assessed, owing to the high inter-rater agreement between measurements and the absence of significant sex and laterality differences. Variations observed by the present study should be considered when examining the anterior ethmoidal artery, particularly in the South African context. Anatomical knowledge gained from this study can be applied to surgical procedures, to improve pre-operative and intra-operative localisation of the anterior ethmoidal artery and avoid its injury.

A19: **Cortical bone thickness of the mandibular interforaminal region: Implications for miniplate fracture fixation.**

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The mandibular body is the most fractured site in the maxillofacial complex. Simple and minimally displaced fractures in this region are often treated with miniplates and monocortical screws, because they provide functional fixation by nullifying the force vectors acting on the mandible under function. This investigation aimed to quantify buccal bone at select sites within the interforaminal region to predict risks for injury to tooth roots and mandibular structures containing neurovasculature, during fracture fixation. Hemimandibles (n=213) were retrieved from an adult Western Cape cadaver population. The simulation was performed in the following manner: Horizontal planes were defined superior to-, inferior to- and on the mental foraminal (MF) midpoint. Each plane corresponded to a possible miniplate anchorage site. On each plane, buccal bone was quantified at four sites corresponding to screw insertion sites. The smallest buccal bone (SBB) reading was selected on each plane. These readings were compared to standard monocortical screw lengths to predict the risks for injury to the surrounding structures. Means (±SD) were computed at a 95% confidence interval and statistical significance was defined at $p < 0.05$. The foraminal plane carried the lowest predicted risk for injury ranging between 3.44% and 7.55% bilaterally with 4 - 7 mm screws. The prevalence of single accessory mental foramina was 6.54% and 6.60% in right and left hemimandible, respectively and did not increase the risk for injury. These findings expand our knowledge of how anatomical variations in the mandible could aid preoperative decision-making of interforaminal mandibular fracture fixation in South Africa.

A20: Morphometric analysis of the cranial fossae in patients with scaphocephaly.

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Scaphocephaly is the morphological consequence of premature sagittal suture fusion. Morphologic and morphometric studies on the cranial vault in scaphocephaly flourish in the literature. Few studies are available on the cranial base in a scaphocephalic population, let alone the morphometry of its fossae. Therefore, this study aimed to analyse and compare the morphometry of the anterior, middle, and posterior cranial fossae (ACF, MCF and PCF) in patients with scaphocephaly. The length and width of the ACF, MCF and PCF were measured using fixed anatomical landmarks on the two-dimensional computed tomography scans of

24 consecutive patients diagnosed with isolated sagittal synostosis between 2014 and 2020, and 14 controls. A comparison of the results between patients with scaphocephaly and the controls showed that the ACF and PCF lengths increased significantly (p=0.041 and p=0.018) in patients with scaphocephaly. No differences in the MCF lengths were observed (p=0.278; 0.774). When compared by the degree of severity, the ACF and PCF lengths were significantly increased (ANOVA, p=0.033; post-hoc, p=0.013 and ANOVA, p=0.015; post-hoc, p=0.036) in scaphocephalic patients within the severe group as opposed to the control group. Morphometric data obtained indicate a preponderance of deformity in the ACF and PCF with elongation along the anteroposterior (AP) plane (lengths) in scaphocephalic patients. Minimal changes were observed in the transverse plane (widths) in scaphocephaly versus controls. This data could aid craniofacial surgeons in understanding which cranial fossa is most affected in scaphocephaly and the extent to which it is affected to conclude on the best treatment option.

A21: The prevalence of the thyroid Ima artery in South Africans.

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The thyroid Ima artery is an arterial variation present in approximately 3 - 10 % of the general population. The origin of the thyroid Ima artery is highly variable and when present, it primarily supplies the isthmus and inferior aspect of the thyroid gland. As it is located in the midline of the neck and is prone to injury during various surgical procedures including tracheostomies. In the current literature, no research has been conducted to investigate the prevalence of the thyroid Ima artery in South Africans. Dissections were performed on 29 adult South African cadavers in the Anatomy dissection halls at the Sefako Makgatho Health Sciences University. The aortic arch and its branches were cleaned via blunt dissection, the branches were traced into the neck noting the presence or absence of the thyroid Ima artery. When present, the origin, course and supply of the thyroid Ima was noted. The thyroid gland was also exposed and its blood supply was identified and vessels were traced to their origins. Only one cadaver (1/29) presented with a thyroid ima artery, 5.93 mm in diameter and 18.43 mm in length, suggesting a prevalence of 3.40 % in this South African sample. The TIA originated from the brachiocephalic trunk as commonly described in the literature. Due to the unpredictable location, morphology, and relative rarity, as well as variations in nomenclature, knowledge of the thyroid Ima artery may preventhaemorrhage during head and neck surgeries.

A22: Anatomical Basis for Preoperative Embolization of Intracranial Meningiomas: A Retrospective Chart Review.

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Meningiomas are described as intracranial, extra-axial tumours arising from the arachnoid cap cells of the meninges. Due to the vast expanse of the meninges, variation in its clinical presentation varies. Treatment of this pathology involves surgical resection of the tumour. Preoperative tumour embolisation has proven to reduce blood loss during resection, however, misidentification of the vascular territory may lead to various post-operative complications such as cranial nerve palsies. The present study aimed to investigate the anatomy of intracranial meningiomas, referred for preoperative embolisation at the Inkosi Albert Luthuli Central Hospital, South Africa. Patient demographics, Magnetic Resonance Images and Digital Subtraction Angiography images were utilized to analyse the study's objectives. We report a high incidence of meningiomas in the female population with a smaller tumour volume in relation to males. The supratentorial region was noted to harbour most meningiomas. Regarding the blood supply, the internal carotid arteries were noted to be the primary

feeders in the skull base region whilst the left external carotid artery was noted to be a primary feeder in the supratentorial region. The results from this investigation provided insight into the variable anatomy of intracranial meningiomas within a select South African population. Key outcomes from this study support the female predisposition for meningiomas along with the high incidences of meningiomas in the supratenorial region. Further research should be carried out as a comparative study in patients that were not referred for preoperative embolisation.

A23: An evaluation of the anatomy related to the IPACK block: a cadaveric study

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The infiltration of the interspace between the popliteal artery and capsule of the knee (IPACK) block, is a novel ultrasound-guided technique used for postoperative pain management after total knee arthroplasty. The success of the block is attributed to the spread of injectate between the capsule of the knee and the popliteal artery. This new regional analgesic technique is believed to target the articular branches of the tibial, common fibular (peroneal) and obturator nerves in the popliteal region. However, the anatomical structures and relationships relevant to this block is still unclear. The objectives of this study was to identify the anatomical borders, bony landmarks and neurovascular structures relevant to performing the IPACK block. Using embalmed cadavers, the IPACK block interspace was dissected to evaluate the borders, muscular and neurovascular structures related to the block. The following anatomical structures are relevant to the IPACK block, irrespective of patient positioning, probe orientation or the needle insertion point. Bony landmarks included the shaft, lateral and medial condyles of the femur, as well as the patella. The posterior capsule of the knee contributed to the ligaments landmark. The muscular landmarks included the muscular borders of the popliteal fossa, as well as the sartorius, vastus medialis and rectus femoris muscles. The neurovascular structures included the popliteal vessels, the tibial, common fibular (peroneal) and obturator main trunks, including the superior tibial, inferior tibial, posterior common fibular (peroneal) and posterior branch of the obturator nerves. This study augments to the few cadaveric studies looking into the anatomy related to the IPACK block.

A24: Elastic and load biomechanics of the tendinous and capsular layers of the rotator cuff complex.

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Modern publications describe the rotator cuff (RC) muscle tendons as forming a singular insertion across the tuberosities, consisting of both tendinous and capsular portions. Orthopaedic surgeons are thus now considering these two layers in their surgical and treatment plans. This study therefore aimed to test and compare the elastic modulus and peak load of both tendinous and capsular layers of supraspinatus (SS), infraspinatus (IS) and subscapularis (SC). Fourteen (n = 14) fresh/frozen arms were reverse dissected at the area of interest and the RC muscles were trimmed to 2 x 2cm strips and separated into the two macroscopic layers. An Instron 1342 was used to place the samples under tensile testing till failure (Newtons/N). Accompanying cameras captured images for full-field strain measurements through digital image correlation. SS, IS, and SC tendinous layers yielded higher average elastic moduli readings (72.34 MPa, 67.04 MPa, and 59.61 MPa respectively) compared to their capsular components (27.38 MPa, 32.45 MPa, and 41.49 MPa respectively). Similarly, the

tendinous layers for SS, IS and SC showed higher average loads to failure (252.74 N, 356.27 N and 385.94 N, respectively) when compared to the capsular layers (211.21 N, 168.54 N and 281.74 N, respectively). These biomechanical variations need to be taken into account during surgical repair as repairing them as one singular structure may place the tough and weaker elastic capsular layer under more strain than the stronger tendinous layer, possibly resulting in re-tear complications or reduced postoperative patient satisfaction. Thus, based on the results, surgeons are implored to consider and repair each layer independently for better postoperative biomechanical integrity.

A25: Descriptive anatomical study of the dorsalis pedis artery for use in clinical and surgical procedures.

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The dorsalis pedis artery (DPA) is the main blood supply of the dorsum of the foot. It branches into the lateral and medial tarsal arteries; arcuate artery; second to fourth (II – IV) dorsal metatarsal arteries; first dorsal metatarsal artery; and the deep plantar artery. Clinicians use the DPA for evaluations of foot pulses; hence the absence of pedal pulsation may suggest the presence of peripheral arterial/vascular disease (PAD/PVD), which may lead to increased risks of infection and ischaemia. The DPA is also used as flaps for plastic and reconstructive surgical repairs across regions of the body. These procedures are carried out for treatments of infections & traumas; ankle surgeries; and at times eye socket & palm repairs; as well as bypass grafts for salvaging ischaemic limbs in diabetic patients. Although variations of the DPA have been reported, focus has been on comparing branching patterns observed without translating the research into clinical practice. This study aims to provide a detailed description of the DPA and its branches for translation into clinical and surgical practice. One hundred and fourteen (114) formalin-fixed cadavers (55 males; 40 females; 19 unknowns; 68.42 ± 18.29 years) were bilaterally dissected at the Department of Anatomy, University of Pretoria. Dissections were performed on the course of the anterior tibial artery until it continues as the DPA, thus dividing into its branching pattern on dorsum of the foot. Relation of the artery to bony structures were noted and measured. Variations in the origin, course, and branching pattern of the DPA have been vastly reported in literature. The lack of knowledge of the anatomy of the DPA and its variations may lead to misdiagnosis of various diseases and conditions, thus resulting in unsuccessful procedures, as the success of these procedures is dependent on how well the artery is vascularized. The artery itself may be vulnerable to injuries during surgical procedures such as arthroscopy, reiterating the need for more research on the anatomy of the DPA and its branches. In some cases of the current study with regards to variations, the anatomy observed was like that described in the literature; while measurements investigated were similar to literature reports that describes the position of the DPA as situated slightly lateral on the ankle. The results of this study will add to the knowledge base of the literature and assist future studies that investigates the DPA and its branching pattern. This knowledge will also assist angiographers and surgeons in correctly and accurately planning procedures using physical palpation and interpreting imaging of the DPA.

A26: A quantitative analysis of craniofacial dysmorphology in anterior synostotic plagiocephaly using computed tomography.

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Anterior synostotic plagiocephaly (ASP) is caused by the premature fusion of one coronal suture, which results in severe craniofacial asymmetry that could be challenging to correct. This study used preoperative computed tomography (CT) scans to document and compare the morphometry of the anterior cranial fossa (ACF), orbit, and ear on the ipsilateral (synostotic) and contralateral (non-synostotic) sides in a select cohort of South

African patients with ASP. The dimensions of the ACF, orbit and the position of the ear on the ipsilateral and contralateral sides were measured using a set of anatomical landmarks on two-dimensional (2D) CT scans of 18 consecutive patients diagnosed with non-syndromic ASP. The differences between the ipsilateral and contralateral sides were computed and expressed as a percentage of the contralateral side. All ACF parameters significantly decreased on the ipsilateral side when compared to the contralateral side, resulting in the volume of the ACF being the most affected (-27.7%). In terms of the orbit, on the ipsilateral side, the length-infraorbital rim (IOR), height, and surface area parameters significantly increased, with the height being the most affected (24.6%). The remaining orbital parameters (length-supraorbital rim (SOR), breadth and volume) significantly decreased, with the length-SOR parameter being the most affected (-10.8%). The ipsilateral ear was displaced anteriorly (9.33mm) and caudally (5.87mm) from the contralateral ear. These measurements may help surgeons during corrective surgery by indicating the degree of the asymmetry on each side, making it easier to plan the technique and extent of surgical correction of the affected craniofacial features.

A27: Human Decedent Identification Unit: Trialling disaster victim identification processes during the COVID-19 pandemic.

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Beginning in 2020, a national state of disaster was declared by the South African government in response to the COVID-19 pandemic. The implemented alert level restrictions or "lockdowns" impacted the Johannesburg Forensic Pathology Services Medico-legal Mortuary by creating a backlog in the collection and recording of primary and secondary identifiers and the burial of unidentified decedents. The Human Decedent Identification Unit addressed the backlog by implementing a trial run of the unit's disaster victim identification procedures. The disaster victim identification process was assessed over six sessions to identify the turn-around-time and formulate the optimal team structure. Participants completed a questionnaire to highlight the encountered obstacles and shortcomings of the processes. Participants (N=21) included forensic pathology officers (n=3), forensic scientists who are University of the Witwatersrand academic and technical staff (n=4) and postgraduate forensic science students (n=14). A total of 128 unidentified decedents were processed by the unit, at an average of 7.5 bodies per hour. The ideal time limit for each identification shift was determined to be three hours; thereafter, fatigue impacted productivity. The ideal team structure included 19 individuals; comprising two photographers, five dry assistants, nine wet assistants, and three forensic pathology officers. Obstacles to the processes included the effects of decomposition, available workspace, moving of bodies, and variations in the duties of each participant. The trial-run of the disaster victim identification process has facilitated the creation of a more robust and effective identification process that can be implemented in a future mass disaster scenario.

A28: The use of decision tree analysis in age estimation: an example.

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New statistical methods for the improvement of age estimation in human skeletal remains are continuously explored to improve its accuracy and reliability. This study explored decision tree analysis using data from a previous study performed on age estimation from the acetabulum. It serves as an example on how to employ decision tree analysis, as well as test the accuracy of the statistical method on age estimation from the acetabulum. The raw data was analysed using the pruned tree function of WEKA, a statistical program developed specifically for data mining and machine learning. A decision tree was built using the complete sample of 100 black South African males, with ages ranging from 16 to 96 years. An additional 25 black males were then

selected and scored according to the criteria used in the original study, which included seven variables. The estimated age ranges using the decision tree were then compared to the actual ages. Twenty of the 25 individuals (80%) were classified into the correct age group, while the remaining five were misclassified by one age range. The results show a more accurate outcome as compared to the use of transition analysis employed in the original study where only two of the five point-estimates were closely related to the actual age. This statistical method is also user-friendly, as it allows an easy stepwise approach towards an estimated age range using multiple variables.

A29: Human skeletal remains from Cathkin Peak rock shelters (South Africa): recent results.

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In the early 20th century, several skeletons were excavated from various rock shelters in the uThukela region of the Drakensberg. Few details of these are now available and the remains were not studied comprehensively before. Here we report on nine of these graves (eight of which contained human remains), excavated during 1931 near Cathkin Peak. The remains are now housed in the Raymond A. Dart Archaeological Human Remains Collection, Wits. Radiocarbon-dating yielded dates between the 14th and mid-17th centuries for most individuals. One was older and dated to the 7th - 9th centuries. The remains included adults of both sexes and children. This indicates that these rock shelters were used for burials and possible occupation over a long period. The individuals were buried in a sitting position in stone corbelled structures made of flat stone slabs. Many had signs of disease and trauma, attesting to the hardships living in this region of South Africa. Stable isotope analyses suggested a plant-based diet with very limited consumption of animal-derived foods. Previously it was thought that these individuals represented the historic amaZizi people, however, radiocarbon dates indicate that most lived during the Moor Park phase of the Blackburn branch, which predates the amaZizi by several decades. One individual even predated the Moor Park phase. This is significant and sheds some light on the timing of the movement of people from KwaZulu-Natal into the interior. Ancient DNA analysis is awaited which will provide more information on the origin and genetic relationship of these individuals.

A30: Three-dimensional Facial recognition: A Forensic Anthropology Research Centre (FARC) Survey.

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Facial reconstruction aims to recreate a likeness of an individual's face at the time of their death. Different two-dimensional (2D) and three-dimensional (3D) manual or computer-aided facial reconstruction techniques have been developed for this purpose. However, compared to 2D and 3D manual methods, 3D computerised facial reconstruction methods could be more beneficial for forensic anthropologists by allowing the faster, easier, and more efficient generation of multiple representations of an individual. Therefore, it is fundamental to investigate the reliability of the data that will be further generated and used for 3D facial recognition. This study aimed to determine whether we can recognise a person from a 3D surface representation. A sample of 30 consenting participants from the University of Pretoria were used. The research project involved 3D surface scanning using the EinScan H Hybrid LED and Infrared Light Source Handheld Colour 3D Scanner (EinScan, n.d.) and photography in a non-invasive and standard manner of the participants face. A survey was then generated and disseminated on the Forensic Anthropology Research Centre

(FARC) social media pages to 157 respondents. Participants' photographs were shown and then hidden to the respondents before selecting the corresponding 3D representations among a pooled sample. The findings demonstrated that 85.8% of the respondents were able to identify the 3D scan representations correctly. This research indicates that the data generated by 3D computerised facial reconstruction methods are reliable and can be used for facial recognition purposes.

A31: Does mathematical complexity of adult age-at-death estimation using multiple skeletal indicators improve results?

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Achieving both acceptable accuracy and precision when calculating adult age-at-death estimations from the skeleton remains challenging. As a result, mathematical methods used to produce age-at-death estimations have become increasingly complex. This study compared results from a mathematically complex method - Bayesian analysis - with a phase-based averaging method and linear regression analysis to analyse whether more complex methods produced better results. Data were collected from 330 skeletons housed in the Raymond A. Dart Collection of Human Skeletons and the Pretoria Bone Collection. An additional 30 skeletons were analysed as a hold-out validation sample to test the mathematical methods developed. Combined and separate sex models were created to account for any sex differences. The three mathematical models were evaluated for bias, inaccuracy and precision. The averaging method performed particularly well, achieving small mean intervals of between 8 and 11 years while simultaneously maintaining accuracies between 75 and 85%. The regression analysis method also achieved small mean intervals of

between 8 and 11 years, but accuracy obtained was between 19 and 43%. Finally, the Bayesian method achieved mean intervals of between 18 and 21 years, but only produced accuracies of between 19 to 31%. Thus, the regression analysis method as well as the averaging method consistently outperformed the Bayesian analysis method when assessing both accuracy and precision. This indicates that the additional computational power and mathematical complexity required for Bayesian analysis did not produce corresponding improvements in the age-at-death estimates.

A32: Normative facial capulometric measurements in a black South African population.

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The face is important for both functional aspects and fundamental social interactions, as well as being the means by which a person is recognised. Facial disfigurement may be caused by several conditions, including congenital deformities, trauma, and infection or cancerous lesions. Rehabilitation for optimal outcomes by means of surgical, orthodontic and/or prosthetic treatment, and guidelines for forensic facial approximations rely on and population specific standards which are inadequately documented for the South African population. The purpose of this study was to generate population specific capulometric measurements for inter-landmark distances on a sample of 91 cone beam computed tomography (CBCT) scans (male n = 49 and females n = 42; ages 18 – 87). The surface of the face was visualised, and twenty-four anatomical landmarks were identified on each face using MevisLab 3.0.2 software. Inter-landmark distances were calculated using Matlab with the Meshmonk toolbox. Intra- and interobserver errors for landmark placement were calculated by computing the measurement errors (ME) for each individual landmark followed by summary statistics and t-test. Good

repeatability was found with the mean intraobserver ME (0.57±0.41 mm) and the mean interobserver ME (0.76±0.55 mm). No statistically significant differences were observed between sexes for the mouth width or eye fissure length, with mean distances recorded as 53,84±0,44 mm and 26,19±0,30 mm respectively. However, significant differences between sexes (p≤0.05) were observed for most nasal parameters. The results of this study validate the need for population specific and within population sex specific guidelines for facial approximations.

A33: Effects of *Boophone disticha* extract on the histomorphometry of the intestines of the male Balb/c mouse model of depression.

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Bulbs infusions of *Boophone disticha* (BD) are used in South African traditional medicine to treat several neuropsychiatric conditions and illnesses that include anxiety and depression due to its affinity for the serotonin transporter. However, there is a lack of information regarding the toxic or therapeutic effects of BD on the histomorphometry of the intestines. We investigated the effects of the hydroethanolic extracts of BD, on the ileum and duodenum of the male BALB/c mouse model of depression. Fifty-six male BABL/c mice were used in the current study. Animals were subjected to either five days forced swimming stress model or 28 days chronic restraint stress model. Animals were then treated for 21 days with either 10mg/kg BD extract or fluoxetine. The effects of the hydroethanolic extracts of BD on the height of the villi, thickness of the muscularis externa and the number of goblet cells were measured in H&E-stained slides using image J software. In addition, the thickness of the collagen fibre bundles in the submucosal layer was measured in Masson's trichrome stained slides. *Boophone disticha* attenuated the effects of acute stress on the thickness of the submucosal collagen fibre bundles, and the number of goblet cells of the duodenum and ileum. In chronic stress, BD treatment attenuates the effects of stress in the muscularis externa of both the duodenum and the ileum. We conclude that BD attenuates the effects of acute and chronic stress on the small intestines in a manner and mechanisms similar to the conventional medication fluoxetine.

A34: *Boophone disticha* attenuates effects of swimming stress on behaviour and neuroblast differentiation in Balb/c mouse hippocampus.

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Depression is one of the most common neuropsychiatric disorders and has been associated with alterations in neuroendocrine system and specific brain proteins. *Boophone disticha* is an indigenous psychoactive bulb that belongs to the Amaryllidacae family, which is widely used in Southern Africa and has been reported to exhibit potent antidepressant-like effects. The present study attempts to examine the antidepressant effects of *Boophone disticha* and its underlying mechanisms by measuring behaviour, brain content of corticosterone and brain derived neurotropic factor (BDNF), and neurobalst differentiation in the hippocampus of balb/c mice exposed to the five days repeated forced swim stress (5dRFSS). Male balb/c mice were subjected to the 5dRFSS protocol to induce depressive-like behaviour. *Boophone disticha* treatment (10mg/kg/p.o for 3 weeks) significantly reversed the 5dRFSS -induced behavioural abnormalities (decreased swimming, increased floating, decreased open arm entry, decreased time spent in the open arms and decreased head dips) and the elevated serum corticosterone levels observed in stressed mice. Additionally, 5dRFSS exposure significantly decreased the number of neuroblast in the hippocampus and BDNF levels in the brain of balb/c mice, while *Boophone disticha* treatment attenuated these

changes. The antidepressant effects of *Boophone disticha* were comparable to those of fluoxetine, an established anti-depressant. However, unlike fluoxetine, *Boophone disticha* did not show any anxiogenic effects. In conclusion, our study shows that *Boophone disticha* exerted antidepressant-like effects in 5dRFSS mice, mediated in part by normalizing brain corticosterone and BDNF levels.

A35: Testicular effects of methanolic leaf extract of *Combretum molle* following D-galactose treatment.

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The use of herbal medicines has increased tremendously over the last decade. Currently, the efficacy and safety of these herbs are evaluated in different research fronts. *Combretum molle* (C. molle) is an African traditional herb commonly used in the treatment of diabetes, hypertension and abdominal discomfort. Despite its various uses, knowledge of its effect on male reproductive functioning is limited. This study investigated C. molle's effects on testicular tissue by inducing aging in Sprague Dawley rats using D-galactose. Fifty rats grouped into five were injected subcutaneously for 90 days with D-galactose (150mg/kg/day) and oral gavage of *Combretum molle* (500mg/kg/day). Connective tissue, cellular profile and general histopathology was assessed using Hematoxylin & Eosin, Mallory Trichrome and Periodic Acid Schiff's. Quantification of parameters was measure using stereology and morphometric on Image J software. Levels of Testosterone were evaluated using ELISA kit. The results showed thinning of the basement membrane, widened interstitial space and irregular seminiferous tubule shape in D-galactose treated rats. C. molle treated rats showed minimum or no tissue damage. 90 combination treatment with D-galactose and C. molle revealed extensive tissue damage in comparison to 45 days treated group. The testicular epithelial height was maintained in all groups however, stanning intensity, Sertoli cell number, Leydig cell number and spermatid

presence differed. The results suggest that testicular damage following D-galactose treatment could be ameliorated by C. molle and could be used as adjuvant in D-galactose age-related treatments.

A36: Characterization of Prefrontal Cortical Synaptic Plasticity in Orchidectomized Insulin-Resistant Adult Male Sprague-Dawley Rats.

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There is little scientific evidence to show that low testicular or plasma testosterone levels increases the risk of diabetes, metabolic syndrome and neurodegeneration. This study examined the cellular changes that occur in the pre-frontal cortex of androgen deprived insulin-resistant adult male Sprague-Dawley rats as well as the plasma glucose, nitric oxide, testosterone and insulin levels. Presumably healthy male rats (n=6) weighing 200g averagely were fed with rat pellets and water *ad libitum,* and acclimatized for 2 weeks before the commencement of the study. 18 of the animals were orchiectomized and randomly assigned into six groups A, B, C, D, E, and F. Group A, Control (non-orchiectomized, only received normal feed and water, no treatment); Group B, orchiectomized rats only (no treatment); Group C, non-orchiectomized rats treated with 0.38ml stock solution containing 10mg of Flutamide; Group D, non-orchiectomized rats treated with 0.76ml stock solution containing 20mg of flutamide; Group E, orchiectomized rats treated with 0.38ml stock solution containing 10mg of flutamide; and Group F, orchiectomized rats treated with 0.76ml stock solution containing 20mg of flutamide. The rats were treated daily for 30 days with flutamide (orally) and 14 days after the ORX (orchiectomy) surgery. The brains were excised and fixed in 4% paraformaldehyde. Brain tissues were processed for histology, biochemical and immunohistochemical studies. Tissues were stained with Haematoxylin and Eosin for general cytoarchitectural demonstration;

Periodic-Acid-Schiff (PAS) for glycogen in tissues and the Glial fibrillary acid protein (GFAP) for glial cell activity were demonstrated. Androgen deprivation therapy results in low serum concentrations of testosterone. Implying that the development of insulin resistance, type 2 diabetes and other related metabolic syndromes be possible. Also, a significant increase in body weight, serum glucose, nitric oxide, and insulin levels, as well as a significant decrease in the plasma testosterone levels of treated rats when compared with control were observed. The administration of flutamide inhibited the production of testosterone which in turn affects protein synthesis, thereby causing neurons of the pre-frontal cortex to degenerate in the rat. In conclusion androgen deprivation resulted in insulin resistance and neurodegeneration in the rat.

A37: *Aspalathus Linearis* (Rooibos) and its bioactive compounds attenuate MPP[+]-induced toxicity in an *in vitro* Parkinson's disease model.

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Parkinson's disease (PD) is a neurodegenerative disease that progresses with age and its major symptoms include tremor, postural and movement-related difficulties. Hitherto, the treatment of PD remains a challenge as available drugs only treat symptoms or cause deleterious side effects which necessitates new treatment options. Rooibos tea is a highly consumed beverage with several medical properties, and it is endemic to the Western Cape Province of South Africa. The current study investigated the neuroprotective effects of *Aspalathus linearis* (Rooibos) and its bioactive compounds aspalathin and linearthin, using the standard *in vitro* model of PD involving 1-methyl-4-phenylpyridinium (MPP[+]) toxicity on SH-SY5Y neuroblastoma cells. The effects of the total extract as well as aspalathin and linearthin were evaluated on cell viability, neuroprotection, levels of reactive oxygen species (ROS), adenosine triphosphate activity (ATP) and caspase 3/7 activity in SH-SY5Y cells using various assay kits. Results obtained showed that pre-treatment with the extract, aspalathin and linearthin effectively protected SH-SY5Y cells from MPP[+]-induced neurotoxicity by inhibiting ROS generation, ATP depletion as well as apoptosis induction triggered by MPP[+]. To our knowledge, this is the first study on the neuroprotective effects of rooibos and its bioactive compounds in a PD model. These findings support the numerous anecdotal claims that drinking rooibos tea is beneficial for ameliorating neurodegenerative diseases.

A38: Aqueous leaf extract of *Camellia sinensis* enhanced human sperm functions in vitro.

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Infertility, defined as inability to conceive following one year of unprotected sexual intercourse, respectively affects 15% and 31.3% of couples in Africa and globally. Oxidative stress has been greatly associated with the idiopathic cause of infertility and *Camellia sinensis* contains antioxidants that may enhance reproductive functions. In this study, the effects of *Camellia sinensis* on human sperm functions were determined. Objectives: To determine the effect of *Camellia sinensis* (green and black tea) on sperm vitality, motility, mitochondrial membrane potential (MMP), reactive oxygen species (ROS), capacitation and acrosome reaction (CTC), and DNA fragmentation and to compare effects between normal and abnormal human spermatozoa. Methods: Semen samples (n= 59) collected from donors, were liquefied, analysed and classified as normal (n=40) and abnormal (n= 19) using the WHO criteria. Samples were washed and exposed to aqueous leaf extracts of green and black tea (0, 0.4, 4, 40, 405 μg/ml) for 1 hour and respective sperm parameters were analysed (sperm motility, vitality, MMP, CTC, ROS and DNA

fragmentation). Results: Both green and black tea significantly increased vitality, and intact MMP, while it significantly reduced, CTC, intracellular ROS and fragmented DNA in both normal and abnormal samples compared to the control (p > 0.05). Conclusion: Camellia sinensis improved human sperm function in vitro and may be attributed to its antioxidant activity.

A39: **The bioaccessibility of encapsulated polyphenols following *in vitro* digestion.**

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Polyphenols are known for their therapeutic benefits however their use in therapies is limited by poor stability and bioavailability. Encapsulation has been shown to improve polyphenol bioavailability. This current study aimed at exploring the encapsulation of three polyphenols (catechin (CAT), gallic acid (GA), and epigallocatechin gallate (EGCG)) in beta-cyclodextrin alone and in combination using the lyophilisation method to potentially improve bioactivity following digestion. This was achieved by encapsulating the polyphenols, then encapsulation was characterised and thermal and storage stability of encapsulated samples was assessed. Samples were then subjected to simple and complex *in vitro* digestion, and the antioxidant, antiglycation and anti-inflammatory activities were subsequently quantified. Inclusion complexes were formed with high encapsulation yield and efficiency. Encapsulated samples showed a change in morphology. Encapsulation improved stability for some samples. Encapsulation did not improve antioxidant activity following *in vitro* digestion. An exception was seen with the antiglycation activity where some free samples had higher activity relative to encapsulated counterparts, however, encapsulated EGCG exhibited increased antiglycation activity relative to free EGCG. Following simple digestion, free GA lost cellular antioxidant activity while encapsulated GA was not affected. Encapsulation improved nitric oxide (NO) scavenging of non-digested and simple

digested GA. All samples inhibited NO production in lipopolysaccharide stimulated murine macrophages (RAW 264.7). Encapsulation did not improve the NO scavenging and inhibition activities following *in vitro* digestion. In conclusion, beta-cyclodextrin formed 1:1 inclusion complexes with polyphenols and exhibited potential for improving the physicochemical properties as well as bioactivity of the polyphenols following digestion.

A40: Protective effects of *combretum molle* leaf extract against d-galactose induced liver and kidney injury.

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Context Oxidative stress and inflammation are implicated in the aging process and its related to hepatic and renal function decline. The free radical theory of aging suggests that there is a single basic cause of aging, modified by genetic and environmental factors, such as the free radical reaction involved in aging and age-related disorders. *Combretum molle* has been reported to be rich in a variety of free radical scavenging molecules such as phenolic compounds and other endogenous metabolites which are rich in antioxidant activity. In the present study, we investigate the protective effects of *combretum molle* leaf extract against D-galactose induced liver and kidney injury of the adult male Sprague Dawley rats. The aging model was established through daily subcutaneous injections of D-galactose (150mg/ml/kg dissolved in 0.9% saline, at 2ml/kg body weight every day) for a period of 90 days. Histological analyses of liver and kidney were done by haematoxylin and eosin staining. The oxidative stress markers and pro-inflammatory cytokines in the liver and the kidney were measured. Results significantly showed the increase of superoxide dismutase, catalase, and malondialdehyde levels and decreased glutathione content in the liver and kidney (p <0.05). Improvements in liver and kidney were also noted in histopathological studies. *Combretum molle* reduced tumour necrosis factor-α and interleukin-1 protein

levels in the liver and kidney in d-gal mice (p <0.05). Conclusion findings suggest that *Combretum molle* attenuates D-gal-induced induced liver and kidney injury and that, this protection may be due to its antioxidative and anti-inflammatory activities.

A41: Hippocampal volumetric and apoptotic cell changes after atripla and alcohol co-administration in low protein fed *Sprague Dawley* rats.

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Increase of pyknotic cells and shrinkage of the hippocampal formation has been reported in HIV-infected persons placed on HAART medication. The above effects have also been seen in alcohol abuse, which is also prevalent in HIV infected patients. Additionally, malnutrition is a persisting public health problem that has also been shown to cause reduction in number of hippocampal neurons of HIV infected patients. The aim of the current study was to determine the effects of co-administration of Atripla and alcohol in the volume of the hippocampal formation and neurogenic activity of low protein fed *Sprague Dawley* rats. Four groups of male adult *Sprague Dawley* rats were treated for 90 days with either Atripla only, Atripla and alcohol, alcohol only, or distilled water as a control. The brains of the animals were harvested at the end of the treatment period, stained with cresyl violet and giemsa stains and mounted. Volumes of the dentate gyrus (DG), granule cell layer (GCL), pyramidal cell layer (PCL) and cornu ammonis (CA) were measured. Apoptotic cells were counted in the GCL. Co-administration of alcohol and Atripla caused a significant reduction in the volumes of DG and CA, while a slight reduction was seen in the GCL and PL. The apoptotic cells significantly increased in the Atripla only group. Co-administration of alcohol and Atripla caused a none significant increase in the apoptotic cell count. In conclusion, this study showed that co-administration of alcohol and Atripla has more deleterious effects on the DG and CA.

A42: Student perspectives of a virtual journal club in Anatomy.

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Higher education was rapidly forced into the online sphere during the COVID-19 pandemic. The anatomy journal club, compulsory for the BSc Honours programme, aims to improve scientific writing and critical appraisal skills. As journal club depends upon collaborative learning, a synchronous format was considered appropriate, with an additional platform for asynchronous discussion. The aim was to develop and implement an online journal club and investigate students' perceptions of this format. The literature was searched in an evidence-based approach to designing the online journal club. Students were approached regarding their access to devices and internet connection. A hybrid model involving fortnightly synchronous Microsoft Teams meetings with an asynchronous platform (WhatsApp group) was implemented. Student perceptions were investigated with open-ended questionnaires (2020 cohort) and semi-structured interviews (2021 cohort) after ethical approval (N20/05/056). Responses were analysed with Braun and Clarke's thematic analysis approach. The themes that developed were virtual format and content, and community of practice, with sub-themes of knowledge, time, challenges, positive experience, social interaction, and mentoring. Students adapted rapidly and enjoyed the virtual journal club, finding the content applicable to their studies.

Minor challenges were experienced, including internet connectivity and lack of social cues, including body language. The educational benefits of journal club were retained in the online environment, with students adapting rapidly to the new format and forming a community of practice. Online journal clubs can be considered as a replacement or adjunct to in-person meetings, provided that they are designed according to resources available to the members.

A43: Integrating Virtual Reality to Enhance Remote Teaching of Anatomy during the Covid-19 Pandemic.

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Due to the COVID-19 pandemic, unparalleled challenges have emerged in medical education, necessitating a global paradigm shift in the teaching of human anatomy. Most institutions transitioned from traditional in-person teaching methods, to distance learning (DL) strategies. Since virtual reality (VR) is a promising tool to deliver immersive three-dimensional experiences, this study investigated students' experiences regarding the capacity of VR to support DL of anatomy. Using the VR application, 3D Organon (Queensland, Australia), and HTC VIVE Pro headset (Taoyuan, Taiwan), anatomy instructors recorded learning content and interactions as 360-degree videos. These videos were integrated into the teaching material of the first-year Abdomen, Pelvis and Perineum Course and delivered as synchronous learning sessions, with live voice-over by the instructor. A 19-item 5-point Likert scale questionnaire, comprising of two major categories, was disseminated to the first-year undergraduate medical student cohort (n = 52). Post-evaluation analysis revealed a response rate of 63.5%. Cronbach's alpha was noted be 0.92, that of which is higher than the accepted threshold of 0.7. In the categories "VR experience in anatomy lessons" and "VR in anatomy lessons vs. traditional cadaveric dissection", more than 50% of responses were within the agree-strongly agree continuum for 8 out of 11 items and 2 out of 8 items, respectively. The study revealed that VR-integrated lessons achieved session learning objectives and augmented one's own learning experience. Although VR offers limitless access to learning environments, that are not confined to time nor place, students preferred cadaveric dissection when a comparison of learning resources was posed.

A44: Students' perceptions on a survey of strategies used in teaching and external factors affecting the learning of Anatomy at a South African institution.

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Over the years, numerous students have indicated that they struggle with the studying of Human Anatomy. A survey-based study was undertaken to determine whether students perceived that the strategies implemented by the Anatomy department of a South African health sciences university, were effective or not. We also set out to determine the external factors that influenced the learning of Anatomy. An online quantitative survey was used to evaluate the effects of different teaching strategies and external factors on the learning of Anatomy as perceived by students. Health sciences students who had studied Anatomy in 2018 and/or 2019 from three different degree programs were included. Students perceived practical lectures and cadaver dissections as the most effective strategies in improving their learning and understanding of Anatomy. Practical lectures provide students with an opportunity to manipulate and visualize anatomical structures while being taught, which assisted students recall their knowledge on what was taught during the lecture. Cadaver dissection is perceived to be one of the most effective strategies to learn the practical aspect of Anatomy according to our results and published literature. Visiting the Anatomy museum was identified as the least effective strategy. This could, however, be attributed to students not utilising this study resource. The

external factor identified to affect student learning most was strikes/protest actions. This study indicated that students perceived practical lectures as the most effective strategy in learning Anatomy. Students reckoned that they were not affected by most of the external factors listed.

A45: **QuPath Edu – Use of open-source digital microscopy in histology teaching for medical students.**

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QuPath is bioimage analysis tool that was originally designed for research purposes, especially in the field of digital pathology (https://qupath.github.io/). However, because of QuPath's open architecture and versatility we have adapted QuPath for education. QuPath has been used as teaching tool at the University of Oulu Medical Faculty since 2018, gradually developing features adapted for teaching purposes. So far, the system has been used to teach 800 medical and dentistry students. We are aiming to publish the QuPath Edu extension during 2022. QuPath Edu is a free teaching tool that can be used both by teachers and students to support basic learning as well as for advanced image analysis. QuPath Edu supports a guided learning experience for students and facilitates groupwork in histology practices. Teachers can build annotations as guided tours around the slide, as multiple-choice questions or as shorter or lengthier explanations about the structures. QuPath Edu has a rich text editor that supports the addition of links and images in the description of the slide to provide additional information. QuPath Edu can be built for use on individual computers (from a hard drive), within a local network or for remote use from a cloud service. However, the operation of QuPath Edu in its current form on web browsers or on mobile devices is limited.

A46: The Relationship Between Prosthetic Design and Patient Psychology: Navigating Human and Technological Identity.

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Amputation refers to the removal of a certain limb which may need to be performed as a result of direct trauma, illness and or disease. The surgical field of prosthetics was established in order to replace a removed limb with that of an artificial limb, in order to restore or mimic initial functionality and to help improve a wearer's quality of life. However, the process of adjusting to wearing a prosthesis may negatively impact a wearer's psychological state. Few studies have been conducted in South Africa that investigate the preferences, expectations and experiences of prosthetic limb wearers in relation to prosthetics. Based in design practice, this study considers the visual evolution of prosthetic aesthetics from earliest-known examples to contemporary art and design investigations. Informed by 'technoself studies' (Luoppicini, 2013), 'transhumanism' (Huxley, 1968) and 'cyborgism' (Haraway, 2006) and their relation to prosthetics, qualitative analysis of primary research (semi-structured interviews with amputee patients, doctors and prosthetic manufacturers across South Africa, n = 35) is presented, to inform patient-centric prosthetic design solutions for the South African context. Findings show that the psychological feedback of amputee patients plays a critical in the manufacturing and design process of prosthetic devices, thus confirming the hypothesis of the study: patient psychology does influence prosthetic design.

A47: A retrospective analysis of fatal ground level falls and falls from a height: A 5-year review.

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Falls have been identified as the second leading cause of accidental deaths in the world

and are a public health issue. Depending on the manner and height at which a fall occurs, different injury patterns are observed, and these may be useful for the determination of circumstances surrounding death. The aim of the present study was to determine the demographic characteristics, prevalence and injury patterns associated with ground level falls and falls from a height. A five year (1 January 2014 - 31 December 2018) retrospective review of fatal fall cases investigated at Salt River mortuary was conducted. Salt River Mortuary services the Western Metropole of the City of Cape Town. The prevalence and patterns of injuries were assessed with regard to fall height, impacting surface and victim demographics. There were 360 fall related deaths during the period, corresponding to a fall prevalence of 3.72/ 100 000 population. Ground level falls were prevalent among the elderly while younger individuals fell from greater heights. There is an association between the sex of an individual and height from which they fall. Accidental falls were more common, and no association was found between the alleged manner of death and sex. Skeletally, a higher frequency of fractures was observed in ground level falls while the head, chest and pelvis were affected in the high-level falls. additionally, an association was observed between injuries sustained and fall heights. There is a significant difference in fracture proportions between the heights in the pelvic and lower extremities and no significant difference in head, spine, chest and upper extremities. Bilateral fractures were more common in falls from a height. This study presents data on injuries sustained in fatal falls, which adds to the growing body of literature to assist in assessing circumstances surrounding death.

A48 Neurophobia: A side effect of neuroanatomy education.

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Neuroanatomy in the medical curriculum tends to be challenging for both lecturers and students. Students and lecturers perceive the relevance and importance of neuroanatomy differently. If not taught sufficiently, students develop a dislike or fear (termed neurophobia) for the subject. This fear prevents them from being receptive to the teaching and consequently applying the neuroanatomy knowledge in the clinical environment. Information in South Africa regarding neuroanatomy in the medical curriculum is scarce and inconclusive. This study explored the attitudes and perceptions of neuroanatomy lecturers towards the relevance of neuroanatomy, as well as its teaching techniques and approach, in the medical curriculum. In a cross-sectional qualitative study, neuroanatomy lecturers from the nine South African medical schools were invited to complete an anonymous online questionnaire, to determine whether the lecturers' teaching approach and attitudes could be a contributing factor to neurophobia. Fourteen lecturing staff from seven medical schools participated and most respondents are professional anatomists
and one a clinician. The respondents classified themselves as either proficient or experts in their neuroanatomy teaching experience. All the respondents acknowledged that neuroanatomy is important in their students' medical training. Themes emerging from the data indicated that only a few respondents deem it necessary to modernize or adapt their teaching approaches to be more suitable for the 21st century student. A lecturer's perceptions and attitude towards the subject or
content, greatly affect the facilitation approaches and techniques used. This might have far- reaching consequences for students as it might impact on their attitude towards the content.

A49: Relationship of the pterion with the anterior branch of the middle meningeal artery in South African Population.

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The pterion is an important cranial landmark located at the junction of the greater wing of sphenoid, frontal, parietal, and squamous part of the temporal bones. The localization and shape of the pterion and its relation to the middle meningeal artery (MMA) and its

branches have been extensively studied because of its topographical significance in pterional surgical approaches and interventions. In addition, the relation of the anterior branch of the MMA makes it prone to rapture from fractures in the pterion region and bleeding during pterion burr-hole procedures. The aim of this study was to record the relationship of the anterior branch of the MMA to the pterion in dry skulls of South African (SA) Population. 100 dry human skulls were used. Four types of pterion formation were observed, the sphenoparietal (79.5%), frontotemporal (14.5%), stellate (4%) and epipteric (2%). The pterion was predominantly found anterior to the lateral edge of the sphenoid ridge (63%). The center of the pterion laid 12.74mm in males and 11.79mm in females to the spheroid ridge. Anterior branch of MMA laid directly over the center of the pterion in 5.5% cases with an average distance of 7.21mm on the right and 7.28mm on the left side. The high prevalence of the sphenoparietal type in this study agrees with the previous studies in different population groups. Although the anterior branch of the MMA lied on a similar average radius on the right and the left side, there are considerable differences between the types of pterion.

A50: The incidence of arterial variations in upper limbs in a sample of South African Population.

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There is no consistency regarding the incidence of the upper limb arterial variations across different population groups. Variable percentages of the incidence of variant branching patterns have been reported to reach up to 25%. There is evidence that there are population differences in the arterial branching patterns. While it is known that population differences exist in the arterial branching patterns, there are not enough reports on the upper limb arterial variations in the South African Population (SAP). The current study aimed to record the incidence of the variations of the upper limb arteries in the SAP. Fifty upper limbs of 25 cadavers from the department of Human Anatomy at Sefako Makgatho Health Sciences University were dissected. Normal and variant branching patterns of the axillary, brachial (BA), radial (RA) and ulna arteries were recorded. We recorded lateral thoracic artery originating from subscapular artery (SA) in 16% cases; Superficial subscapular artery (34%); common trunk for anterior and posterior (PCHA) circumflex humeral arteries (20%); common trunk for SA and PCHA (4%); tortuous BA (4%); tortuous RA (4%); median artery (2%); high bifurcation of BA (4%) and superficial course of RA running on the roof of the anatomical snuff box (4%). Arteries that take a superficial course can be mistaken as veins in drug administration. While the incidence of variation of the upper limb arteries has been recorded to go up to 25% on average, 80% of upper limbs dissected in this study showed variations, suggesting high incidence in the SAP.

A51: Assessing measuring accuracy amongst µCT, CBCT and CT images for application of 3D cochlear models.

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Scanning machines that provide high-resolution images, such as micro-computed tomography (µCT), are not viable options to be used on living cochlear implant (CI) recipients. Therefore, it was necessary to compare the accuracies between different imaging modalities; µCT, cone-beam computed tomography (CBCT) and computed tomography (CT) imaging used to reconstruct recipient-specific three-dimensional (3D) models of the cochlea in a clinical setting using an established 73-point anatomical landmark map. This was accomplished by scanning both the left and right sides of four formalin-fixed embalmed cadaver heads using different imaging modalities; µCT (MIXRAD scanner), CBCT (Planmeca ProMax® 3D) and CT (Philips, Siemens and Toshiba) scanner machines (n =

36). The 73 landmarks were then digitally marked on each of the scans. This allowed for the comparison of accuracy and reliability among the imaging modalities by analysing unprocessed measurements, followed by the analysis of processed (derived) measurements obtained from the UPCochlea custom software. Quantifying the measurement error on clinical images such as CT and CBCT relative to the standard provided by high-resolution μCT images provides a mean to assess the level of inaccuracy that may be present in 3D reconstructions of the cochlea that are based on clinical images. It was found that scanning machines which provide the highest quality and reliability of images are μCT scanning followed by CBCT and CT scanning. However, CBCT and CT nevertheless provide sufficient reliability and accuracy in the more applied use of a clinical setting, provided the data is processed using UPCochlea software.

A52: A geometric morphometric study on shape variations in the auditory matrices of South African populations.

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Information on how to reliably reconstruct the ear for craniofacial approximation is limited. This study aims to assess variations and correlations in the shape of the ear and underlying hard-tissues. Fifty capulometric and 43 craniometric landmarks were placed on reconstructed Cone Beam Computed Tomography (CBCT) scans of 40 black and 76 white South Africans between the ages of 18 and 90 years of age. A further 559 semi-landmarks were also placed along the external auditory meatus (EAM) and midface curves. Strong positive correlations were observed between the soft-tissue ear and EAM ($r^2 > 0.7$). The ear was also tested for correlations against other facial features, with strong positive correlations observed between shapes of the ear and orbit, mid-facial matrix, and nose. Both hard- and soft-tissue auditory matrices showed statistically significant asymmetry (p-value = 0.007). Statistical analysis revealed highly significant variation in ear shape between groups for population affinity (p-value = 0.001), while sex and age were only significant between white South Africans (p-value < 0.05). Population affinity also significantly influences shape in the EAM (p-value = 0.001). Variations between groups indicate a need for population-specific databases for estimating the shape of the ear in South Africa. When estimating the shape of the ear, other facial features and the influence of population affinity should be considered. Understanding how these factors influence ear shape can allow for increasingly accurate methods to estimate ear shape during facial approximations in South African reconstructive surgery.

A53: Understanding the effects of rehydration on the rate of decomposition.

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Rainfall has been reported to have a great effect on decomposition rates and, the timing of rainfall can both increase and decrease these rates. Researchers have observed that carcasses exposed to rainfall may re-initiate decomposition in desiccated tissue. However, no conclusive research exists on the effects of rehydration on decomposition patterns. Therefore, the aim of this research was to assess the effects of rehydration on the rate of decomposition. Twelve adult pig carcasses (40-100kg) were set out to decompose in the central Highveld of South Africa and the decomposition rates were scored, three times a week, to obtain the Total Body Score. Once the nine experimental carcasses had reached stasis in the advanced phase of decomposition for three weeks, they were artificially rehydrated with spring water from a watering can, and the decomposition rates were further followed. Analysis of the data indicated changes in the pattern and rate of decomposition between the control and experimental groups. The rehydrated carcasses showed re-initiation of decay, along

with insect re-colonization while the control carcasses stalled in advanced decomposition. It was also noted that the experimental group displayed greater cadaver decomposition islands. Preliminary results indicate that rehydration does increase the rate and change the pattern of advanced decomposition. Further research to understand how rainfall/rehydration impacts decomposition patterns and invertebrate colonization will further our understanding of the effects of these environmental factors on the accuracy of the post-mortem interval estimation.

A54: The association between skeletal lesions and tuberculosis in a South African sample.

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Skeletal tuberculosis (TB) is the extra-pulmonary manifestation of *Mycobacterium tuberculosis* infection and occurs in a significant percentage of all TB cases. The aim of this study was to assess the sensitivity and specificity of skeletal lesions to accurately diagnose TB in a pre-antibiotic South African skeletal sample. For this purpose, the presence / absence of 23 skeletal lesions were assessed on 436 skeletons from the Raymond A. Dart Collection of Human Skeletons. These skeletons were divided into three groups: individuals where TB was recorded as cause of death (n=177), individuals where other pulmonary diseases were recorded as cause of death (n=109) and individuals where a variety of diseases, excluding TB and other pulmonary diseases, were recorded as causes of death (n=150). Chi-squared and Fisher's Exact tests were used to assess differences between groups. The skeletal lesions' respective sensitivities and specificities were calculated and compared to a similar study by Dangvard Pedersen et al. (2019). Lesions on the ventral surface of thoracic and lumbar vertebral

bodies were observed significantly more in TB cases than in controls. This lesion type was also found to be the most valuable indicator with a high sensitivity and 55% probability of a true TB diagnosis if observed. An association between skeletal lesions and TB could only be found for rib and vertebral lesions. The results suggest that TB-related changes are likely to be observed in many individuals in a South African skeletal sample, even when they were not documented to have died of the disease.

A55: Isolated Left Vertebral Artery Terminating in the Posterior Inferior Cerebellar Artery in South African Patients.

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The right and left vertebral arteries supply approximately 24% of total brain blood flow volume in adult individuals. The vertebral artery is segmented into four parts, and each of the segments of the artery has associated morphologic variation. The variation in origin, level of entering the transverse foramen, tortuosity, fenestration, and hypoplasia has been reported. However, the incidence of isolated left vertebral artery terminating in the posterior inferior cerebellar artery is rare. Isolated left vertebral artery terminating in the posterior inferior cerebellar artery has been identified as a risk factor for rotational vertebral artery syndrome, lateral medullary infarction, stroke, or transient ischemia attack. We report on two isolated left vertebral arteries terminating in the posterior inferior cerebellar artery observed in two male patients examined by multidetector computed tomography angiography. The ipsilateral vertebral arteries are hypoplastic and enter the transverse foramen at an atypical level. Imaging the entire course of the vertebral artery from the origin to the point of convergence to form the basilar artery may be necessary to decide a treatment strategy for

interventions in the vicinity of the vertebral artery. Details of clinical sequelae in this case report will contribute to the necessity of studying the prevalence of this variation in patients with cerebrovascular events. Knowledge of anatomical variation will help interpret preoperative images and analyze potential consequences of intentional arterial occlusion during endovascular procedures and open repair surgeries.

A56: An anatomical investigation of the suboccipital- and inferior suboccipital triangles.

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The suboccipital triangle (ST) is a clinically relevant landmark in the posterior aspect of the neck and is used to locate and mobilize the horizontal segment of the third part of the vertebral artery before it enters the cranium. Unfortunately, this space is not always a viable option for vertebral artery exposition, and consequently a novel triangle, the inferior suboccipital triangle (IST) has been defined. This alternative triangle will allow surgeons to locate the artery more proximally, where its course is more predictable. The purpose of this study was to better define the anatomy of both triangles by measuring their borders and calculating their areas. Ethical clearance was obtained from the University of Pretoria (Ref: 222/2021) and both triangles were subsequently dissected out on both the left- and right sides of 33 formalin-fixed human adult cadavers. The borders of each triangle were measured using a digital calliper and the areas were calculated using Herons Formula. The average area of the ST is 969.82 mm^2 (SD = 153.15 mm^2), while the average area of the IST is 307.48 mm^2 (SD = 41.31 mm^2). No statistically significant differences in the findings were observed between the sides of the body, ancestry- or sex of the cadavers. Measurement and analysis of these triangles provided important anatomical information and speak to their clinical relevance as surgical landmarks with which to locate the vertebral artery. Of particular importance here is the IST, which allows for mobilisation of this artery more proximally, should the ST be occluded.

A57: A morphological study of the angle of inclination of the acromioclavicular joint in a cadaveric sample.

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The acromioclavicular (AC) joint is an important link between the axial skeleton and the upper limb. The AC joint is associated with sports injuries in the superior aspect of the shoulder region. Knowledge of the complex anatomy of the AC joint is imperative in planning and constructing successful treatment of the AC joint injuries. Therefore, this study measured the angle of inclination and ligament angle to in order to note population specific differences that may exist. A total of 32 (n =32) shoulders and 240 (n = 240) clavicles were used to measure the ligament angle and angle of inclination of the AC joint, respectively. Cadavers (n = 16) were bilaterally dissected, and the AC ligament was exposed, and an image take. For the osteological component, images of the acromial end of the clavicle were taken. Images of the AC joint area and the superior view of the dry clavicles were taken and added into the Paint application, lines were drawn. The same images were added into the ImageJ programme, this allowed for measurement of the angles using the angle tool. The mean for the ligament angle was documented as 22.3º ± 13.1º (Range: 9.0º - 51.8º). The mean for the angle of inclination was noted as 49.6º ± 10.0º (Range: 12.4º - 75.1º). The direction of fibres of the AC ligament were not perpendicular to the AC joint surface. The fibres ran obliquely across the joint surface. The current study found no statistically significant difference between the different sexes, ancestry groups, and different sides of the same cadaver when comparing the ligament angle.

A57: Relationship between the quadriceps muscle attachment and the microstructure of the patella in baboons and humans.

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Given the ability of bony tissues to adjust structurally to loading environments, variation in trabecular bone has been investigated for assessing joint loading and thus inferring locomotor behaviours in fossil hominins. Although the patella is important in knee biomechanics, in palaeoanthropology its analysis has frequently been limited to few features compared to detailed studies commonly conducted on the distal femur and proximal tibia. This study aimed to determine the relationship between the microstructure of the patella and the associated muscle attachments by analysing two living primates with different locomotor behaviour, terrestrial bipedalism versus terrestrial quadrupedalism. An osteological sample of 16 human and 10 baboon individuals were scanned using high resolution X-ray tomography to analyse the trabecular bone using the region of interest approach. Cadaveric specimens (lower limbs) of 4 humans and 4 baboons were dissected to record sites and extent of attachment of muscles on the patella. Human individuals showed a significantly higher lateral trabecular bone fraction (TBF) than the medial TBF and the average extent of attachment of the vastus lateralis muscle on the lateral border of the patella was larger in humans than in baboons. In baboons, the medial TBF was higher than the lateral TBF. These findings suggest that the microstructure of the patella may proof useful in deciding whether the individual was a bipedal or a quadrupedal. The trabecular bone in the core of the human and baboon patella adapts to the load created by the extent of the quadriceps tendon attachment and different locomotor behaviours.

A58: A morphometric analysis of select cranial ventricular access points in scaphocephalic patients.

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Due to varying cranial morphologies, ventricular access in patients with craniosynostosis using conventional techniques is often a challenge. Although ventricular access may not be frequently required in scaphocephalic patients, it is vital that an ideal location of the access points be established for safe ventricular catheterization. This study aimed to document the morphometry of commonly used ventricular access points, i.e. Kocher's and Frazier's points, within a select South African scaphocephalic population. The craniometric dimensions of Kocher's and Frazier's points were measured relative to anatomical and craniometric landmarks on pre-operative computed tomography scans of 24 consecutive patients diagnosed with scaphocephaly between 2014 and 2020. The results were compared against age, sex, population group and the degree of severity. Kocher's point was located between 91.6mm and 140mm posterior to the nasion, and between 20.5mm and 34.6mm lateral to the midline. Statistically significant increases were reported in the mean distance posterior to nasion between patients in the <1 year and older age groups (>1-<9 years) (ANOVA, $p<0.001$; post-hoc, $p=0.001$; 0.001; 0.002); and in the mean distance lateral to the midline (ANOVA, $p=0.004$), between patients in the <1 year and 3-<6-year (post-hoc, $p=0.002$) and 1-<3-year and 3-<6-year (post-hoc, $p=0.030$) age groups, respectively. Frazier's point was located between 60.9mm and 82.8mm superior to the inion, and 25.9mm and 41.4mm lateral to the midline. The study concluded that the traditional landmarks used for ventricular access are relatively unreliable in scaphocephalic patients and provides novel morphometric data for neurosurgical consideration regarding ventricular catheterization procedures in scaphocephalic patients.

A59: An anatomical investigation into the anastomotic veins of the superficial cortical venous system.

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Knowledge of the anatomy of the three anastomotic veins (AV), *viz.* superficial Sylvian vein (SSV), vein of Labbe (VL) and vein of Trolard (VT), of the superficial cortical venous system are imperative for neurosurgical procedures. These veins are reported to be in haemodynamic balance; therefore, anatomical variations compromising safe sacrifice of these veins could lead to post-operative complications. However, a significant paucity in literature regarding anatomical variations of these veins exists. Therefore, this study aimed to investigate the anatomy of the superficial AV to determine incidences of variations of dominant AV. Two hundred lateral angiograms (n=200) that depicted left and right cerebral hemispheres were analysed. Presence of the VL had the highest occurrence (96.5%), whereas the SSV and VT had an occurrence of 75.5% and 64.5%, respectively. Furthermore, presence of double veins of the AV was documented: SSV (12.0%), VL (22.0%) and VT (19.5%). This study also reports novel presence of a triple vein for each AV. Diameters for the SSV, VL and VT were 1.99±0.500mm, 2.18±0.579mm and 2.14±0.472mm, respectively. Seven types of variant dominant patterns were recorded. The Equilibrium configuration had the highest occurrence (54.5%), followed by the co-dominant pattern of VL/VT (28.0%). Results of this study provide insights on variations encountered within a select South African population and would be beneficial to local clinicians by providing a reference framework. Furthermore, the novel variations reported adds to the information surrounding the anatomy of the AV and can be clinically applied in surgical approaches to lesions at the skull base.

A60: Anatomy of the deep branch of ulnar nerve in a sample of South African Population.

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The ulnar nerve is a terminal branch of the medial cord of the brachial plexus from the ventral rami of the spinal root values C8 and T1. It bifurcates into the superficial sensory and deep motor branch distal to the pisiform bone as it enters the hand. In the hand, the deep branch supplies adductor pollicis (ADP) and first dorsal interosseous (FDI) first web muscles of the hand that are often affected by spasticity, requiring selective neurectomy of ulnar nerve branches, an area that is poorly studied due to its complexity. This study aimed to describe the anatomy of the deep branch of ulnar nerve in the sample of South African Population. Forty hands of 20 cadavers from the department of anatomy of Sefako Makgatho Health Sciences University were dissected. The distances from the bistyloid line, and from the pisiform bone to the point of entry of the deep ulnar nerve branch between the two heads of the ADP muscle were measured, and the twigs of the deep branch to the FDI, the transverse and oblique heads of the ADP muscles were dissected and counted. The number of twigs to each muscle ranged from 1 to 4. 47.5% of muscles were innervated by one twig, while 52.5% had more twigs. The average distances from the bistyloid line and pisiform bone were 57.11 and 45.63mm respectively. Our results suggest that selective neurectomy of the deep ulnar nerve branch might paralyze first web muscles for the majority of the South Africans.

A61: Anatomical variation of the cubital veins in a South African sample.

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The superficial cubital veins are commonly used to obtain venous blood for analysis, transfusions, insertion of intravenous drips, venipuncture as well as health testing

procedures. These superficial veins are often visible through the skin and its venous pattern is highly variable. The cubital veins are formed by the connection with the cephalic and basilic veins. The aim of this study was to identify and describe the variations in the venous arrangement of the cubital veins in a South African sample and to determine the most common venous pattern observed in this sample. Superficial dissections were performed on 27 adult South African cadaver forearms. The skin was reflected, and the superficial veins dissected out in order to observe and describe the venous arrangement of the cubital vein. Three variations were detected in the venous arrangement of the cubital veins in this sample. The most common type was the "N" variation (51,9 %), followed by the "M" variation (33,3%) with the third variation, where the median cubital vein had a deep connection with the brachial veins which accounted for 14,8% of the variations. Although the median cubital veins are known to be highly variable in its venous arrangement, the most common variation, the "N" variation, was noted as the most common variation type, similar to Northwest Ethiopians. Knowledge of the variation in the venous arrangement of the cubital veins are of clinical importance as various procedures, which include venipuncture, is routinely performed in the cubital area.

A62: **Thoracic limb myology of the South American Tapir (*Tapirus terrestris*).**

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Tapirus terrestris (South American tapir), is an herbivorous land mammal belonging to the Perissodactyl order. Although capable of moving across various terrains and adaptable to diverse habitats, the South American Tapir is classified ecologically vulnerable due to human activity. Understanding the anatomical variations of *Tapirus terrestris* is important to guide genetic preservation and protect primitive traits of this vulnerable species. This study documents the morphology of the thoracic limb musculature in a South American tapir and compares findings to *Equus caballus* (domestic horse). Dissection of one (n=1) right thoracic limb in a two-year-old *Tapirus terrestris* specimen, was conducted in 2021, in the Department of Anatomy and Physiology, University of Pretoria, South Africa. The specimen was donated by a private game reserve in Pretoria. The Animal Ethics Committee of the University of Pretoria, and the South African Department of Agriculture, Land Reform and Rural Development approved this study, with waiver of an exclusion criteria. We report a total of n=30 (n=4 superficial brachial and n=26 deep brachial and antebrachial) thoracic limb muscles in *Tapirus terrestris.* All four (n=4) superficial brachial muscles and 24/26 (92%) deep brachial (n=12) and antebrachial (n=12) muscles were comparable in the South American tapir and the domestic horse. Obvious differences in antebrachial muscles were observed, with a well-developed pronator teres and presence of the brachioradialis in the South American tapir. Despite the known comparable anatomy in Perissodactyls, this study shows variation in the thoracic limb myology of the South American tapir and the domestic horse.

A63: Myology of the thoracic limb of the African lion (Panthera leo).

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The African lion (Panthera leo) is a cooperative hunter, and the powerful thoracic limbs are used to bring down prey. Thoracic limb myology of big cats has recently been documented in the cheetah (Acinonyx jubatus), and information for the African lion is in the form of sketches for artists. Two thoracic limbs from lions (culled on a private game farm) were studied. Prior to dissection, the lions were embalmed in the field and stored in 10% neutral-buffered formalin. Thoracic limbs were removed in a previous study, rinsed in water, skinned and the muscles described and removed. The bones were boiled, defatted, and muscle attachments described. Fascia is prominent in the whole limb. Muscles of the shoulder and brachium are stout and fleshy. Rotators of the antebrachium are well-developed. Carpal and digital flexors have

more fleshy interconnections and are more pronounced than the extensors. The deep digital flexor tendon in the carpal canal is broad, flat and reinforced with cartilage. P3 lies parallel and lateral to P1 for digits 2-5 and the common digital extensor muscle additionally inserts on the base of P2. The marked oblique angulation of the claws and the strong supinators would enhance the ability to hook and grab prey. Fleshy muscles provide power, however, would not sustain prolonged activity in such a heavy animal. The broad, reinforced tendons in the carpal canal would support carpal hyperextension. The characteristics noted in this study support the thoracic limb functions of stalking and grabbing prey.

A64: Pelvic limb myology of the South American tapir (Tapirus terrestris)

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The South American tapir (Tapirus terrestris) is one of four extant tapir species that, together with equine and rhinoceros' species, belongs to the Perrisodactyla order. This tapir, also known as the Brazilian tapir, is a herbivore and well adapted to swimming and diving. It is the largest indigenous terrestrial mammal in the Amazon and its numbers are in decline due to poaching and deforestation. The pelvic limb myology of tapir species has not been described previously. One Brazilian tapir, that originated from a private game farm, died from a chronical bacterial infection. A full post-mortem was performed and thereafter one pelvic limb was donated for this study. The limb was immersion fixed in 10% neutral-buffered formalin. The pelvic limb muscles were dissected and described. Relevant ethical approval was obtained. The tapir possesses three digits, similar to the rhinoceros. Very thick
skin and fascia is present over the entire pelvic limb. Proximally, the muscles are very fibrous and similar in arrangement to equine species. Distally, the muscles are fleshier. The axial and abaxial digits (II and IV) are extended by tendon slips from the M. extensor digitorum

longus while the middle digit (III), which bears the majority of the animal's weight, is extended by the M. extensor digitorum brevis muscle only. The thick skin and fascia are thought to play a role in the weight bearing capacity of the limb. Knowledge on the myology
of the pelvic limb may aid wildlife workers when dealing with an injured tapir.

A65: Anatomical Variations of the Profunda Femoris Artery and its Circumflex Branches: A Cadaveric Study.

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The profunda femoris artery (PFA) is a branch of the femoral artery (FA). The PFA gives off two branches: the medial circumflex femoral artery (MCFA) and lateral circumflex femoral artery (LCFA). Knowledge of the anatomical variations of the PFA may aid surgeons performing reconstructive, vascular, and plastic surgeries in the area of the upper thigh and hip, as well as when interpreting scans. This study aims to describe the morphology and morphometry of the PFA, LCFA, and MCFA and their variations. Forty formalin fixed human lower limbs were dissected at UCT's Department of Human Biology. Ethical clearance was granted via UCT Body Donor Program. The PFA, LCFA, MCFA were observed. Morphometric measurements were taken. Variations in the position of the PFA, origin of the PFA and origins of the MCFA and LCFA were noted. Statistical analysis was done based on sex and laterality. In 98.5% of cases, the PFA originated from the FA. The orientation of the origin of the PFA from the FA were categorized into 5 types. The mean diameter of the PFA was 6mm. In 58.7% of cases the MCFA originated from the PFA and in 71% of specimens the LCFA originated from the PFA. The distance between PFA origin and the middle inguinal point was on average 44mm on the left and 41mm on the right side. Knowledge of the anatomical variations of the PFA, LCFA, and MCFA may be helpful in surgical and diagnostic procedures, and possibly reduce intraoperative and postoperative complications.

A66: Application of the bioarchaeology of care framework A case study from Northern Cape, South Africa.

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In bioarchaeology, there has been a growing interest in exploring aspects of health-related caregiving in attempting to reconstruct the social environment of past societies. A four-step, individual-centred, methodological framework called 'bioarchaeology of care' (BoC) aims to support research in this regard. However, no published research to date has applied it within a South African context. This case study applied the first two steps of the BoC framework to the skeletal remains of a San woman from 19th century Northern Cape, South Africa, showcasing an interesting cranial pathology. By doing so, the study aimed to diagnose the condition(s) and infer the possible impact (if any) this may have imposed on the individual during life. A morphological evaluation, as well as morphometric and radiographic (CT and Lodox technology) analyses, were conducted to provide a comprehensive report on the cranial pathology. A differential diagnosis revealed the presence of multiple conditions from the skull, including generalised osteoporosis, biparietal thinning, platybasia and basilar invagination. Basilar invagination may possibly have impacted this woman during life, potentially causing neurological and/or musculoskeletal complications, perhaps rendering her dependent on others in her community to some degree. This research has demonstrated the value of radiographic technology for the evaluation and diagnosis of pathological conditions in bioarchaeology. It also contributes to our understanding of rare and poorly characterised conditions documented in archaeological human remains and reveals aspects of this woman's life story that were previously unknown and serves as a foundation for future research wishing to expand on her BoC analysis.

A67: The applicability of the anatomical method for stature estimation in White South African males.

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The anatomical method is widely considered the most accurate method for the estimation of stature, regardless of sex and population-affinity. Recent research has, however, concluded that sex- and population-specificity may apply to the soft-tissue correction factors associated with this method. Therefore, the aim of this study was to evaluate the applicability of the anatomical method for stature estimation of White South African males. The measurements of the bones that directly contribute to stature were collected from 30 full-body MRI scans of White South African male volunteers, and were summed to calculate their total skeletal height and estimate stature using various soft-tissue correction factors. Paired t-tests were run to assess the accuracies of these estimates compared to the measured stature of each individual. The soft tissue correction factors of Fully (1956), Raxter and colleagues (2006), and Brits and colleagues (2017) significantly underestimated the stature of White South African males by 6.14, 4.80, and 0.96cm, respectively, while Bidmos and Manger's (2012) soft-tissue correction factors significantly overestimated the stature of this group by 9.65cm. Cloete's (2017) soft tissue correction factors overestimated stature by 0.65cm, however this was not significant. A soft-tissue regression equation was generated for the stature estimation of White South African males, to improve the accuracies associated with the anatomical method. Results suggest a population-specificity for the soft-tissue correction factors associated with this method. The regression equation by Cloete (2017), or the newly derived equation are recommended for the estimation of stature of White South African males when using the anatomical method

A68: Introduction: Changes in pH and electrical conductivity of soils underneath decomposing.

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Carcasses have been suggested to be useful in minimum post-mortem interval estimations and locating carcass deposition or burial sites. However, no studies exist on the impact of carcass decomposition on soil pH and electrical conductivity in Africa. Here, we investigated the impact of decomposing carcasses on the pH and electrical conductivity of the underlying soil in the Western Cape Province of South Africa. Furthermore, we investigated the changes in the pH of the carcass skin and larval mass(es) established in/on each carcass. Materials and Methods: Six (6) neonate pig carcasses [two (2) for each summer month investigated] were used for the study duration (December, January, and February). The pH and electrical conductivity of both carcass and control soils were measured using the ThermoScientific Multimeter (Orion Star A329). Similarly, carcass skin and larval mass(es) pH were measured in situ using the same device. In all the trials, carcass soil pH and electrical conductivity significantly differed when compared to the control. Carcass soil pH and electrical conductivity increased as decomposition progressed. Likewise, carcass skin pH increased as decomposition progressed. The larval mass(es) pH was mostly above neutral, indicative of an alkaline environment, and most likely a major contributor to the observed environmental and carcass pH changes. This study is the first in Africa to demonstrate locally relevant patterns of decompositional pH and soil conductivity change that have significance for estimation of the minimum post-mortem interval in forensic death investigations.

A69: A novel search method for the recovery of skeletal remains scattered by animals.

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Skeletal remains of forensic interest are often scattered by scavenging animals in South Africa. The effectiveness of forensic anthropological analysis depends on the holistic recovery of all surviving skeletal elements. The grid search method, an archaeological method, is commonly used to recover remains that are scattered but it is a time-consuming process. This study developed guidelines for a novel link search method, which relies on scavenging knowledge and adapting the search direction based on scavenger ques in the environment. The effectiveness and efficiency of the grid and link search methods were compared. The scatter pattern of black-backed jackals (*Canis mesomelas)* and slender mongooses (*Galerella sanguinea*), which are scavengers of forensic interest, were recreated using four pig skeletons. Two search groups, a link method group and a grid method group, independently recovered the scattered remains for each animal scatter pattern using their assigned search method. The time taken to recover each skeletal element and the total search time was recorded for each group and compared using a chi-squared test. Both methods successfully recovered all skeletal elements. There was no statistically significant difference in the duration of each search method; however, the link search method took half the time to recover the remains and is a more practical method for forensic investigations, which are time sensitive. Guidelines for the link search method were formalised into a standard operating procedure. The link search method is recommended for use in the recovery of forensic anthropological cases that have been scattered by animals

A70: Hyoid Bone: A morphometric and morphological analysis in the Black South African population of KwaZulu-Natal.

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The hyoid is a 'U' shaped bone, located on the anterior aspect of the neck, between the mandible and thyroid cartilage. This bone exhibitions morphological and morphometric characteristics that may aid in the estimation of age, sex and race of an individual. The present study aimed to investigate the morphological and morphometric parameters of the hyoid bone in a Black South African population of KwaZulu-Natal. The morphological and morphometric parameters of the 40 hyoid bones obtained from the Department of Clinical Anatomy, University of KwaZulu-Natal were classified in accordance with Deepak *et al*. (2013). Ethical clearance was obtained from the Biomedical Research Ethics Committee (BE366/19). In this study, 35% and 70% of hyoid bones were 'U'- shaped and 65% and 30% were 'V'- shaped in males and females, respectively. Furthermore, this study recorded a statistically significant relationship between the shape of the hyoid bone and sex. With regard to the morphometry, the width of the hyoid bone was greater in males than females; however, the length of the hyoid bone was greater in females than males. This study concludes that these results may contribute to the existing knowledge on the morphology and morphometry of the hyoid bone and may assist forensic procedures.

A71: Understanding the effects of rehydration on the rate of decomposition.

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Rainfall has been reported to have a great effect on decomposition rates and, the timing of rainfall can both increase and decrease these rates. Researchers have observed that carcasses exposed to rainfall may re-initiate decomposition in desiccated tissue. However, no conclusive research exists on the effects of rehydration on decomposition patterns. Therefore, the aim of this research was to assess the effects of rehydration on the rate of decomposition. Twelve adult pig carcasses (40-100kg) were set out to decompose in the central Highveld of South Africa and the decomposition rates were scored, three times a week, to obtain the Total Body Score. Once the nine experimental carcasses had reached stasis in the advanced phase of decomposition for three weeks, they were artificially rehydrated with spring water from a watering can, and the decomposition rates were further followed. Analysis of the data indicated changes in the pattern and rate of decomposition between the control and experimental groups. The rehydrated carcasses showed re-initiation of decay, along with insect re-colonization while the control carcasses stalled in advanced decomposition. It was also noted that the experimental group displayed greater cadaver decomposition islands. Preliminary results indicate that rehydration does increase the rate and change the pattern of advanced decomposition. Further research to understand how rainfall/rehydration impacts decomposition patterns and invertebrate colonization our understanding of the effects of these environmental factors on the accuracy of the postmortem interval estimation will further.

A72: Decomposition of buried piglet remains during the warm and cold seasons of South Africa's Highveld.

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Due to South Africa's high homicide rate, there is a proportionately high incidence of clandestine graves across the country. Despite this, research into the effects of burial upon a body's decomposition are limited locally.

Knowledge on variables that may affect a buried body, allowing bodies buried in different conditions to be contrasted against each other, may assist in providing more accurate post-mortem intervals. Therefore, this study aimed to compare the effects of different soil types on piglet decomposition, as well as the effects of seasonality in South Africa. Additionally, the possibility of using Accumulated Degree Days as a tool to determine post-mortem interval in a buried environment was investigated. Five piglet carcasses were buried in plastic containers filled with one of three soil types which are common in the Johannesburg area (quartzite, dolomite, and mine tailing). They were partially exhumed at regular accumulated degree intervals to document their decomposition score, and soil samples were taken to record changes in soil pH and water content to see if these would affect the observed trends. While the rates of decomposition were very similar across all soil types during the summer, there were several points of deviation during the winter period. Furthermore, the piglets buried in mine tailing soil also exhibited several atypical decomposition patterns during the winter period.

A73: Development of a correction factor for Greulich-and-Pyle estimated bone age in a South African sample.

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Bone age, an indication of the rate of skeletal maturation relative to the chronological aging process, is consistently underestimated in South African studies. Accurate bone age estimation is contingent on the population-specific agreement between bone age and chronological age. The study aimed to establish and quantify the reliability of the Greulich-and-Pyle method in a South African sample. The bone age of a sample of 80 X-rays of the left hand and wrist of healthy individuals aged 0-19 years, were estimated using the approach advocated in the Radiographic Atlas of Skeletal Development of the Hand and Wrist (1959). Bland-Altman and multilinear regression analyses were used to assess the agreement between bone age and chronological age and to produce a correction factor, respectively. No agreement was found between chronological age and bone age in both females (p-value: 0.013) and males (p-value: 0.012). Nonetheless, a multilinear regression model revealed that chronological age and sex could reliably predict bone age (R^2: 0.904; p-value: 0.000), with the appropriate correction coefficients (chronological age: 0.876; sex: -0.330; constant: 4.267). The lack of agreement between estimated bone age and chronological age in South African children may result in an inaccurate depiction of skeletal maturation. This has serious clinical repercussions in endocrine disorder diagnosis and orthopaedic corrective surgeries. The accuracy of this frequently used bone age estimation method could potentially be improved with the correction factor, which encompasses the sample-specific relationship between the two variables. This correct factor, however, requires further investigation for validity and reliability.

A74: Anatomy students' opinions on online anatomy education during the Covid-19 pandemic at Stellenbosch University.

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With the emergence of the Covid-19 pandemic, it is difficult to predict if the "golden standard" of teaching anatomy with cadavers would be possible in the unforeseeable future. This has forced traditional anatomical teaching and learning practices to be transitioned to remote online platforms. This study explored the opinions of anatomy students, on their online learning experience of anatomy during the Covid-19 pandemic. A mixed methods approach to a descriptive, exploratory study was conducted, by means of an online survey. The survey consisted of a six-point

Likert scale and was assembled into four categories. Likert scale options ranged from; strongly agree to strongly disagree. An optional open- ended question provided at the end of each category allowed for further opinions. Results obtained appear to tally with expectations, for room to improve online practical teaching. Virtual classes were simple to navigate with few technical difficulties experienced. Students reported to have adapted well to remote learning environment, however, feel need for improved practical teaching. Theoretical course content, course duration and platforms for communication were of a satisfactory standard. Students noted having access to enough study material, videos, and additional online material. However, majority of students felt disadvantaged by the lack of cadaveric exposure and practical teaching. This research therefore highlighted the effects of the pandemic on the modality of anatomy education and how it affected students. Although anatomy is multi-modal, it can be concluded that it is possible to achieve academic success by using online learning methods.

A75: Resource choice and methods adopted for e-learning purposes by anatomy students (during the Covid-19 pandemic).

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The purpose of this study included the observation of student adoption of anatomy-related and open-source e-learning tools during the Covid-19 pandemic. A total of 236 students (medical science and medical students) from the University of Kwa-Zulu Natal participated in the questionnaires. Students answered regarding their use of purely anatomy-related e-platforms (e.g. Software such as Pocket Anatomy) (61%), and open-source content platforms (e.g. YouTube) (95.75%). With regards to purely anatomy-based resources, majority of students indicated the use of Clinical Key to obtain e-textbooks (45.8%), and mostly used Pocket Anatomy as their chosen software package (15.7%). However, overall, in terms of anatomy-specific modalities, students mostly made use of Learning Management Systems (89.8%). In terms of open-source platforms, a great proportion of students (99.2%) utilized a search engine for their learning, 80.5% of students refer to a Google search when seeking anatomy information. YouTube was found to be the mostly used (30.1%) social media platform and being the most preferred (14.1%) e-learning resource overall to access anatomy. The overwhelming proportion for the use of open-source platforms provide insight into the preferred functionality a student expects from a knowledge hub, inclusive of the ability to global search a topic, and receive different levels of explanation based on the content creator (pure academics, field based or opinionated). A further necessary observation includes the use of multiple approaches by students, who would use a combination of anatomy and open-source resources to learn content. The functional requirements and user interface preferred by students provide insight for the platform development required.

A76: A preliminary study on the effect of binge-alcohol consumption on the adolescent Sprague Dawley rat mandible development.

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Binge alcohol exposure during adolescence affects bone structure and development. Previous literature indicates a decrease in trabeculae, a disturbance in cortical parameters and a reduction in bone density. However, there is a dearth of information regarding the effect of binge-drinking on the adolescent skeleton and more specifically on the craniofacial structures. The current pilot study, therefore, aimed to determine the impact of binge-drinking on the growth and functional integrity of adolescent rat mandibular bone morphology. The study design consisted of 7-week-old male Sprague Dawley rats (n=8) which were placed into 4 groups (n=2 per group): A1:1-week alcohol-exposed rats (acute-binge drinking), C1:1-week pair-fed control rats, A4:4-week alcohol-

exposed rats (chronic-binge drinking), C4:4-week pair-fed control rats. Groups A1 and A4 received 1.5g/kg of a 20% (vol/vol) ethanol solution 3 times a week for 1 and 4 weeks respectively via oral gavage. Groups C1 and C4 received an isocaloric equivalent of maltose dextrin in the same manner as A1 and A4. Groups A1 and C1 were terminated after 7 days and groups A4 and C4 after 28 days. The mandibles were dissected, and the following parameters analysed: trabecular parameters using Micro-Focus X-ray Computed Tomography and Volume Graphics Studio® software, mandibular osteometric measurements, bone strength testing (Shimadzu universal testing machine), cytoarchitecture (hematoxylin and eosin staining), and alkaline phosphatase expression by osteoblasts (immunohistochemistry). Results showed a decrease in some osteometric measurements, and slight changes in the periosteum, trabeculae, and bone morphology which may clinically affect facial aesthetics, contribute to airway problems, cause complications with lack of space in dentition, and affect implant stability. However, this data needs to be verified in a larger study population.