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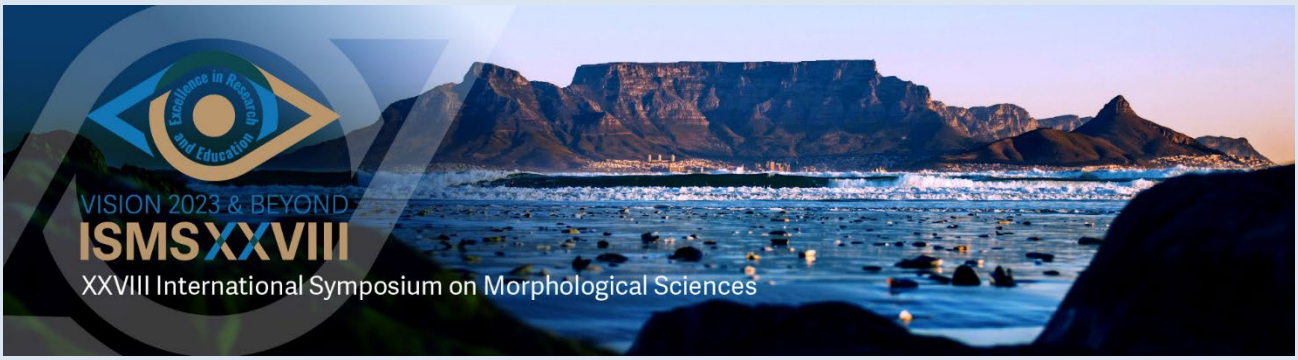
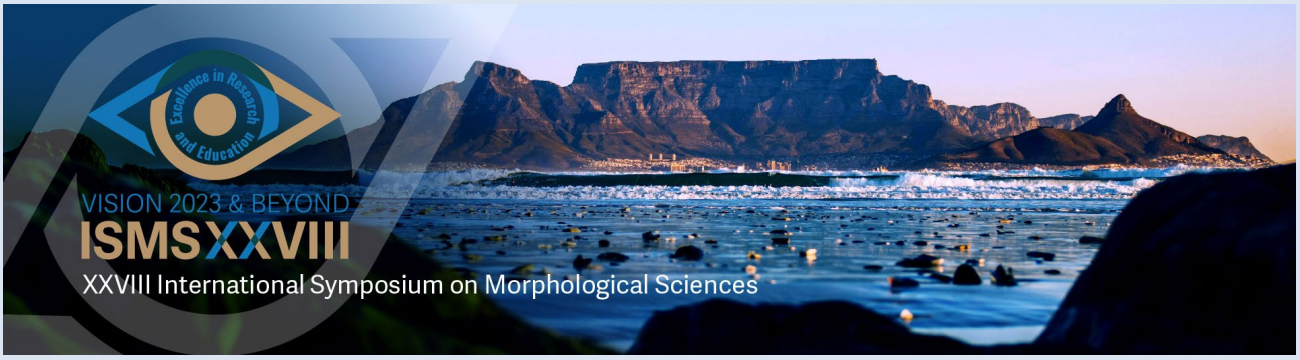


XXVIII International Symposium on Morphological Sciences

Abstract Book

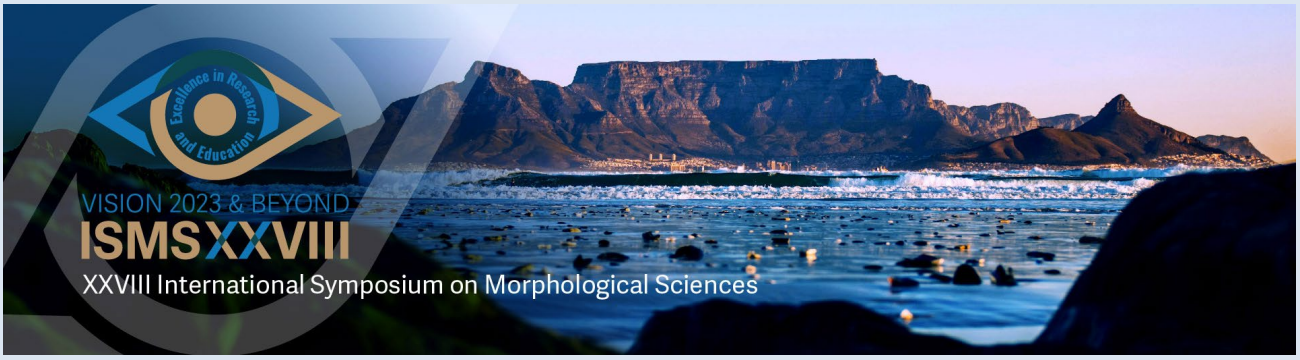


8

3D digital models in Anatomy and Medical Education

Dr Caroline Erolin
University of Dundee, Dundee, UK

This presentation provides an overview of the creation and use of interactive, three-dimensional (3D), digital models for Anatomy and Medical Education. This is a rapidly growing field, with many anatomists creating their own models in addition to those commercially available. As such, the quality of the resulting resources can vary greatly. Various methods of model creation will therefore be explored, including working with different types of scan data as well as creating models from scratch using 3D modelling software. The advantages and disadvantages of each approach will be discussed. Following this, various means of distributing the resulting models will be considered, including online environments as well as i and eBooks, interactive PDF's, and bespoke software. Finally, a case study will be presented, showcasing recent research into user preference for realism in anatomical surface scans. Staff and students working with anatomical material were asked to look at three versions of a 3D scan of the upper limb at varying levels of realism. The results show that the preferred level of realism is not static, rather it varies depending on the target audience and use case.

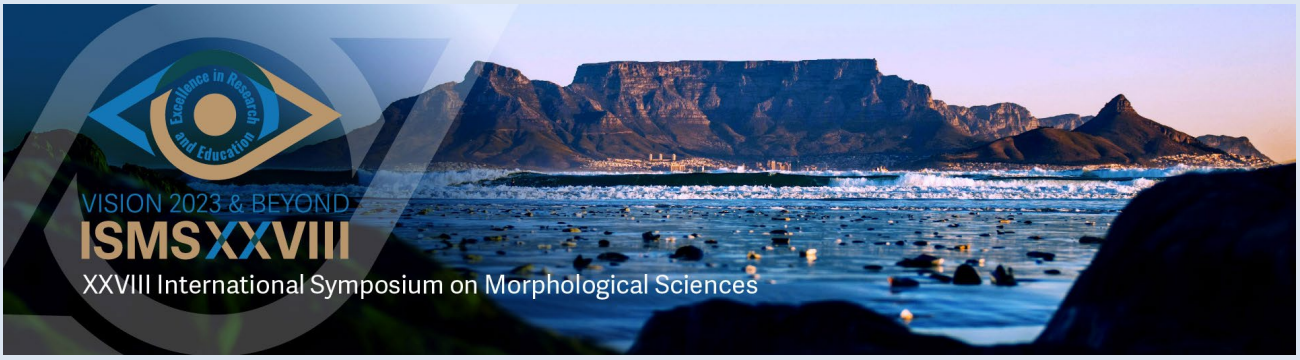


11

Proposed standardisation of terminologies and methodologies used in morphological studies of human cochlear dimensions

Dr Rene Baron[1], Prof Tania Hanekom[1]
[1]*University of Pretoria, Pretoria, South Africa*

The morphology of the cochlea has been studied using a variety of modalities and anatomical landmarks, resulting in measurements with varying reliability and validity. There is still inconsistency regarding case definitions of dimensions measured and scanty literature on the methodological validity and reliability of common techniques used in studying the cochlear dimensions. Inconsistent findings arising from such variations have the potential of masking the true morphology of the cochlea. Gaps noted in the literature include standardisation and may cause improper diagnosis and management arising from the lack thereof. The aim of the study was to propose a standard set of landmarks, derived from the dimensions taken in the literature, and the definition of landmarks to better capture cochlear morphology, and associated terminology. This will provide a basis for the comparison for the dimensional description of ambiguous terms in the literature and supplement existing data where terms are unique. The purpose of the research was to define standardised terminology and to describe and align varied cochlear case definitions. A review of the literature was conducted to compare and contrast case definitions of each measurement used in anatomical, radiological and surgical studies of the cochlea in an attempt to align terminologies. Interpretations from the literature review were then compared to and contrasted with thirty-one microCT scans of the cochlea. The results confirmed that methodological techniques and definitions of cochlear parameters may affect the quantification of dimensions that describe cochlear morphology and may therefore introduce variations when reporting these measures.
Ethics number: 174-2013



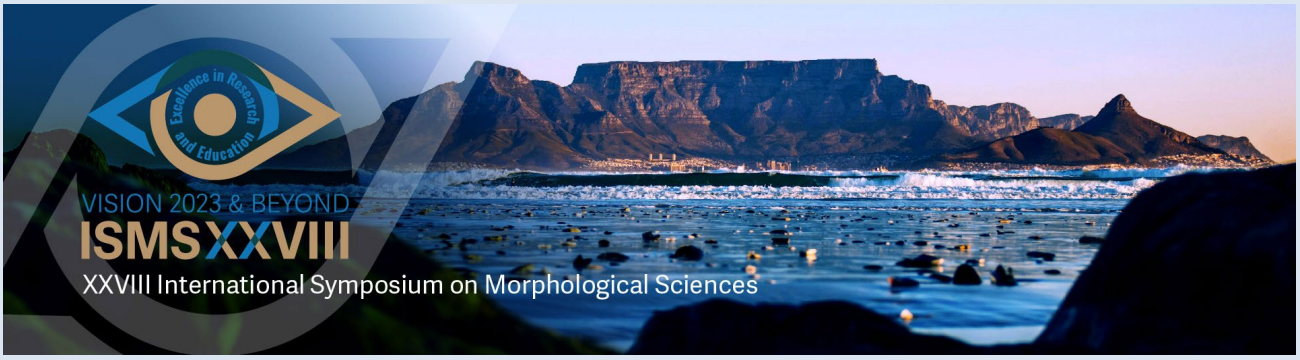
12

Co-existent vertebral malformations: Sacral spina bifida occulta (SSBO) with lumbosacral transitional vertebra (LSTV) in a South African population sample

Prof Shahed Nalla[1,2], Prof Juan A Sanchis Gimeno[1,2], Dr Glen Paton[3]

[1]Department of Human Anatomy and Physiology, Faculty of Health Sciences, University of Johannesburg, Auckland Park, South Africa, [2]Research Associate: GIAVAL Research Group, Department of Anatomy and Human Embryology, University of Valencia, Faculty of Medicine, Valencia, Spain, [3]Department of Chiropractic, Faculty of Health Sciences, University of Johannesburg, Johannesburg, South Africa

The vertebral column exhibits anomalies that could have an impact clinically. Spina bifida occulta (SBO) is a neural arch cleft defect that occurs in the lamina or the spinous process of a vertebra. This defect is usually found in the lumbosacral region, classifying as Sacral SBO (SSBO), affecting the sacrum with different degrees of non-fusion of the spinous process. Lumbosacral Transitional Vertebra (LSTV) refers to incorporating the last lumbar vertebra into the sacral complex or the first sacral into the lumbar, with variable types based on the Castellvi classification. This study looked at the prevalence of SSBO with LSTV in a South African population by studying 1798 adult human skeletons (representing three populations; both sexes) from the Raymond A. Dart Collection of Modern Human Skeletons, School of Anatomical Sciences, Medical School, University of the Witwatersrand. The indicated prevalence of complete (10) or partial (1) SSBO was in 11 individuals (0.6%) with one individual (0.06%) exhibiting complete SSBO with LSTV (type IIIb, Castellvi classification). Although insignificant in terms of a population sample, the clinical relevance for a particular individual may be significant. Clinical studies related to SBO with LSTV have indicated an increased risk of lower back pain (Bertolotti's syndrome) and disability, especially in younger individuals. SSBO has been suspected as a predisposing factor for posterior disc herniation. Awareness of the variant morphology of the sacrum is essential for clinicians across all modalities of health care practitioners.



14

Iliac and femoral vessels: Dimensions and tortuosity in a South Africa sample

Ms Robyn Lunn-Collier[1], Prof Karin Baatjes[2], Mr Lee-roy Witbooi[3], Ms Kerri Keet[1]

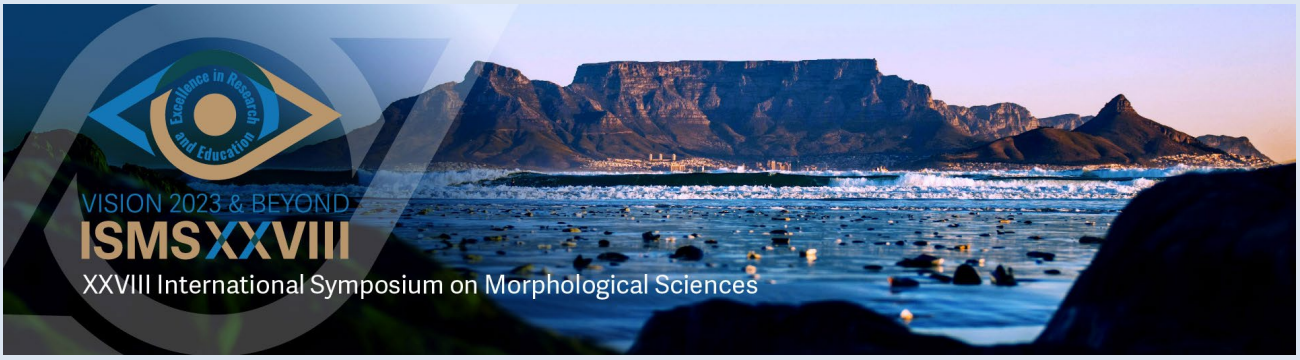
[1]Division of Clinical Anatomy, Department of Biomedical Sciences, Faculty of Medicine & Health Sciences, Stellenbosch University, [2]Vice Dean of Teaching and Learning, Faculty of Medicine & Health Sciences, Stellenbosch University, [3]Department of Radiodiagnosis, Tygerberg Hospital.

Arterial morphology varies between individuals and undergoes changes with increasing age which influences the success of endovascular procedures. Therefore, the present study determined the mean dimensions and tortuosity severity of the iliofemoral pathway of adult males and females in a South African sample.

A retrospective and cross-sectional study was conducted using a sample of 224 (117 males and 107 females) computed tomography angiograms of trauma patients (aged 18-80), accessed from Tygerberg Hospital, South Africa (S21/05/079). The arterial length and lumen diameter of the common iliac, external iliac, and common femoral arteries were measured. Tortuosity severity was described by a visual estimation and quantified using the tortuosity index and inflection count metric.

On average, the common iliac artery was the widest (9.50±1.53 mm), while the external iliac artery was the longest (110.89±16.04 mm). Bilateral asymmetry was observed. The diameters of all arterial segments were larger in males. Regression analysis revealed a strong positive relationship between arterial tortuosity and increasing age. A tortuosity phenotype was most frequently observed in the external iliac artery. However, c-shaped curving was observed in all arteries. Furthermore, changes in arterial morphology were most severe after 60 years of age. Thus, the vasculature of patients within this age range may present with challenging anatomy for endovascular procedures.

Comparing the arterial dimensions and tortuosity of this South African sample to international measurements proves challenging due to the varying methodologies employed. Therefore, the demographic-specific measurements generated in this study contribute to a reference database of arterial anatomy in South Africa.



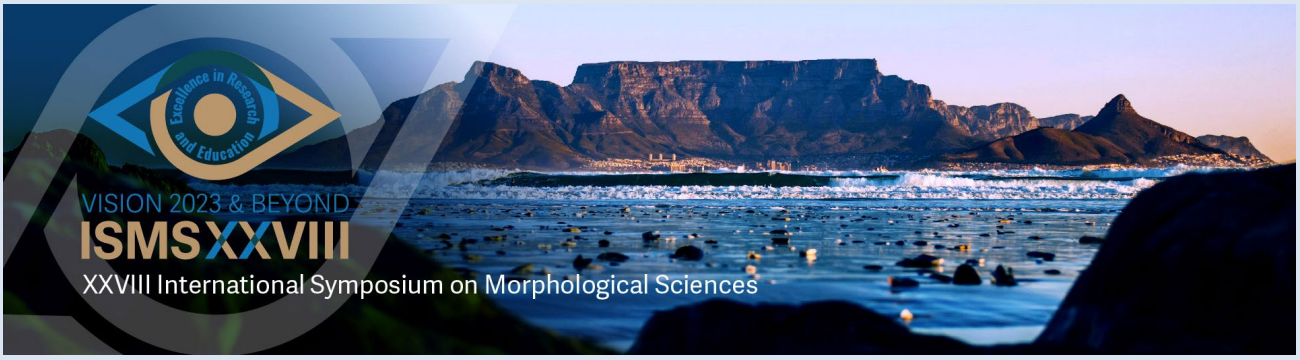
15

Ghrelin gastric tissue expression in morbid obesity and T2DM patients submitted to laparoscopic sleeve gastrectomy

Dr Khlood Mohammed Mehdar, Dr Aziza. R Al-Rafiah, Dr Saeed. A Alsareii, Dr Abdurahman. M Alamri, Dr Sabah. M Alshafie

Anatomy Department, Medicine College, Najran University, Najran, Saudi Arabia

Ghrelin is implicated in the pathophysiology of obesity and type 2-diabetes-mellitus which are causes of morbidity and mortality worldwide. Laparoscopic sleeve gastrectomy is a therapeutic technique for patients with morbid obesity. Removal of ghrelin-secreting cells by sleeve gastrectomy is associated with diminished hunger sensation. The aim of the study was to: (i) compare body weight and body- mass- index in females who were obese-non-diabetic (control) (n=10) and obese-diabetic patients (n=10), (ii) determine ghrelin expression in gastric tissue (fundus-antrum and body) in both groups, (iii) evaluate the relationship between ghrelin cell expression and pre-and post-operative serum ghrelin and glucose levels, (iv) assess the influence of sleeve-gastrectomy on glycaemic-parameters: insulin-serum glucose-glycosylated haemoglobin and insulin resistance. Patients underwent laparoscopic sleeve gastrectomy. The removed stomach biopsies underwent immunohistochemistry to detect ghrelin cell expression. Serum ghrelin were measured and glycaemic status at baseline and three months after operation. Body mass index ($p<0.05$) and body weight ($p<0.001$) were significantly lower in non-diabetic compared with diabetic patients before and after the surgery. Pre-operative serum ghrelin level was higher in non-diabetic patients compared with diabetic patients, and postoperative plasma ghrelin levels reduced in diabetic patients ($p<0.001$) compared with non-diabetic patients. Gastric mucosa of three regions in diabetic patients exhibited lower number of ghrelin cells ($p<0.05$) compared with non-diabetic patients. Significant negative correlations were detected between pre- and post-operative ghrelin serum level and blood glucose in all patients. That suggests diabetic status of obese female patients may affect the incidence of ghrelin cells in three major stomach's regions.



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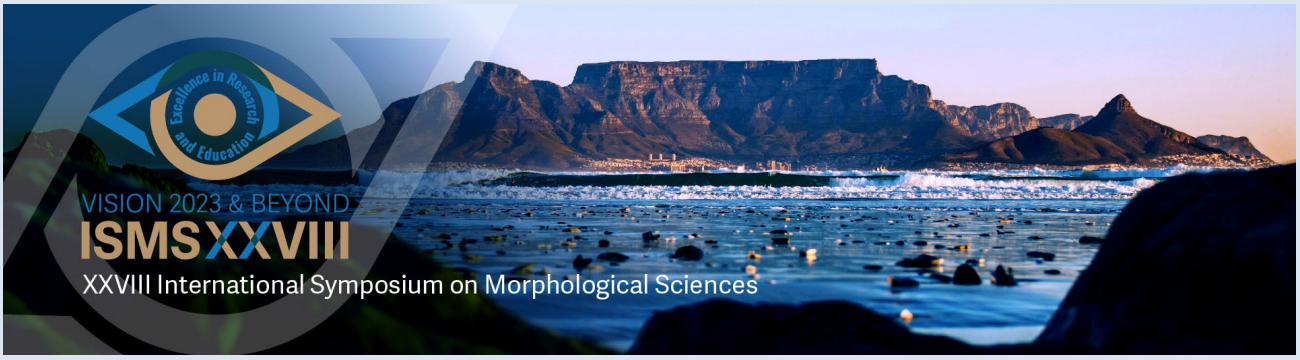
Importance of evaluating bone fracture patterns: a hands-on experience

Dr Roopam Dey[1,2], Mr Habtamu Yimam[1], Prof Stephen Roche[2], Prof Sudesh Sivarasu[1]
[1]Department of Human Biology, University of Cape Town, Observatory, South Africa, [2]Department of Surgery, University of Cape Town, Observatory, South Africa

Orthopaedic fracture fixations are always challenging. Fractures are non-homogenous and sometimes not identified in radiographs. This may lead to sub-optimal fixation using non-invasive or invasive fracture fixation techniques. Implants assist in fracture healing and research has highlighted that current implants do not always enable satisfactory healing of fractures to irregular bones such as the scapula. To have a global understanding of any fracture mechanism and propagation, creating a summative fracture pattern, also termed a fracture map, is necessary. This not only improves the visualisation of fractures for clinicians but also provides important information to implant designers regarding the critical fracture areas of any bone. We identified 70 scapular fractures, reconstructed them using Materialise Mimics® software, and reduced them using Materialise 3-Matic. The fracture pattern of each bone was traced and a two-dimensional image was acquired. This image was superimposed on a two-dimensional image of a healthy scapular bone in the same respective view. The superimposing process included creating landmarks on the healthy bone image and aligning them with the respective landmarks of the fractured bone. Using GIMP, an image manipulation software, the fracture lines were transferred to the healthy bone image. This was repeated for the 70 scapulae. The resulting fracture map was digitised to create heat maps. The heat maps highlighted critical fractured regions of the scapula. One of the critical regions identified using this process was the body of scapula which had a high number of fractures propagating across this region.

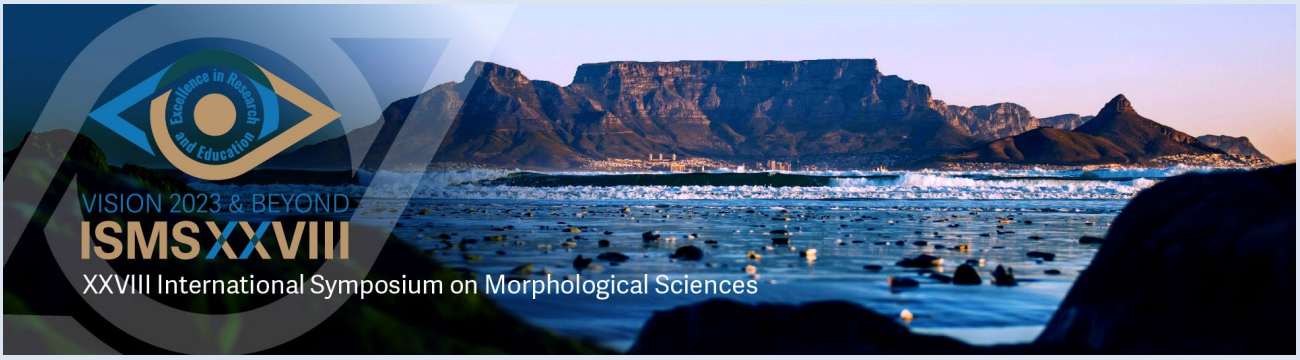


19

Influence of pneumatisation on morphology of temporal bone-related vasculatures

Mr Okikioluwa Stephen Aladeyelu[1], Dr Samuel Oluwaseun Olojede[1], Dr Sodiq Kolawole Lawal[1], Dr Wonderboy Eumane Mbatha[2,3], Dr Andile Lindokuhle Sibiya[4,5], Dr Carmen Olivia Rennie[1]
[1]Discipline of Clinical Anatomy, Nelson R. Mandela School of Medicine, University of KwaZulu-Natal, South Africa, [2]Radiology Department, Inkosi Albert Luthuli Central Hospital, South Africa, [3]Lake, Smit & Partners Inc., South Africa, [4]Discipline of Otorhinolaryngology- Head and Neck Surgery, Nelson R. Mandela School of Medicine Campus, University of KwaZulu-Natal, South Africa, [5]ENT Department, Inkosi Albert Luthuli Central Hospital, South Africa

Anatomical variations in the location and position of temporal bone-related vasculature are routinely encountered in clinical practice, contributing to clinical syndromes and complexities in ear-related and neurological surgeries. Pneumatisation of the temporal bone is one of several factors that have been hypothesised to influence the variabilities and variations of these vessels. This study aimed to investigate the association between the degree of pneumatisation and the morphologies of some temporal bone-related vessels, as well as their morphometrical relationship with ear regions. Observational retrospective chart review of 496 temporal bones computed tomographic scans were examined. Different degrees of pneumatisation were observed, with hyper-pneumatisation being the most common and hypo-pneumatisation being the least common. Various anatomical variants of the sigmoid sinus (SS), jugular bulb (JB) and internal carotid artery (ICA) were observed. The distances of the SS and JB to ear regions were observed to have significant differences ($p<0.05$) in laterality. These distances increased relative to increased air cells, showing a significant association ($p<0.05$). A significant association ($p<0.001$) was also observed between the degree of pneumatisation and variants of JB and ICA. High JB, JB dehiscence and ICA dehiscence were significantly associated with increased pneumatisation, while a flat JB was significantly associated with decreasing pneumatisation. However, no significant association ($p=0.070$, $p=0.645$) was observed between the degree of pneumatisation and morphologies of SS. In conclusion, the degree of pneumatisation serves as a factor that influences the morphology of the JB and ICA only and the morphometrical relationship of the SS and JB to different ear regions.
Ethical Number: BREC/00002263/2020



20

Morphometric features of the corpus callosum of the hemispheres of the brain

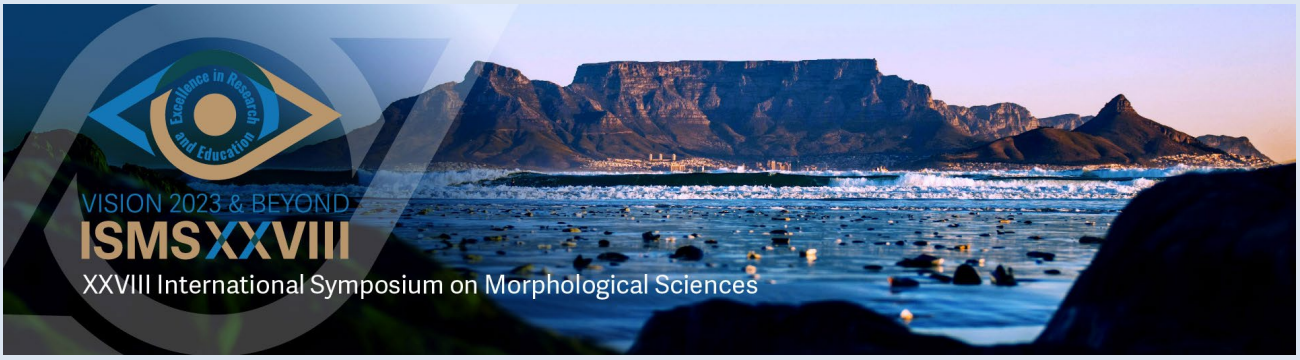
Mr Ruslan Makhatov[1], Mr Sapargali Rakhmanov[1], Ms Aigul Zhanabayeva[1], Ms Aru Balmagambetova[1], Ms Maigul Sarsenova[1]

[1]*West Kazakhstan Medical University Named After Marat Ospanov, Kazakzhstan*

The inter-relationship between brain hemispheres is currently considered a real problem in neuromorphology. The purpose of this study was to compare the features of individual morphological variability of the corpus callosum in the sagittal section of the cerebral hemisphere.

For the methodology, the research materials were obtained from the "Forensic Medicine Center of the Ministry of Justice of the Republic of Kazakhstan" and were divided into two research groups (men and women - 16 each), and cerebral hemispheres were selected. Statistical analysis was performed using classic anatomical preparation and morphometric methods. Based on the special parameters, the typical forms of the corpus callosum were characterised by using angles α, β and γ. The external shape of the corpus callosum of the brain hemispheres and intraspecies variability were described.

In conclusion, the three types of the external shape of the corpus callosum were identified in this sample, namely α, β and γ. Angle α was present in 18.3% of males and 22.6% of females, angle β was present in 24.2% of males and 20% of females, and angle γ was present in 18% of males and 25.8% of females. Angles α and γ of the outer shape of the corpus callosum were more common in females, and angle β was more common in males. In addition to the presence of intraspecies differences in the thickness of the anterior and posterior portions of the corpus callosum between males (5-8 mm) and females (3-7 mm), the thickness and length of these two parts of the corpus callosum in males revealed that individual variability was greater than that in females.



21

Anthropometric factors and birthing: Analysis of routine data taken on South African mothers and babies

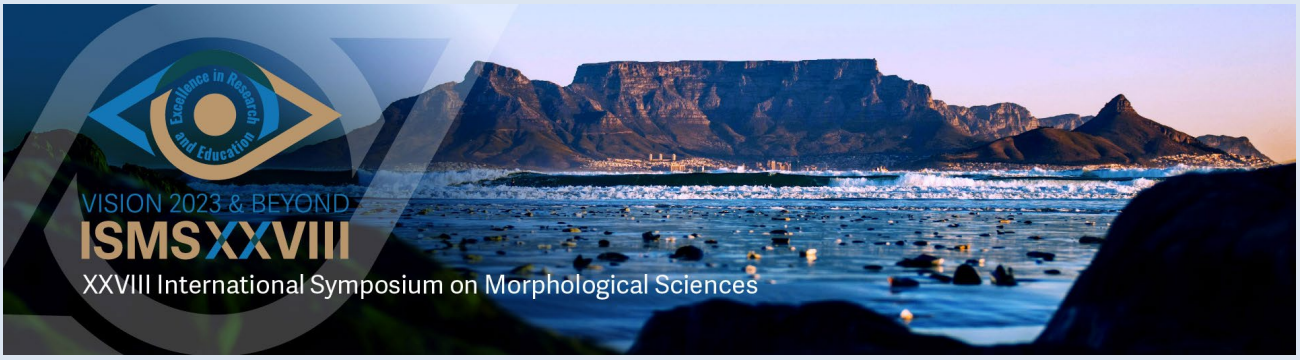
Dr Suvasha Jagesur[1,2], Prof Mariatha Yazbek[1], Ms Sirasha Naidoo[2], Prof Anna Oettlé[1,2]
[1]*University of Pretoria, Pretoria, South Africa,* [2]*Sefako Makgatho Health Sciences University, Pretoria, South Africa*

Anthropometric factors are useful for midwives to predict cephalopelvic disproportion (CPD) risk. There is a critical need to determine CPD risk in developing countries where most of obstetric deaths occur to ensure timely referral without increasing costs. The relationship between anthropometric factors and their correlations with the duration of labour were made for a better prediction of CPD risk ensuring more directed care.

Anthropometric data of 147 South African mothers (86 Blacks and 61 Whites) (age, height, weight, body mass index (BMI) and shoe size) from a private birthing centre in Pretoria, South Africa, and their newborns (head circumference, length and weight) were collected retrospectively (ethics number 505/2019). Population, parity, sex of baby and duration of labour were also recorded. Mothers were categorised into population-parity-sex of baby groups. Correlations between maternal and fetal anthropometric factors as well as duration of labour as a reflection of possible CPD were made.

The findings revealed that in Whites, multiparity male babies and tall stature were respectively associated with a shorter duration of labour despite a larger neonatal size. Other positive correlations between maternal factors and neonatal size existed. Duration of labour was prolonged in some nulliparous mothers with lower BMI and weight, and in some multiparous mothers with higher BMI and weight.

The significance is that younger or underdeveloped (shorter stature, lower weight and BMI) nulliparous mothers, especially Blacks, should be monitored and referred for trial of labour under safe conditions. Future studies including larger sample sizes could verify the statistical significance of moderately strong correlations.



22

Anthropometrics in a South African caesarean section sample versus a vaginal birth sample

Dr Suvasha Jagesur[1,2], Ms Sirasha Naidoo[2], Prof Anna Oettle[1,2]
[1]*University of Pretoria, Pretoria, South Africa,* [2]*Sefako Makgatho Health Sciences University, Pretoria, South Africa*

Anthropometric factors are useful for midwives to predict cephalopelvic disproportion (CPD) risk. There is a critical need to determine CPD risk in underdeveloped countries where most of obstetric deaths occur to ensure timely referral without increasing costs. Objective: The relationship between anthropometric factors and their correlations with the duration of labour were made for a better prediction of CPD risk ensuring more directed care.

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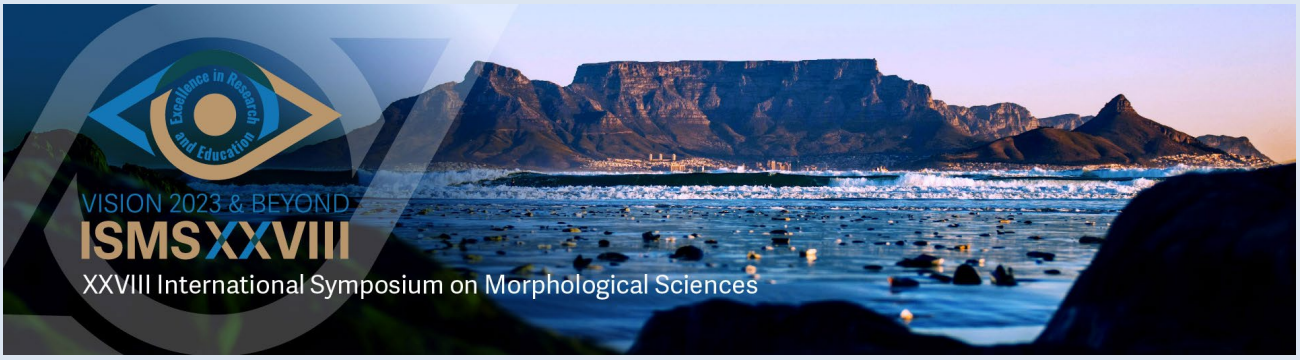
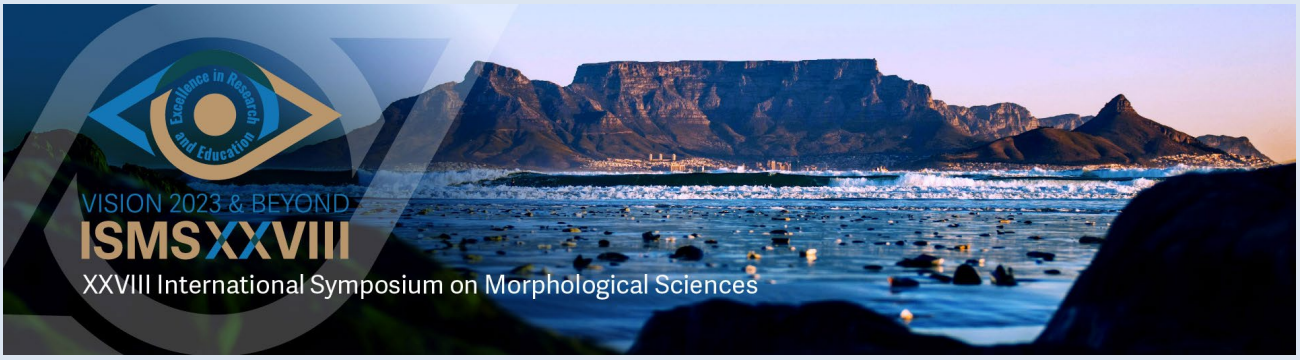


25

Microarchitecture of the human postnatal maxilla across the stages of the dentition

Ms Xolisiwe Mhlathi[1], Dr Erin Hutchinson[1], Dr Candice Small[1]
[1]*School of Anatomical Sciences, Faculty of Health Sciences, University of the Witwatersrand, South Africa*

The growth, modelling and remodelling of the maxilla is shaped by biomechanical forces. As functional demands of the masticatory system become more complex due to dental development and eruption, the intensity of biomechanical forces increases and as such influences the associated bony architecture. Knowledge gained from assessing the impact of these changes on the microarchitecture of the maxilla is important in the clinical and forensic contexts. Thus, this study aimed to assess changes in microarchitecture of the alveolar region of postnatal and sub-adult human maxilla in relation to dental development and eruption. The study sample included seventy-nine individuals, subdivided according to dental development stages: deciduous dentition (n = 28; 0-5 years), mixed dentition (n = 9; 6-12 years), and permanent dentition (n = 42; 13-18 years) (Ethical clearance W-CBP-220504-01). Maxillae were scanned using micro-computed tomography. Seven regions were selected along buccal and lingual surfaces of each dental crypt for microarchitecture evaluation, including bone volume fraction (BVTV), trabecular thickness (TbTh), trabecular spacing (TbSp), material surface to material volume (BSBV), and trabecular number (TbN). As age progressed, the microarchitecture of the maxilla changed, following patterns of bone remodelling during growth. These changes included an increase in BVTV ($p<0.001$) while BSBV and TbN both significantly decreased ($p<0.001$). Thus, the trabeculae became more mineralised and decreased in number as they thickened. No significant differences were observed in TbTh and TbSp. The observed microarchitecture reflects changes in the state of dentition as well as adjustments to the complex functional environment of the oral cavity complex.



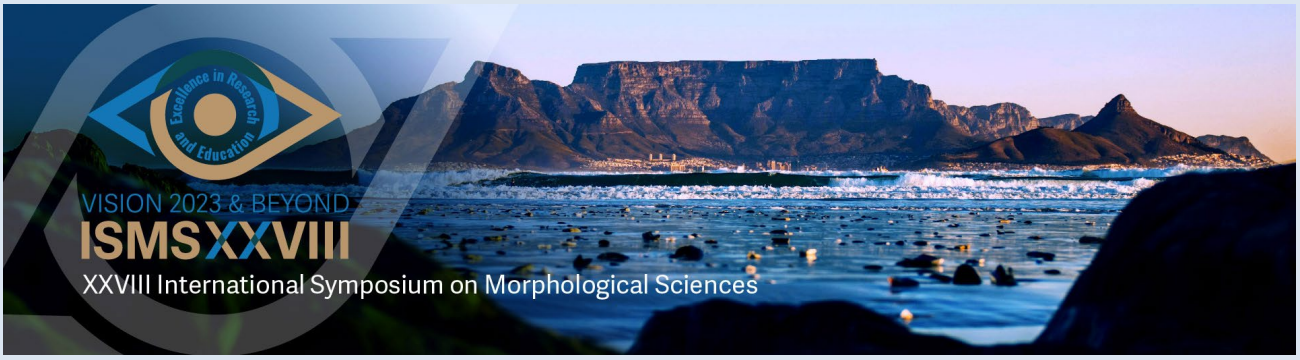
27

Anatomy as social change agent: Decolonising gender in South African Medicine with evidence-based teaching

Mx Ruan Lochner[1,2], Dr B Camminga[3], Mr Bryan Bergsteedt[1,2]

[1]Stellenbosch University, Parow, South Africa, [2]Genderdynamix, Observatory, South Africa, [3]University of the Witwatersrand, Braamfontein, South Africa

Transgender and non-binary (TGNC) identities continue to be excluded in the healthcare environment, starting as early as during medical training. As a result, TGNC individuals are experiencing exclusionary practices and systemic barriers to health care, which have led underserved individuals to rely on unsupervised and potentially negative methods of therapies. Accessible healthcare is a constitutional right in South Africa, and this is the only country with legal policies to protect TGNC on the continent of Africa. Data were collected in three parts during this study. Firstly, a self-reported, mixed methods, online interview was sent to students at the Faculty of Medicine and Health Sciences. Secondly, interviews were conducted with TGNC-identifying individuals (N=13) who had previously made contact with the South African healthcare environment. The final data collection was through a focus group session (n=6). Overall, 7% (N=154) of the students completed the online interview. Students identified a lack of TGNC resources in the curriculum, noting underserving and discrimination of TGNC identities in hospital environments. TGNC participants described experiencing systemic barriers and discrimination concerning medical education, in healthcare environments, and from healthcare workers - all of which impeded their right to access healthcare in South Africa. Students and TGNC individuals requested that evidence-based information representing TGNC identities be made available in the curriculum. Future recommendations included a greater focus on the structural and functional elements of the human body in medical education and avoiding assumptions that would attribute characteristics of bodily structures to gender and sex when these are not relevant to the patient history taking or the treatment plan. development.



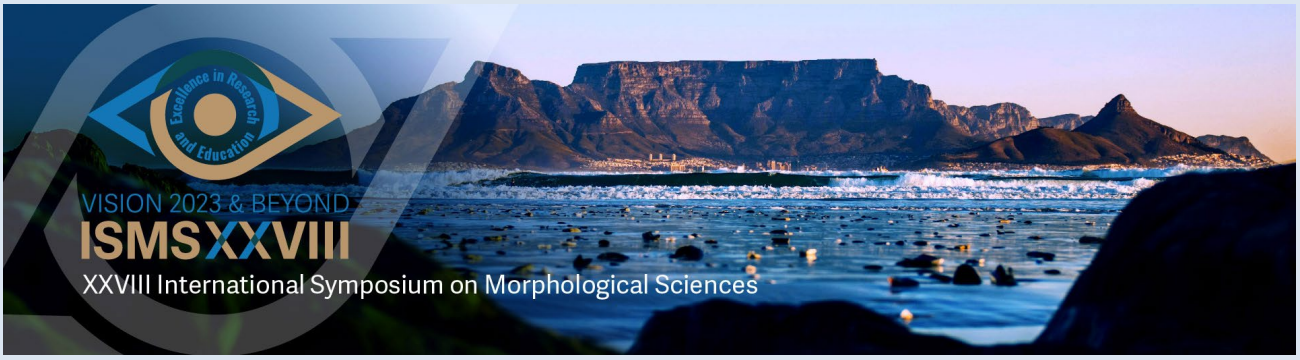
28

Topographical anatomy and clinical implications of the metatarsal diaphyseal nutrient foramina across South African populations

Mr Arthur Manjatika[1,2], Dr Pedzisai Mazengenya[1,3,4], Dr Joshua Davimes[1]

[1]School of Anatomical Sciences, University of the Witwatersrand, Parktown, South Africa, [2]School of Life Sciences and Allied Health Professions, Kamuzu University of Health Sciences, Malawi, [3]College of Medicine, Ajman University, United Arab Emirates, [4]Center of Medical and Bio-allied Health Sciences Research, Ajman University, United Arab Emirates

The topography of metatarsal bone nutrient foramina (NF) varies depending on population affinity. The purpose of this study was to describe the topography and morphometry of the metatarsal diaphyseal NF in South African Africans (SAA), South Africans of European descent (SAED), and South Africans of Mixed Ancestry (SAMA). A total of 4284 metatarsals from both sexes and sides of SAA, SAED, and SAMA populations were examined from the Raymond Dart Morden Skeletal Collection of the University of the Witwatersrand (Ethics number: W-CBP-220504-01). The parameters investigated included the presence, number, location, position, size, direction and foramina index (FI) of the NF on the metatarsal bones. The NF was present in 99.4% (4260) of the metatarsals. The absent NF was mostly in the third metatarsals. The majority of metatarsals examined had a single NF with population proportions ranging from 60-100%. One metatarsal presented with five NF. Most (97.4%) NF were located in the middle third of the metatarsal. The median FI of the left and right second metatarsal exhibited population affinity. The NF positions on the fourth metatarsals showed the greatest population affinities. The first metatarsal bones had primarily dominant-sized NF while the second through fifth had primarily secondary-sized NFs. The nutrient canal was directed distally on all first metatarsals while the second through fifth metatarsals had NF canals directed proximally. Topographical knowledge of the NF is crucial in understanding fracture development and fracture site healing patterns.



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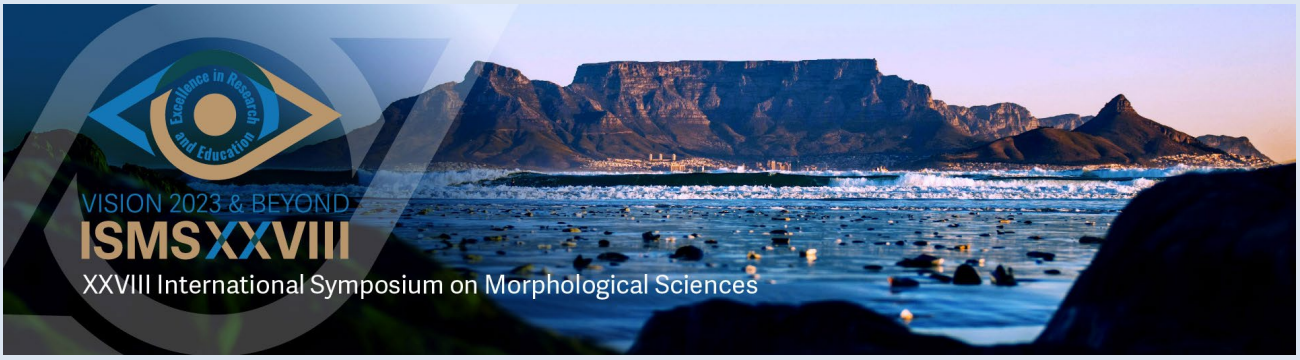
A novel method for closer Anatomy observation includes the sense of touch and drawing

Mr Leonard Shapiro
University of Cape Town, Cape Town, RSA

A novel observation method which significantly includes the sense of touch as an observation modality, was developed by Leonard Shapiro in 2015. Coupled with drawing, it is called the Haptico-visual observation and drawing (HVOD) method and is taught over a period of 6 hours. The primary aim is closer observation and not the making of art. In anatomy education, the benefits of using the HVOD method include i) the enhanced observation of the three-dimensional (3D) form of anatomical parts, ii) the cognitive memorisation of anatomical parts as a 3D mental picture, iii) improved 3D spatial awareness and iv) an ability to draw. Improved 3D spatial awareness is crucial in the comprehension of the 3D nature of the human anatomy as well as for application in clinical and surgical practice. The afferent nerves of the hand take up a relatively large part of the sensory cortex of the brain, making touch a useful sensory modality in the deeper exploration of 3D objects. Research into haptics by Roberta Klatzky and Susan Lederman identified six 'Exploratory Procedures' (EPs) which humans employ in order to extract various object properties. Two EPs named as 'Contour Following' and 'Enclosure' are specifically responsible for the extraction of 3D form. Two drawing approaches known as 'cross-contour drawing' and 'gestural drawing' are suited to directly reflect the hand movements made by these two EPs. When employing the HVOD method, the EPs (haptic observation) is performed together with the simultaneous drawing of marks which directly reflects what is being observed.



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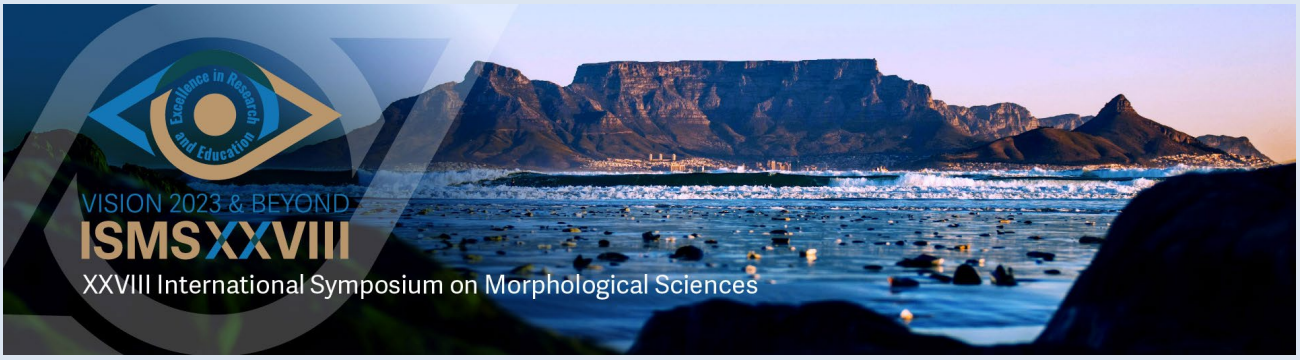
The taphonomy of subaerial bone weathering (Workshop)

Dr James Pokines[1,2]

[1]Boston University School of Medicine, USA, [2]Office of the Chief Medical Examiner, USA

Forensic investigators often recover skeletal remains from terrestrial surface environments, and the exposed bones frequently display subaerial weathering, characterised by sun-bleaching and surface cracking, along with concurrent taphonomic effects that can include soil staining and algae formation. The causes of subaerial weathering have undergone some investigation and include gradual breakdown and loss of organic content; exposure to solar (UV) radiation, mineral dissolution and recrystallisation, and perhaps most importantly cycles of warming-cooling, freezing-thawing, and wetting-drying causing repeated expansion and contraction of the bone and leading to its progressive cracking and structural failure. Behrensmeyer (1978) developed a 5-stage system for recording subaerial weathering, extending from stage 0 (unweathered) through 5 (severely weathered/falling apart). Of particular relevance to forensics is that these subaerial weathering stages can be used to estimate the postmortem interval for cases that have been exposed past the early interval where stages of decomposition are more applicable, on the order of years. This workshop will explore the causes of subaerial weathering, the correct diagnosis of stages, and the application of these stages to estimations of the postmortem interval. Rates of subaerial weathering have been shown to be highly variable based upon environment, including minor variations in local habitat, and these considerations will be examined along with other methodological difficulties. The goal of the workshop is to provide a common language and understanding of subaerial weathering among researchers so that their data collection and interpretation will be comparable and to encourage them to examine subaerial weathering rates in their own localities.



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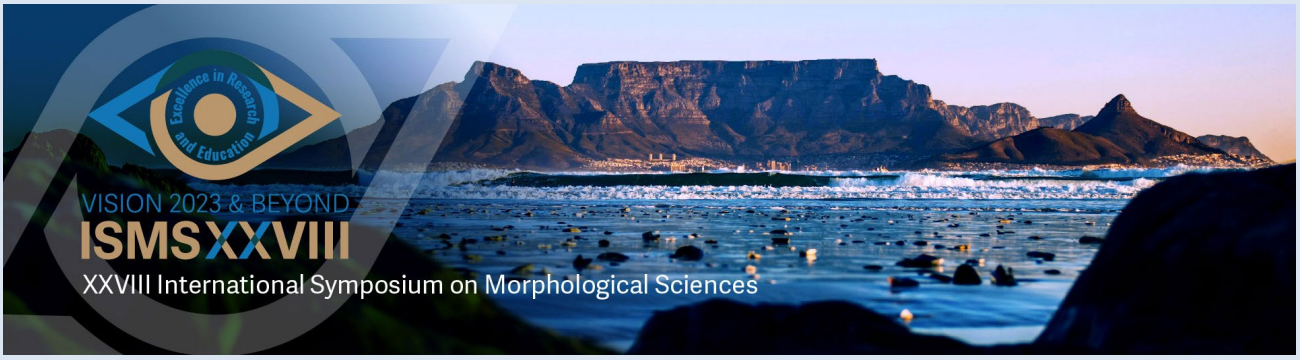
Variations in French facial morphology matrices using CT scans

Mr Pieter Daniël de Wet[1], Ms Meg-Kyla Erasmus[1], **Dr Alison F. Ridel[1]**
[1]University of Pretoria, South Africa

Facial approximation is a developing forensic field requiring knowledge of modern populations. Information from living individuals can be used to create reliable population databases to approximate the face of an unknown person using their skull. This study aimed to analyse the soft- and hard-tissue facial matrices of French adults using computed tomography (CT) scans. A total of 99 CT scans of males and females from the University of Bordeaux, France, were used. Sixty-nine capulometric landmarks were placed on the soft-tissue surfaces, while 43 craniometric landmarks were placed on the hard-tissue surfaces. Five hundred and fifty-nine semi-landmarks were also indicated on cranial elements to capture curves. Shape differences and correlations between matrices were assessed using geometric morphometric methods. When assessing shape variation, the sample was found to be significantly influenced ($p<0.05$) by sexual dimorphism, while age had little influence on the overall shape variation. When the French sample was statistically compared to a white South African sample, all facial matrices were significantly influenced by population affinity ($p\leq0.001$). The correlations in the French sample were weak to moderate ($0.2\leq r^2<0.59$). Finally, additional correlations assessed in a white South African sample produced mostly strong correlations ($r^2>0.6$). Our findings provide an understanding of how biological factors influence the morphology of facial matrices within population groups. Applying this research can benefit the forensic sciences by improving facial approximation methods used across different population groups and biological profile estimation methods. This research is also beneficial in applied medical sciences for reconstructive facial surgeries.



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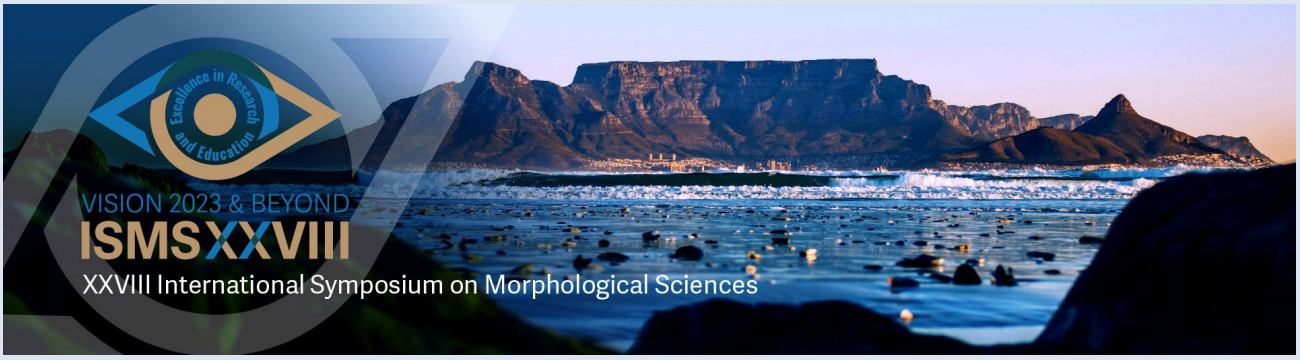
Exploring 3D Anatomy: Global launch of a Massive Open Online Course

Dr Iain Keenan[1], Leonard Shapiro[2]
[1]*Newcastle University, UK,* [2]*South Africa*

The development and introduction of remote learning strategies in modern Anatomy education has recently become increasingly important due to greater student numbers, curricular constraints and impacts of the Covid-19 pandemic. Furthermore, our previous work has identified challenges for novice learners in three-dimensional visualisation and spatial understanding of Anatomy. We have described innovative technology-enhanced and art-based approaches for supporting and enhancing these areas of learning, including 'Observe-Reflect-Draw-Edit-Repeat', 'Haptico-Visual Observation and Drawing', and 'Haptic Surface Painting'. Based on educator and learner perceptions, we adapted our in-person activities for asynchronous online delivery, in order to enhance accessibility and flexibility for learners. In doing so, we have built upon our international collaboration between the UK and South Africa to create our free massive open online course, 'Exploring 3D Anatomy'. Course participants follow a progression of video and text-based instruction and carry out short and accessible learning activities and reflections, which can be carried out in their own time and at their own pace. A recommended time commitment of 1 hour per week over 5 weeks enables novice and experienced learners to pursue the course in parallel to formal studies. Activities have been specifically designed for remote delivery and require only simple household objects or other easily procured materials. The course supports incremental skill development in observation, visualisation, and spatial awareness, and a holistic understanding of clinically-relevant three-dimensional and spatial anatomical concepts. Our work will have implications for the international reach, value, and impact of flexible and accessible remote learning strategies in Anatomy education.



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Descending aorta dimensions and tortuosity in a South African sample

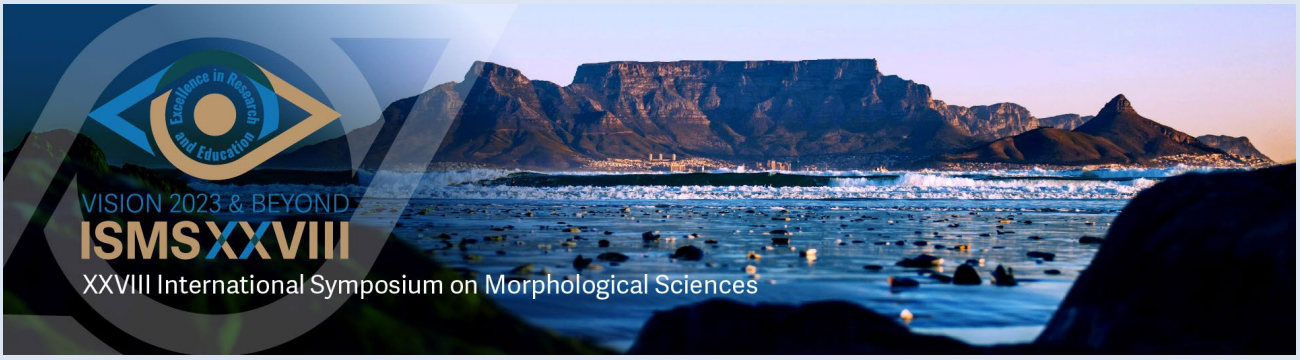
Ms Kerri Keet[1], Ms Pheladi Mokoena[1], Ms Robyn Lunn-Collier[1], Mr Lee-Roy Witbooi[2], Prof Karin Baatjes[1]
[1]Stellenbosch University, Parow, South Africa, [2]Tygerberg Hospital, Parow, South Africa

The length, diameter and tortuosity of the descending aorta varies between sexes and age groups, which may have clinical implications for endovascular procedures. This study aimed to determine the dimensions and tortuosity prevalence and severity of the descending aorta and its association with age and sex in a South African sample.

After institutional ethical approval (U22/04/168), the length and diameter of the descending thoracic aorta (DTA) and descending abdominal aorta (DAA) were measured on 97 computed tomography angiography (CTA) scans (54 male and 43 female), mean age 48.5 ± 17.2 years. Tortuosity of the DAA was quantified with the tortuosity index (TI) and assessed by phenotype description.

The descending aorta diameter tapered inferiorly from the DTA to the DAA bifurcation point (22.2 mm - 13.9 mm). Males had larger dimensions than females although the differences were significant only for DTA length ($p < 0.001$). Mean lengths of the DAA showed a weak positive correlation to age that was statistically significant in males. Mean diameters of the DAA had a significantly strong positive correlation to age in both sexes. A tortuous c-shaped-curve was found in the DAA in 8.2 % of the whole study sample, with a 7:1 male to female ratio. There was a strong positive correlation between age and tortuosity ($p < 0.001$).

The dimensions and tortuosity prevalence of the descending aorta differ between sexes and vary significantly with age, which may be informative in the clinical setting for endovascular aortic procedures and device design.



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Do burrowing strategies affect muscle architecture and muscle fibre composition in African mole-rats?

Dr Lauren Sahd[1,2], Ms Narusa Doubell[1], Prof Nigel Bennett[3], Prof Sanet Kotzé[1,4]

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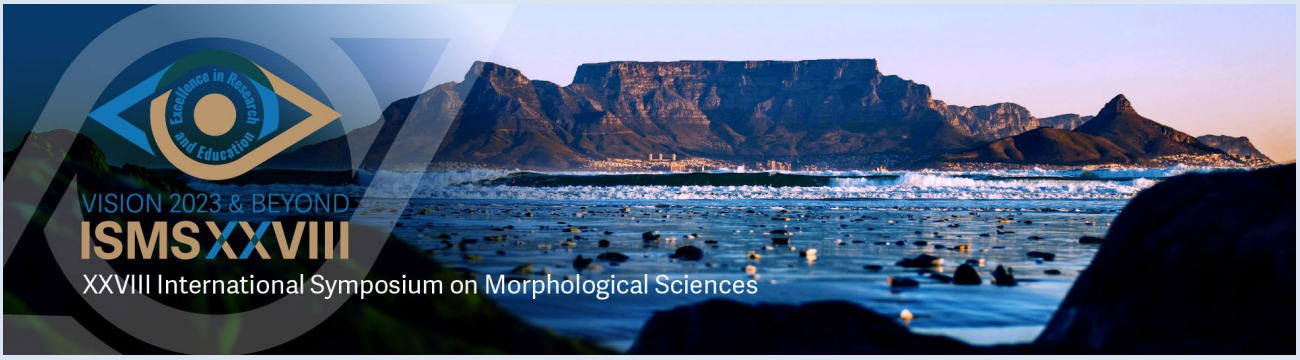
The Cape dune mole-rat (Bathyergus suillus) and naked mole-rat (Heterocephalus glaber) are African rodent moles that use scratch and chisel tooth digging, respectively. This study aimed to determine if the difference in burrowing strategies is reflected in the muscle architecture and fibre type composition of the forelimb muscles. Muscle morphometry (muscle mass, fascicle length and physiological cross-sectional area [PCSA]) of 39 forelimb muscles were compared in each of the six individuals in both species Additionally, muscle fibre type composition and oxidative capacity of 21 forelimb muscles in each individual of both species were quantified using immunohistochemistry and NADH staining. In B. suillus, the limb retractors and scapula elevators had higher muscle mass percentages, force outputs ($p=0.03$) and shortening capacities ($p<0.01$) compared to H. glaber. Additionally, B. suillus had a significantly higher percentage of glycolytic fibres in the scapular elevators ($p=0.03$) and digital flexors ($p=0.03$) compared to H. glaber. These findings suggest that the forelimb muscles of B. suillus provide fast, powerful motions for effective burrowing during scratch digging. In contrast, H. glaber, possessed significantly greater PCSA ($p<0.01$) and fascicle length ($p=0.04$) values in the neck flexor, m. sternocleidomastoideus, compared to B. suillus. Furthermore, significantly more oxidative fibres occur in m. sternohyoideus of H. glaber compared to B. suillus ($p<0.05$). These findings suggest possible adaptations for chisel-tooth digging in the neck muscles of H. glaber. Functional demands may play a significant role in muscle morphology, but phylogenetic differences between the two species may be an additional factor to be explored.

Ethical clearance was obtained for the use of animal tissue from the Research Ethics Committee: Animal Care and Use of Stellenbosch University (SU-ACUM 16-00005). Ethical clearance was extended under a new number, ACU-2020-19344 and the Ethics committee of the University of Pretoria (EC069-17).



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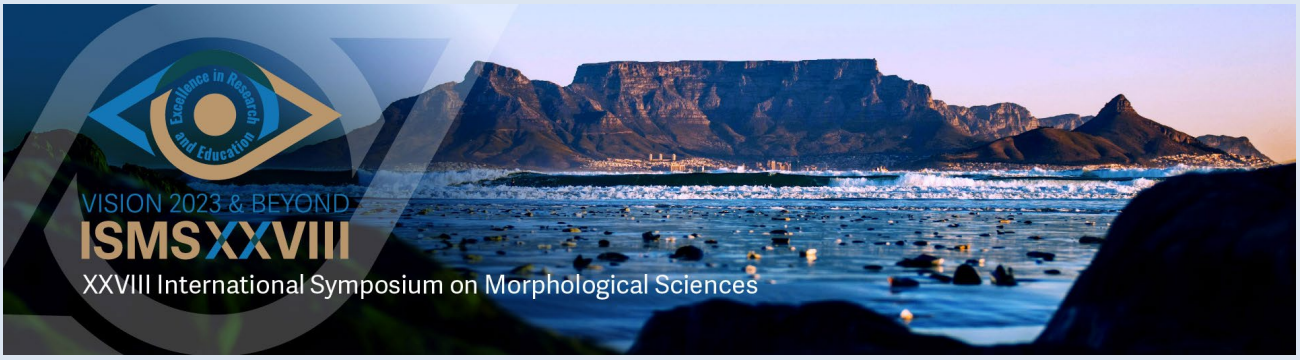
Volumetric micro-computed tomography investigation of the hindlimb musculature of three African mole-rat species

Dr Lauren Sahd[1], Prof Nigel Bennett[2], Prof Sanet Kotzé[1,3]

[1]Division of Clinical Anatomy, Department of Biomedical Sciences, Faculty of Medicine and Health Sciences, Stellenbosch University, South Africa, [2]Department of Zoology and Entomology, Mammal Research Institute, University of Pretoria, South Africa, [3]Anatomy Division, Department of Biomedical Sciences, Ross University School of Veterinary Medicine, St Kitts and Nevis, West Indies

Hind foot drumming is used by several African mole-rat species for communication. This study aimed to create three-dimensional reconstructions and compare volumetric measurements of hindlimb muscles of two drumming (Georychus capensis and Bathyergus suillus) and one non-drumming (Cryptomys hottentotus natalensis) species. Diffusible iodine contrast-enhanced micro-computed tomography scans were performed on six specimens per species. In each specimen, 27 individual muscles were manually segmented, volumes determined and expressed as a percentage of the total hindlimb volume, and statistically compared between species. Several hip and knee extensors, namely mm. gluteus superficialis, semimembranosus, gluteofemoralis, rectus femoris, vastus lateralis and gracilis anticus, had significantly larger muscle volume percentages in the two drumming species compared to the non-drumming species ($p<0.01$ for all muscles). Additionally, G. capensis had the largest summed percentage of the total hindlimb volume in the hip flexor, hip extensor, knee extensor and ankle plantar flexor muscle groups of all three species. In G. capensis, whole muscle hypertrophy of these muscles may be caused by the repeated fast eccentric contractions that occur during hind foot drumming. However, several significantly larger muscle volume percentages were observed when the scratch digging B. suillus was compared to the two chisel-tooth digging species ($p<0.03$ for all muscles). These large hindlimb muscles in B. suillus may be adapted for their scratch digging or to support the large relative size of this species. Therefore, while the action of hind foot drumming appears to influence certain key muscle volumes, digging strategy and body size may also be a factor.



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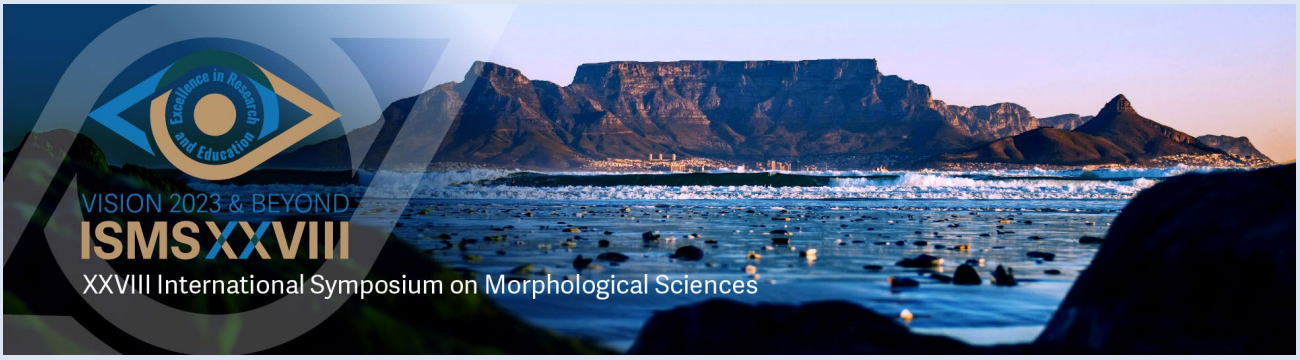
Are the youth of the Shembe church willing to donate their bodies to science?

Ms Qiniso Nontobeko Zulu[1], Ms Cassandra Creamer[1], **Dr Brenda Zola De Gama[1]**
[1]Clinical Anatomy, School of Laboratory Medicine and Medical Sciences, College of Health Sciences, University of KwaZulu-Natal, Westville, South Africa

Perspectives of religious groups towards body donation are important in designing relevant body donation campaigns in the province of KwaZulu-Natal (South Africa), especially since willingness to participate in body donation programmes remains low among the Black African population. In attempting to understand these perspectives and their influencing factors, a sample of 100 youth members from the Shembe church aged between 18 and 35 years as future potential donors were purposively selected for this descriptive quantitative study. A three-page pre-developed questionnaire was distributed measuring their willingness to participate in body donation in association with their sociodemographic profile and their held religious and cultural perspectives towards body donation (Ethical clearance number: BE 359/19). Responses (70% of sample) were analysed using descriptive statistics that considered a p-value of <0.05 as statistically significant. The majority of respondents [90%] reflected an unwillingness to donate their bodies to science, stating religious and cultural beliefs as predominantly associated factors. Of the respondents that were willing to donate their bodies to science [4.3%], the main reasons for consideration of body donation were limited to aid in research (66.7%) and health care (33.3%), the remainder of the respondents were unsure [5.7%]. In conclusion, the youth of the Shembe church in this study were not willing to participate in donating their bodies to science based on their religious and cultural beliefs. This reflects that this age group may not be a target group of potential body donors in KwaZulu-Natal province.



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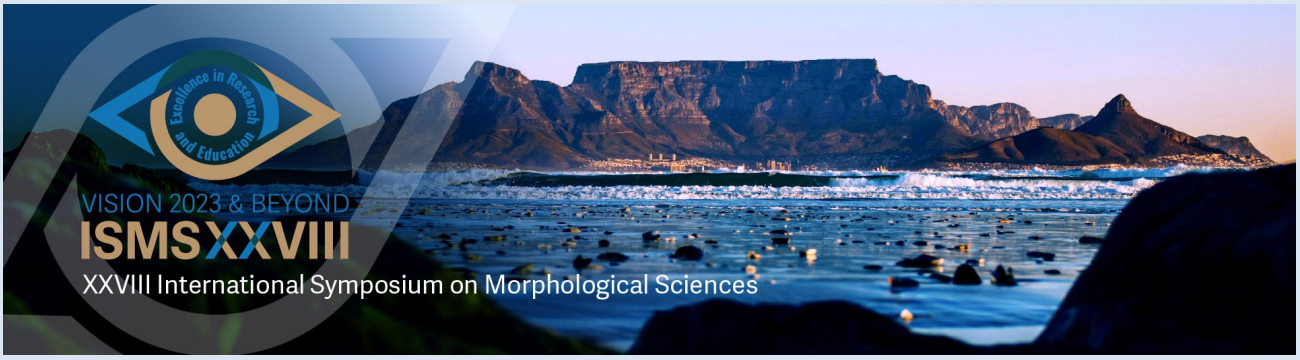
Beatings, Broken Bones, Bullet Holes and 3D prints: education in bone trauma

Prof Ericka Noelle L'abbe[1], Dr Alison Fany Ridel[1], Dr Charlotte Theye[1], Dr Rudolph Venter[2], Ms Pearl Bothma[1], Ms Alieske Hagg[1], Mr Marius Loots[1]
[1]University Of Pretoria, Arcadia, South Africa, [2]University of Stellenbosch, Stellenbosch, South Africa

Worldwide, a high burden of trauma exists in both clinical and medicolegal disciplines. While not all bone fractures cause death, a fracture can be related to the cause of death which is important in any medico-legal investigation. Forensic Anthropology postgraduate students and practitioners struggle with practical experience in bone trauma analysis as few illustrative examples exist. However, with the nature of biological materials and ethics, access to specimens is limited. The purpose of this study was to assess the use of 3D prints of bone trauma in two workshops with postgraduate students. As part of the Bakeng se Afrika [‘for Africa’] European Union project, a total of 42 bone trauma specimens from cold cases were micro-XCT scanned from 2019 to 2020 at the South African Nuclear Energy Corporation (Necsa), and included both crania (n=40) and postcrania (n= 1) of adults and one juvenile (n=1 crania). All specimens are anonymised. The distribution of trauma types includes blunt force trauma (n=16), ballistic/projectile trauma (n=16), sharp force trauma (n=3), and healed injuries (n=8). All micro-XCT scans of these specimens were processed into three-dimensional (3D) meshes, and 3D printed. In a workshop, postgraduate students were able to ethically work with human remains, to learn bone trauma, and to provide feedback on the process. With 3D prints, students felt that education in bone trauma was more accessible, shareable, and easier to understand than through lectures, alone. Overall, this improves education in Forensic Anthropology and its accessibility.



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The role of Surgical Anatomy dissection courses in surgical training

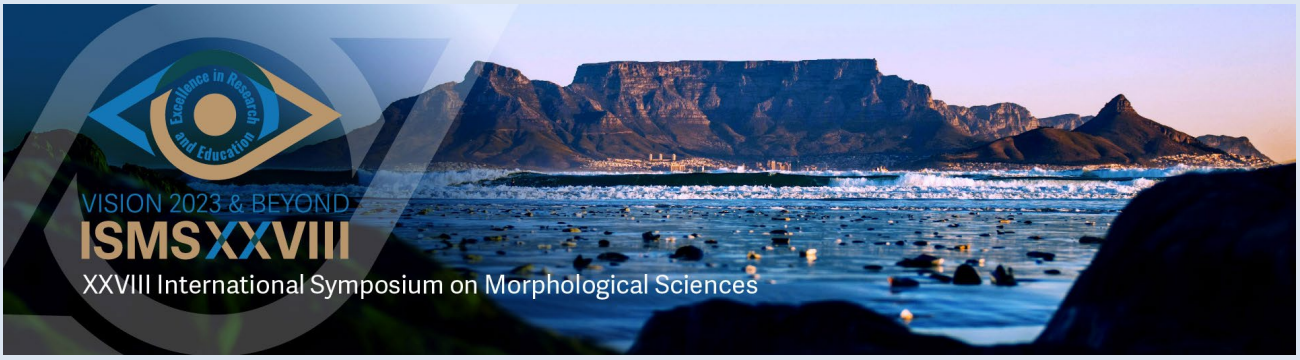
Prof Julien Gashegu[1], Dr David Hakizimana[1], Dr Isaie Ncogoza[1], Prof Martin Nyundo[1], Prof Faustin Ntirenganya[1]
[1]*University of Rwanda, HUYE, Rwanda*

Human Anatomy is among the fundamental Biomedical Sciences which form the cornerstone of the ever-evolving medical practice. It is, therefore, important to strengthen Anatomy education at all stages of medical training. The aim of this study was to assess the impact of the dissection courses on the trainees' competencies.

This is an educational interventional study that measured the knowledge and skill acquisition of surgical trainees through Surgical Anatomy dissection courses. Courses were designed with clear learning objectives and programmes. A pre-test was administered to trainees before the dissection course, and a post-test was organised at the end. Descriptive statistics were used to compare pre- and post-test scores. A p-value less than 0.05 was considered statistically significant. The Likert scale was used to measure trainees' satisfaction at the end of every course. From August, 2020 to December, 2021, 11 cadaveric dissection courses were organised, benefitting 173 trainees.

The average increase in the mark was 26.4% with a 95% CI of 23-0–29.7 and a p-value of 0.001. There was a negative correlation (r = -0.8948, p-value of 0.001) between the marks at the pre-test and the improvement score, suggesting that the lowest performers on the pre-test had the biggest post-test improvement.

In conclusion, Surgical Anatomy dissection courses positively impacted the surgical trainees' knowledge and skill acquisition. This is a useful tool to integrate Anatomy into surgical training. With those courses, Cadaver Surgical Training (CST) is surfacing in Rwanda.



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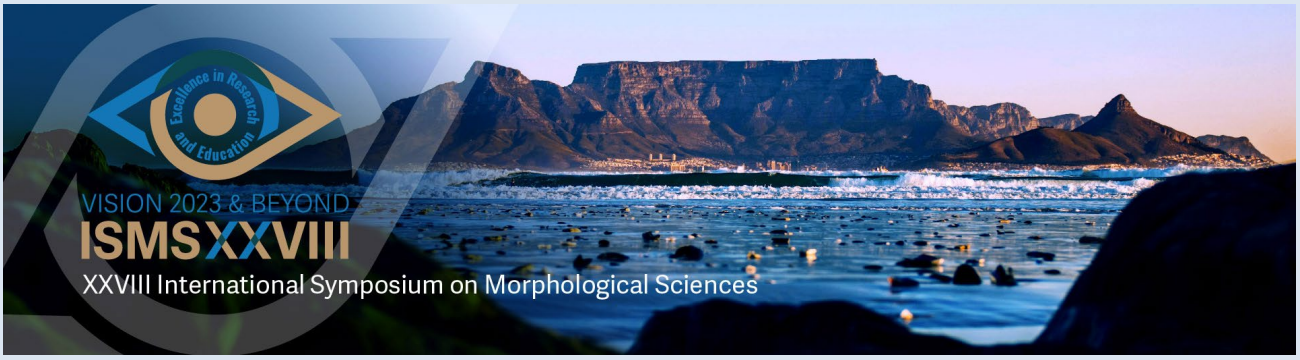
Correlations between facial feature shapes for applications in compound cranio-facial approximation techniques.

Ms Meg-Kyla Erasmus[1], Prof Ericka L'Abbé[1], Dr Alison Ridel[1]
[1]*University of Pretoria, Prinshof, South Africa*

A biological relationship in form is expected between cranial structures and overlying soft tissues. Understanding this intercorrelated relationship is vital for developing accurate methods in facial approximation. This study aimed to assess correlations between the shape of the soft-tissue facial features and the underlying skeletal structures in 116 South Africans between the ages of 18 and 80 years (46 males; 70 females) using Cone-Beam Computed Tomography scans. Scans were loaded into MeVisLab 2.7.1 for 3D reconstruction and automatic shape extraction using 69 anatomical landmarks on the eyes, nose, ears, and mouth; 43 anatomical landmarks on the midfacial skeleton; and 559 sliding landmarks on the orbits, anterior nasal aperture, and external auditory meatuses. The cartesian coordinates were recorded and analysed using geometric morphometric methods to assess the correlations in shapes through Two-Blocks Partial Least Squares analyses. The ears and nose correlated strongly to their respective underlying hard-tissues ($r^2 \geq 0.7$). The eyes and mouth had the weakest correlations to other soft- and hard-tissue features ($0.3 \leq r^2 \leq 0.65$). The ear, where little information on its shape and size is found on the temporal bone for approximations, also correlated strongly to the hard and soft tissue midface ($r^2 \geq 0.7$). The nose and midfacial skeleton have the strongest correlations to soft-tissue facial features and should be used as a baseline reference when developing compound cranial-facial approximation methods. Features of the midfacial skeleton are the most reliable to use when estimating all soft-tissue facial features in both forensic and reconstructive surgery preparation contexts to ensure a holistically proportionate facial appearance.



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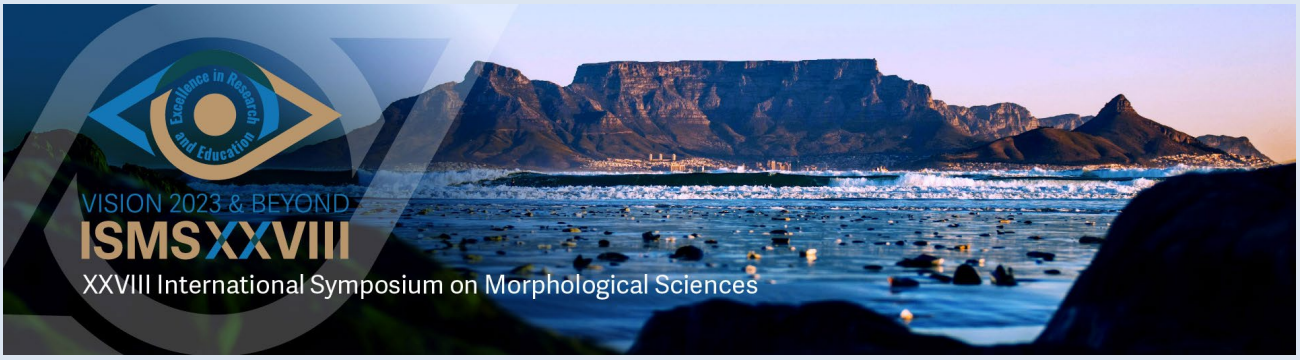
In vitro effects of MAZ-51 and Epigallocatechin Gallate on cellular morphology in melanoma cells

Ms Carolyn Nadasen[1], Mr Keith Ncube[2], Dr Yvette Hlophe[3], Dr June Serem[1]

[1]University of Pretoria, Department of Anatomy, South Africa, [2]University of Pretoria, Department of Pharmacology, South Africa, [3]University of Pretoria, Department of Physiology, South Africa

In 2020, the International Agency for Cancer Research reported approximately 10 million cancer deaths worldwide. The South African population represented over 60 thousand of these cancer deaths. Melanoma is a cancer of the melanocytes, which is an aggressive malignancy with low survival rate. Current therapeutics for melanoma are limited in efficacy. Epigallocatechin gallate (EGCG) is a flavonoid in green tea. It interacts with cellular targets to inhibit tumour cell proliferation through apoptotic induction. 3-[[4-(dimethylamino)-1-naphthalenyl]methylene]-1,3-dihydro-2H-indol-2-one (MAZ-51) is a selective tyrosine kinase inhibitor that acts as an antagonist in ligand-induced vascular endothelial growth factor receptor-3 (VEGFR-3) autophosphorylation. The in vitro effects of MAZ-51 and EGCG on tumour cell survival was determined using mouse melanoma (B16F10) and non-cancerous murine macrophage (RAW 264.7) cell lines. In the crystal violet assay, EGCG (50 – 200 µM) and MAZ-51 (11 – 16 µM) were used to determine percentage cytotoxicity. Additionally, polarisation-optical transmitted light differential interference (PlasDIC) microscopy, light microscopy with haematoxylin and eosin staining and transMsion electron microscopy (TEM) were used to determine morphological alterations at inhibitory concentrations. The IC_{50} values for B16F10 cells were obtained at 48 hours, 107 µM for EGCG ($p<0.0001$) and 34 µM for MAZ-51 ($p<0.0001$). Morphological changes concurred with the cytotoxicity data showing decreased cell density and cell rounding indicative of apoptosis and necrosis in B16F10 cells. In conclusion, both MAZ-51 and EGCG showed a significant reduction in B16F10 cells, with a lesser effect in RAW 264.7 cells. Going forward, morphological observations of apoptosis will be confirmed using caspase-3 in flow cytometry.



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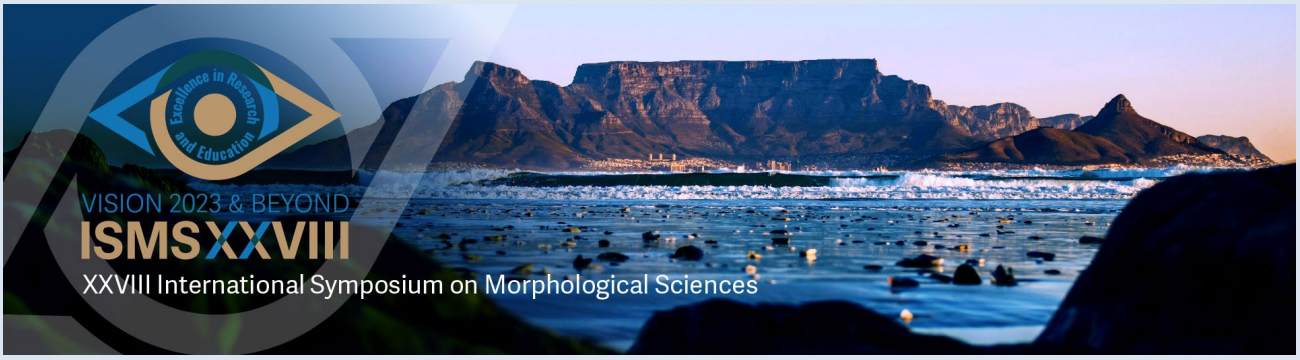
An in vitro investigation of CTCE-9908 and L-Kynurenine on melanoma cell morphology and apoptosis

Ms Charlise Basson[1], Dr June Serem[2], Dr Priyesh Bipath[1], Dr Yvette Hlophe[1]

[1]University of Pretoria, Department of Physiology, South Africa, [2]University of Pretoria, Department of Anatomy, South Africa

The high incidence and low survival rate of melanoma patients highlight the need for new treatment strategies. However, a single treatment may not inhibit all signalling pathways associated with melanoma progression. Therefore, the aim of this study was to investigate the in vitro effects of CTCE-9908 (a CXC chemokine receptor 4 antagonist) and L-kynurenine (a kynurenine pathway metabolite) individually and in combination on melanoma cell morphology and apoptosis. Melanoma cells (B16 F10) and a non-cancerous control murine macrophage cell line (RAW 264.7) were treated with L-kynurenine (1.74 mM, which is the IC_{50} value) and CTCE-9908 (0.05 mM, which is ten times lower than the IC_{50} value, as CTCE-9908 previously displayed non-selective cytotoxicity towards B16 F10 cells) for 48 hours. Microscopy techniques, including polarisation-optical transmitted light differential interference contrast imaging, light microscopy after haematoxylin and eosin staining and transMsion electron microscopy, were used to assess morphological changes. Flow cytometry was used to quantify apoptosis through the activation of caspase-3. Both cell lines exposed to L-kynurenine and the CTCE-9908/L-kynurenine combination treatment revealed morphological changes related to apoptosis, which was accompanied by increased levels of caspase-3 activation. CTCE-9908 induced signs of cell stress, such as cell protrusions and rounding, but did not result in increased caspase-3 activation. Individually, L-kynurenine and CTCE-9908 induced cell death and morphological changes in melanoma cells. Furthermore, the combination therapy promoted apoptosis in melanoma cells. Future research will confirm the antimetastatic effects of the combination therapy on melanoma cells and substantiate the findings of this study.



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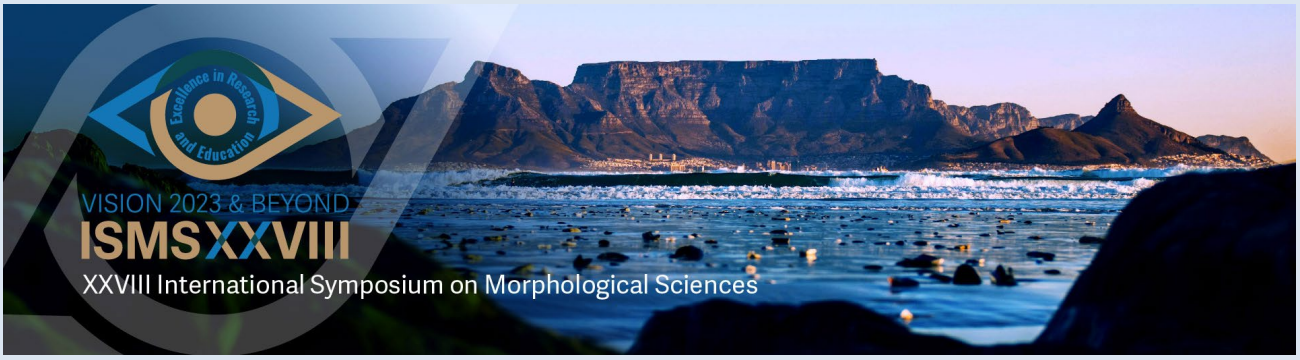
With the body, beyond the body – The meaning of Anatomy Education in 2023

Md Sabine Hildebrandt[1]

[1]*Boston Children's Hospital, Harvard Medical School, USA*

In 2023, Anatomy Education means more than a simple knowledge gain of structures of the human body within Health Professions training. Rather, its potential as a learning and practice room for professional competencies – including ethics – has been recognised, as well as its role in professional identity formation. A new concept of Anatomy integrates these insights from the domain of Medical Education with the framing of relational Anatomy as developed by Medical Anthropologist Elizabeth Hallam. It allows the analysis of relationships between learners, educators, and the human body – as donor or patient – not only within the space of the dissection laboratory, but also within their social networks and specific history. This triad model of relational Anatomy has attained new meaning through the lens of the Covid-19 pandemic, which increased visibility of the inequities in society that influence relationships and interpersonal connections, including in health care. Explicitly introducing learners to the concept of relational Anatomy may support their socialisation as humane care givers.



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Non-iatrogenic vascular injuries secondary to traumatic brain injury: A single-centre study

Dr Bukola Omotoso[1], Dr Rohen Harrichandparsad[2], Prof Lelika Lazarus[1]

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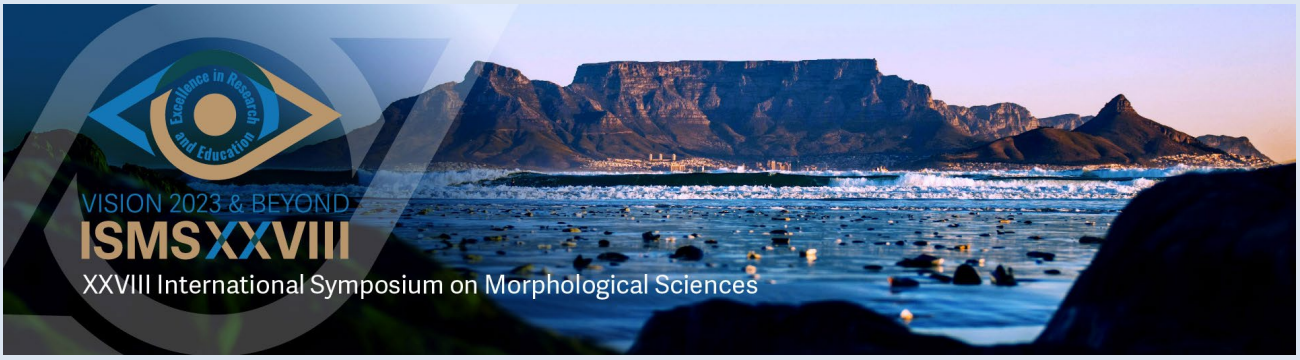
Traumatic brain injury is one of the leading public health problems in the world. It may result in significant injury to the cerebral blood vessels with subsequent subarachnoid haemorrhage, cerebral hypoperfusion, ischaemia, and blood-brain barrier disruption. The neurosurgery database at Inkosi Albert Luthuli Central Hospital, Durban, South Africa, was reviewed retrospectively (January 2012 - December 2022). Patients with penetrating intracranial and extracranial injuries in the head and neck region with suspected vascular injury were included. Medical records were analysed for demographics, clinical presentation, computed tomography and digital subtraction angiography findings, neurosurgical intervention, and Glasgow Coma Scale at the discharge. A total of 121 patients, median age 26, were included in the study: male 91.7%, female 8.3%. Most patients were Black (88.4%), Indian 6.6% and Coloured 1.7% South Africans. Vascular damage was confirmed in 44.6% of the patients. Injured blood vessels included the middle cerebral artery (16.5%), internal carotid artery (8.3%), middle meningeal artery (4.1%), vertebral artery (4.1%), pericallosal artery (3.3%), anterior cerebral artery (2.5%), ophthalmic artery (1.7%) and posterior cerebral artery (1.7%). The most common type of injury was pseudoaneurysm (33.1%). Mechanisms of injury involved the use of a knife (39.7% of cases), amongst others. The incidence of traumatic vascular injuries is high in patients with penetrating head and neck trauma, and one should have a high index of suspicion. Vascular injury remains one of the major consequences of penetrating traumatic brain injury that contribute to functional deficits and traumatic brain injury-related chronic disability and may even result in death. (Ethical No: BREC/00004897/2022).



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Is the Nolla Classification Scheme applicable to the KwaZulu-Natal population of South Africa?

Dr Sundika Ishwarkumar[1,2], Dr Pamela Pillay[2], Prof Kapil Satyapal[2], Prof Manogari Chetty[3]
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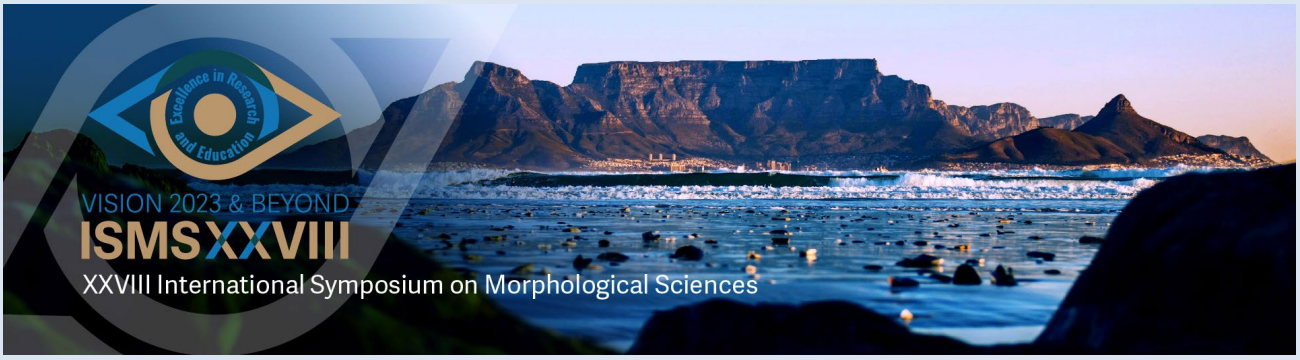
Dental age estimation is imperative in clinical practices, such as forensic science, orthodontic treatment and radiology. The Nolla (1960) Classification Scheme is utilised as a tool for age estimation in teaching and clinical practice. In the KwaZulu-Natal population of South Africa, the applicability of the Nolla (1960) classification scheme for age estimation is unknown. Consequently, the present study aimed to determine the applicability of the Nolla (1960) Classification Scheme on a select KwaZulu-Natal population sample and develop a regression model to extend the Nolla (1960) maturation and age norm tables beyond 17 years. A sample of 840 digital panoramic radiographs of individuals aged between 5 and 25 years met the inclusion criteria. All dentition (8 maxillary and 8 mandibular) in the left quadrant were analysed using the Nolla (1960) Classification Scheme. The paired T-test, Wilcoxon and Polynomial Regression Analysis were performed using R Studio. Ethical clearance was obtained from Biomedical Research Ethics Committee at University of KwaZulu-Natal (BE:405/17). In this study, the original Nolla (1960) method over-estimated age for the entire sample by -0.39 and -0.57 years in females and males, respectively. While, the modified Nolla (1960), showed an overall under-estimation in females, but over-estimation in males aged between 18.00 and 18.99 years. Since, the Nolla Classification schemes over- or under-estimated dental age within the selected sample; population-specific tables were developed for the South African Black and Indian population groups of KwaZulu-Natal. The results of this study may enhance the accuracy of age estimation in the aforementioned South African population.



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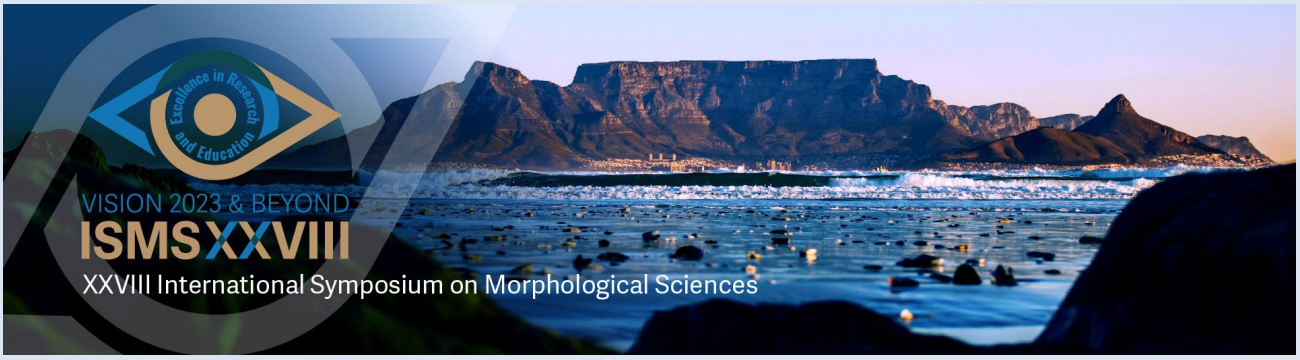
Tale of the tail: a study of the evolutionary and developmental paths to humans, “Shippology”

Dr Sayaka Tojima[1]

[1]*The Hakubi Center for Advanced Research, Kyoto University, Japan*

When you hear the word "tail," what do you think of? You may imagine your pet’s tail, the tail of a particular animal in a zoo, or any other similar image. Many creatures use tails of various shapes and sizes in a variety of ways. This means that by looking at the appearance of a tail, we can draw conclusions about its functions, adaptations and evolutionary development. Humans do not have tails, which leads one to wonder why. This is my research theme. In a biological context, we lost our tails during both evolutionary and embryological developmental processes. How and why we lost our tails is the subject of my research, which combines various biological approaches. In addition, it can be said that we are instinctively interested in tails, even although we have lost ours biologically, and representations of tails in myths, folklore and art are evidence of this. I think that is what helps make up “human-like” humans today. In other words, I am recognising the tail as one of the clues to explore how we came to be "human" biologically and culturally; trying to clarify how we came to be "human" using an interdisciplinary approach. I have named this study "Shippology" from the word “Shippo” which means "tail" in Japanese. In this talk, I will tell you a tale of tail loss in biological humans by making use of a review of previous studies and my own research results, and also introduce the “Shippological” approaches that I am using.



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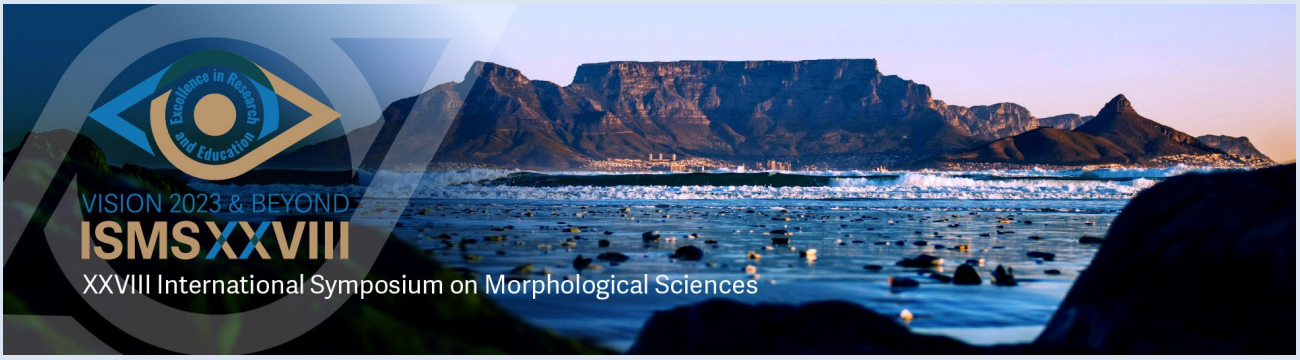
Anatomical investigation of the transverse dural venous sinuses

Ms Kirsten Regan[1], Mr Jacobus Gates[1], Ms Gerda Venter[1], Ms Lané Prigge[1]
[1]*University of Pretoria, Prinshof, South Africa*

A significant lack of resources and imaging equipment available to neurosurgeons in Sub-Saharan Africa can make pre-operative location of clinically important vascular structures challenging. The location of the transverse dural venous sinuses is of particular importance in various craniotomies, as they are used to determine the most appropriate site of initial burr hole placement, and it has been determined that currently superficial landmarks are not reliable enough to locate the transverse sinuses. This study aimed to better describe and define the morphology and most common anatomical variations of the transverse sinuses in a South African population. Following ethical clearance (Ref: 233/2021), the transverse sinuses were exposed in 32 formalin-fixed human adult cadavers by removing the calvaria and the brain. The length and width at the sinus's origin, midpoint and termination points were measured in both the dura mater as well as the bony impressions within the cranial cavity. Statistical analysis involved both descriptive and inferential statistics to illustrate the data obtained. The right transverse sinus was found to be on average shorter than the left, both within the dura mater (Left: 71.11 mm; Right: 68.97 mm) and on the bony impressions (Left: 73.96 mm; Right: 71.49 mm). The right sinus was on average wider and dominant in 72% of the sample. The sinuses widen gradually from the origin to the midpoint and then more abruptly towards the termination point. Further studies on the sinus's morphology are recommended. Asymmetry of the sinuses are a crucial aspect to consider when planning surgical approaches.



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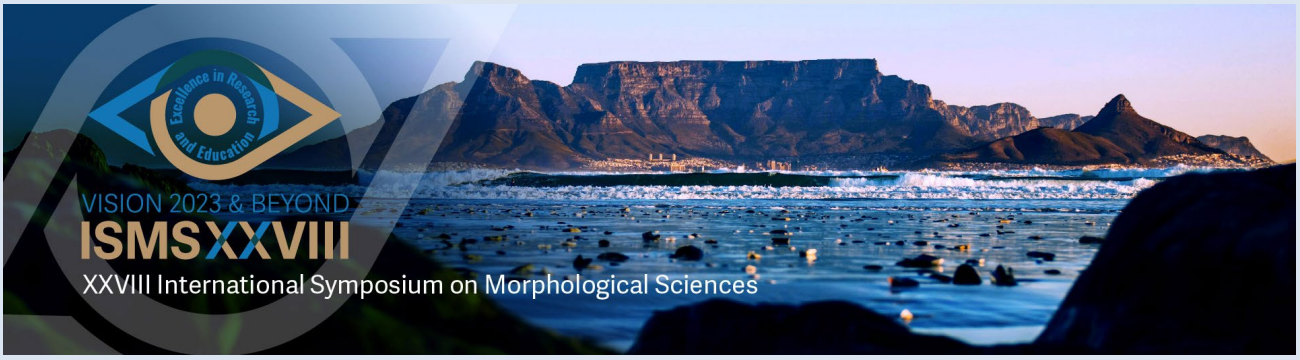
Exploring skeletal asymmetry and indicators of developmental stress in a South African sample

Ms Miksha Harripershad[1], Dr Alison F. Ridel[1], Dr Charlotte E.G. Theye[1], **Ms Leandi Liebenberg[1]**
[1]*University of Pretoria, Prinshof, South Africa*

Understanding skeletal asymmetry and its correlation to health and disease is of great importance to biological anthropologists. Indeed, studies have found high levels of skeletal asymmetry to be associated with low socio-economic status and non-specific signs of disease. This study aimed to evaluate the magnitude of craniofacial asymmetry in a South African population using micro-focus X-ray computed-tomography (micro-XCT) scans and explore potential associations between asymmetry and developmental stress. The sample included cranial micro-XCT scans and associated skeletal remains of 115 individuals from the Pretoria Bone Collection. From bilateral pairs of landmarks placed on 3D models of the crania, inter-landmark distances and fluctuating asymmetry values were calculated. Additionally, geometric morphometric methods were used to assess asymmetrical shape variations. Four non-specific signs of disease (cribra orbitalia, porotic hyperostosis, enamel hypoplasia and periostitis) were recorded and used as indicators of potential developmental stress. Significant levels of asymmetry were observed in the orbital, nasal, and temporal regions. Higher levels of asymmetry were noted more frequently among females and black South Africans in the sample, which is consistent with existing literature. Overall, only 26 individuals were considered to be significantly asymmetrical. The highest frequency of non-specific signs of disease was recorded among black South Africans. However, correlations between asymmetry and the observed pathological lesions were weak to absent. The results suggest that asymmetry and non-specific signs of disease frequently occur independently and are most likely unrelated, contrary to observations of previous studies. Consequently, the implications of craniofacial asymmetry on skeletal analyses should be further explored.



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Vascular anatomy of the anterolateral abdominal wall in neonates: A feasibility study

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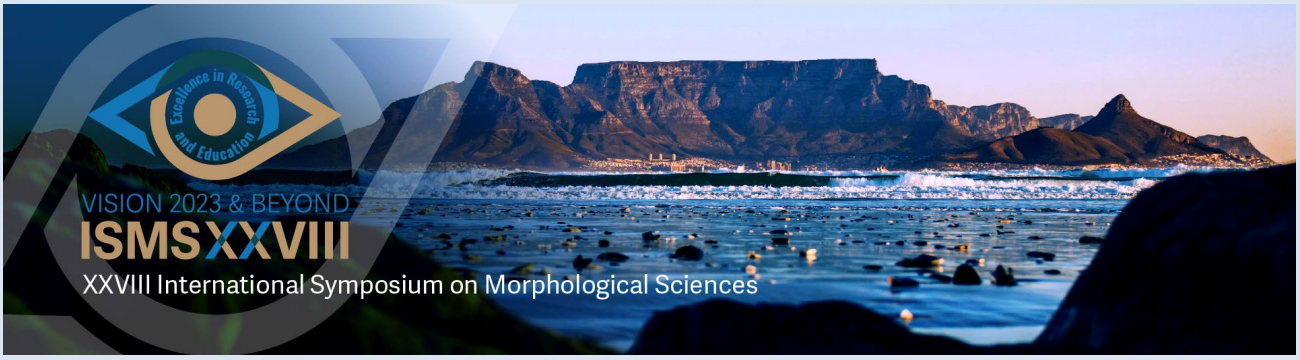
[1]Khalifa University, United Arab Emirates, [2]University of Pretoria, South Africa, [3]University of Warwick, United Kingdom

Laparoscopic procedures through the abdominal wall can cause inadvertent damage to vascular structures owing to anatomical variations and poor visibility. Therefore, this feasibility study was conducted to identify the vascular structures of the anterolateral abdominal wall in a neonatal sample, relating to the nine surface anatomical regions.
Midline skin incisions were made into ten embalmed neonatal cadavers (n = 10; <28 days) sources through the donor programme of the Department of Anatomy at the University of Pretoria and the South African National Tissue Bank. The skin was reflected inferiorly, and a deeper incision was made to expose and trace the superficial and deep vascular structures according to the nine abdominal regions.
The results revealed that the superficial epigastric and thoraco-epigastric vessels could be identified in 75% and 60% of neonates, respectively, while no superficial external pudendal vessels were observed. Deeper umbilical arteries and veins were identified in 80% and 90% of the sample, respectively, while the superior and inferior epigastric vessels were identified in 25% and 90% of the sample, respectively. These vessels showed a large degree of variability.
In conclusion, within this neonatal sample, differentiation between arteries and veins proved challenging and the recommendation is to consider them as vascular bundles. In this sample vascular bundles are small and fragile, requiring an experienced dissector and specialised dissection instruments. The suprapubic and epigastric regions were viewed as the least accessible area of all nine abdominal regions, while both lumbar regions were considered the most favourable for laparoscopic surgical access.
(University of Pretoria Ethics#: 224/2023)



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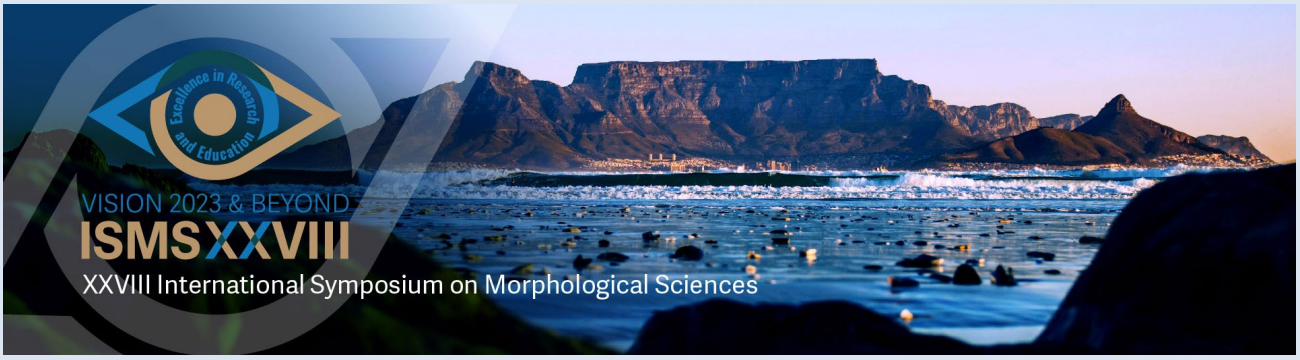
Automatic placement of anatomical and sliding landmarks on 3D human pelvis models for shape analysis

Ms Thandolwethu Mbonani[1], Prof Anna Oettlé[1,2]
[1]*University of Pretoria, Gezina, South Africa,* [2]*Sefako Makgatho Health Sciences University, South Africa*

Sex estimation methods are an important component in Forensic Anthropology and employ landmarks to make both morphological and osteometric comparisons. The visual scoring of pelvic bone variation has been viewed as subjective and unreliable. As manual landmarking is regarded as time-consuming and subjective, an automated three-dimensional method was developed to decrease observer subjectivity and reduce measurement errors.

The purpose of this study was to validate the utilisation of the automatic placement of anatomical and sliding landmarks on the human pelvis for shape analysis using Computed-Tomography scans. Computed-Tomography scans of 88 adult South African pelvises were collected from Steve Biko Academic Hospital, in Pretoria, South Africa. The three-dimensional reconstructions and pelvis shape data were acquired using the Avizo 2019.3 (Thermo Fisher Scientific, Inc.) and MeVisLab© v.2.7.1 software, respectively. The reconstructions and landmark datasets were acquired using a manual and automatic approach such that 18 anatomical and 256 sliding landmarks were registered on 88 three-dimensional models of the same individuals and compared using reproducibility testing and geometric morphometric analysis. Reproducibility testing demonstrated minimal dispersion errors (> 2 mm) for both landmark datasets. Variance analysis showed that pelvis shape variation was statistically significant ($p < 0.001$) for sex using both procedures. Cross-validated linear discriminant function analysis for automatic and manual landmarking yielded accuracies between 84.09% and 97.72%, and 65.90% and 93.18%, respectively, indicating that three-dimensional automatic approaches, and advanced statistical analysis, may allow forensic anthropologists to estimate sex in a more accurate and repeatable way.



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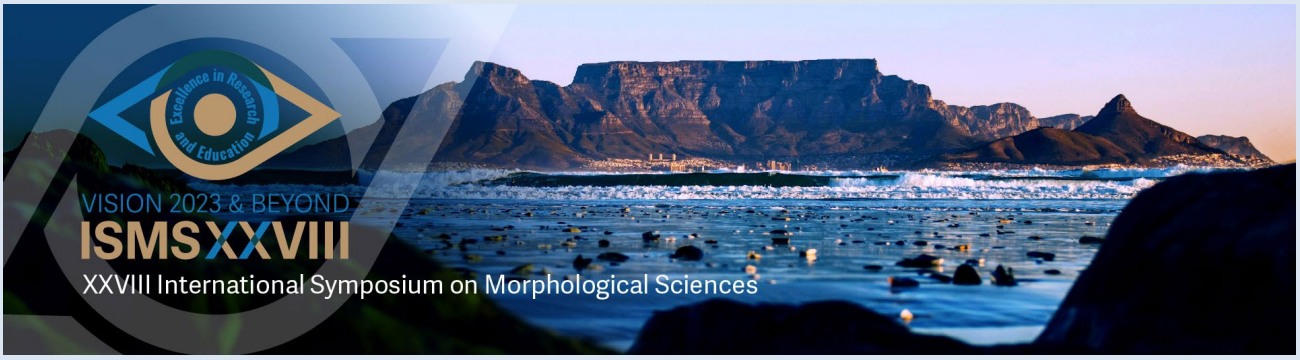
Anatomical configurations of the circle of Willis and its variations

Ms Gugulethu Sibiya[1], Prof Lelika Lazarus[1], Ms Bukola Omotoso[1]
[1]*University of KwaZulu-Natal, Westville, South Africa*

The circle of Willis (CoW) is a vascular network formed at the base of the skull in the interpeduncular fossa. The presence of morphologic variations of arteries forming the CoW may alter blood flow to the brain, resulting in intracranial vascular disorders, associated with stroke, aneurysms, and white matter hyperintensities. The study of variation in the anatomy of the CoW may partially explain differences in incidences of some of the cerebrovascular diseases in different racial groups. This study aimed to document the morphology of the CoW and distinguish variations in South African patients. Two hundred and thirty-nine computed tomography angiographies scans were assessed. CoW typical morphology and variations were registered and classified as typical, absent or hypoplastic. The anterior cerebral artery (ACA) A1 was absent in 4.91%, hypoplastic in 30.40% and typical in 63.6% of subjects. We found fenestrated ACA A1 in 1.06%. The ACA A2 was absent in 0.42%, hypoplastic in 26.28% and typical in 69.44% of subjects. We found triple ACA A2 in 2.98%, azygos in 1.28% and fenestration in 1.28%. The middle cerebral artery (MCA) was hypoplastic in 7.35% and typical in 92.64% of subjects. The posterior cerebral artery (PCA) was hypoplastic in 28.74% and typical in 71.25%. Variations commonly found in the CoW in the present study include hypoplasticity and absence of component vessels. A typical CoW was seen in 74.23% and variations in 10.84%. Awareness of these anatomical variations would play a vital role in neurovascular procedures.
Abbreviations: CoW - Circle of Willis; ACA - anterior cerebral artery; MCA - middle cerebral artery; PCA - posterior cerebral artery.



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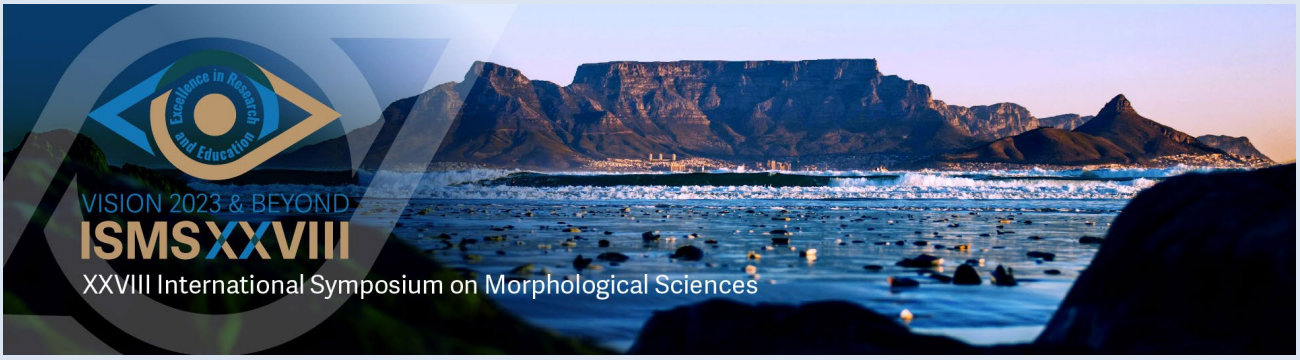
The role of Tenascin-c in HIV-associated pre-eclampsia

Mr Seke Nzau Mafuika[1], Prof Thajasvarie Naicker[1]
[1]*University of KwaZulu-Natal, Umbilo, South Africa*

Pre-eclampsia (PE) is a condition characterised by the new onset of hypertension (>140 mmHg systolic or >90 mmHg diastolic). Globally, 10% of pregnancy complications are caused by PE. In South Africa, PE accounts for 14.8% of maternal deaths. In a normal pregnancy the cytotrophoblast invades the maternal uterine spiral arteries, thereby transforming them into large bore conduits. However, in PE this remodelling is deficient. This leads to a decreased blood flow with consequential hypoxia. HIV-infection may lead to increased or decreased risk of PE development. Tenascin C (TN-C) is an anti-inflammatory cytokine expressed in the extracellular matrix and may be dysregulated in the hyperinflammatory PE micro-environment. This study examined serum TN-C in normotensive and pre-eclamptic HIV positive and negative women (n= 36) respectively using an immunoassay. Maternal blood samples were collected and centrifuged at 1000 rpm for 10 minutes at 20°C and stored at -80°C until further analysis. A multiplex immunoassay method using Human Angiogenesis Magnetic Bead Panel 2 was performed according to manufacturer instructions. TN-C was significantly upregulated in PE vs normotensive pregnant women (p= 0.0075) and HIV-positive vs negative pregnant women (p= 0.0009). TN-C levels across all groups was statistically different ($p < 0.0001$). This study demonstrates an elevation of TN-C in HIV-associated PE. The upregulation of TN-C in PE may be attributed to its multiple roles in cell migration, apoptosis, immunomodulation and angiogenesis. TN-C is a potential biomarker for the detection of PE development, however the potential benefit of TN-C used in this context requires further investigation.



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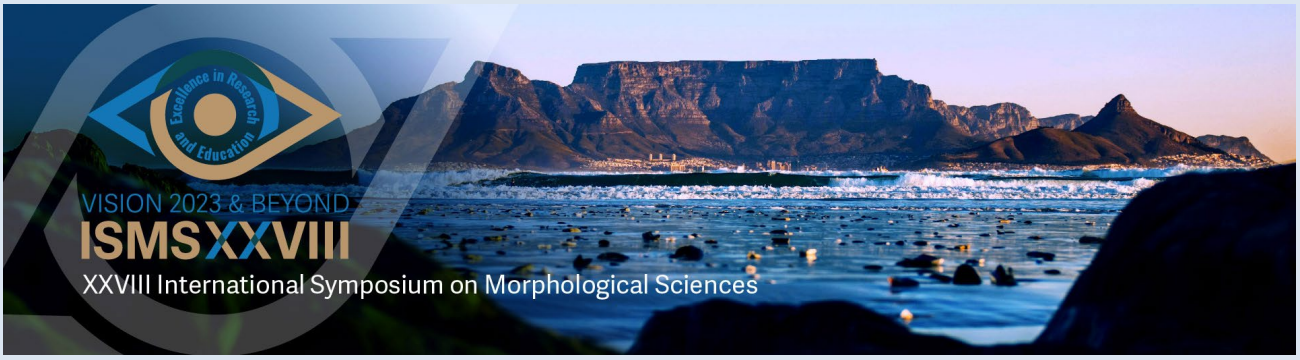
Quality of life of children treated for cleft lip and/or palate

Mr Siyabonga Lembede[1], Prof Anil Madaree, Prof Lelika Lazarus
[1]*Siyabonga Lembede, Westville, South Africa*

Cleft lip and palate are facial defects that affect the orofacial region and continue to be a serious public health challenge due to their life-threatening nature or potential to result in disability or death. These defects have a complex aetiology and develop between the fourth and seventh week of embryological development, during organogenesis when sensitivity is at its highest. Clefts not only affect the patient physically, but are also psychologically and socio-economically challenging, disrupting psychosocial functioning and reducing quality of life for both the patient and the family. This study aimed to investigate the impact of cleft lip and/or palate repair surgery on the quality of life of patients with orofacial clefts with regards to the physical, psychological and social health. A total of 23 patients between 3 months and 21 years of age were recruited from the Plastic and Reconstructive Clinic at the Inkosi Albert Luthuli Central Hospital in Durban a year after their surgery.
Patients with cleft lip only (35%) were found to have a higher quality of life compared to patients with cleft lip and palate (52%) or cleft palate only (13%). Patients with a cleft lip and palate or cleft palate experience a lower quality of life because of the functional difficulties this type of cleft entails. The findings of this study can be used as a way of identifying which type of cleft results in a poorer quality of life and thus inform healthcare service providers on the type of cleft that requires improved managing and repairing techniques.

Ethical approval for this study was obtained from the Biomedical Research Ethics Committee (BREC/00004708/2022).



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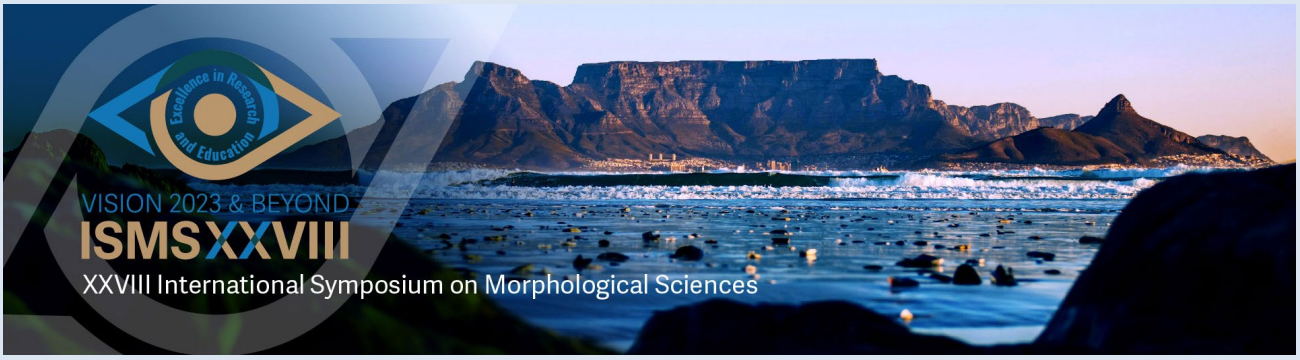
Facial canal morphometry: A technical report

Ms Shavana Govender[1,2], Dr René Human-Baron[2], Prof Tania Hanekom[2]
[1]*University of Witwatersrand, South Africa,* [2]*University of Pretoria, South Africa*

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 lie extracranially. The facial canal is divided into three segments, viz. the labyrinthine, tympanic and mastoid segments, each travelling in a different plane and of varying importance. The main area of interest is 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, containing the facial nerve, is of concern to otologists during electrode placement of a cochlear implant, as the canal 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 can be followed to visualise the facial canal and nerve. The objective was to propose a detailed dissection technique to address this gap in research. With the use of a diamond burr tip drilling tool and medical cutters, the facial canal was exposed in the temporal bone of cadaveric skulls (Ethical clearance: 545/2021). In conclusion, once exposed, morphometric analyses and relationships of the facial canal can be conducted. Knowledge of the facial canal may assist otosurgeons to safely dissect the region without injuring vital structures within this area.



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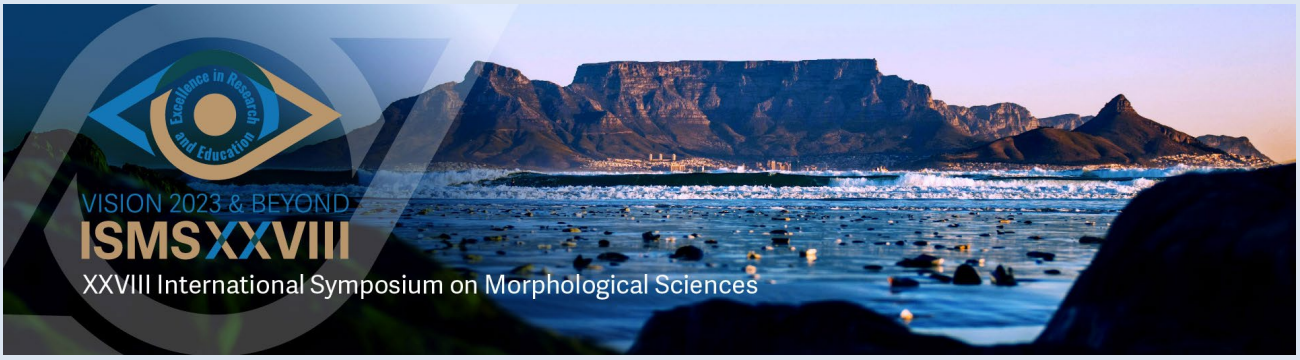
Tenofovir-silver nanoparticles(Ag-Nps) conjugate ameliorates neurocognitive disorders, protects ultrastructure of the prefrontal cortex in diabetic rats

Dr Sodiq Lawal[2], Dr Samuel Olojede[2], Dr Edwin CS Naidu[2], Dr Carmen Rennie[2], **Prof Onyemaechi Okpara Azu[1]**

[1]School of Medicine, University of Namibia, Khomas, Namibia, [2]University of KwaZulu-Natal, Durban, Umbilo, South Africa

Tenofovir disoproxil fumarate (TDF) is the highly recommended antiretroviral drug in human immunodeficiency virus management. Although research has shown the neurological and metabolic disorders associated with TDF administration, the effect of TDF-silver nanoparticles conjugate (TDF-AgNPs) on the disorders has not been fully elucidated. Thus, this study evaluated the neuroprotective effects of TDF-AgNPs on ultrastructural and cytoarchitectonic properties of the prefrontal cortex (PFC) in diabetic rats. Forty-two adult male Sprague-Dawley rats (250 ± 13 g) were randomly divided into non-diabetic groups (1–3) and diabetic groups (4–6), each administered distilled water (0.5 ml/100g, p.o), TDF (26.8 mg/kg/bw, p.o) or TDF-AgNPs (6.7 mg/kg, i.p). After eight-weeks of administration, cognitive function, oxidative injury, and tissue inflammation were evaluated. Furthermore, the PFC ultrastructure was observed using transMsion electron microscopy, Nissl staining, and immunohistochemistry. Diabetic rats administered TDF exhibited cognitive deficits; and increases in blood glucose, malondialdehyde, and interleukin-1 beta (IL-1β) levels, which correlate with decreases in glutathione level, superoxide dismutase (SOD) and catalase (CAT) activities. Furthermore, loss of PFC astrocytes and neuronal organelles was observed. Conversely, TDF-AgNPs administration to diabetic rats improved cognitive deficits; and increased glutathione, SOD, and CAT, but reduced PFC malondialdehyde and IL-1β concentrations. Notably, TDF-AgNPs prevented loss of PFC neurons and astrocytic cells, and morphology aberration of neuronal organelles. This study suggests that TDF-AgNPs attenuated cognitive deficits via silver nanoparticles' antioxidant and anti-inflammatory properties, preventing the loss of PFC astrocytes and neurons. The TDF-AgNPs may be utilised to ameliorate the neurological dysfunction caused by prolonged TDF administration.



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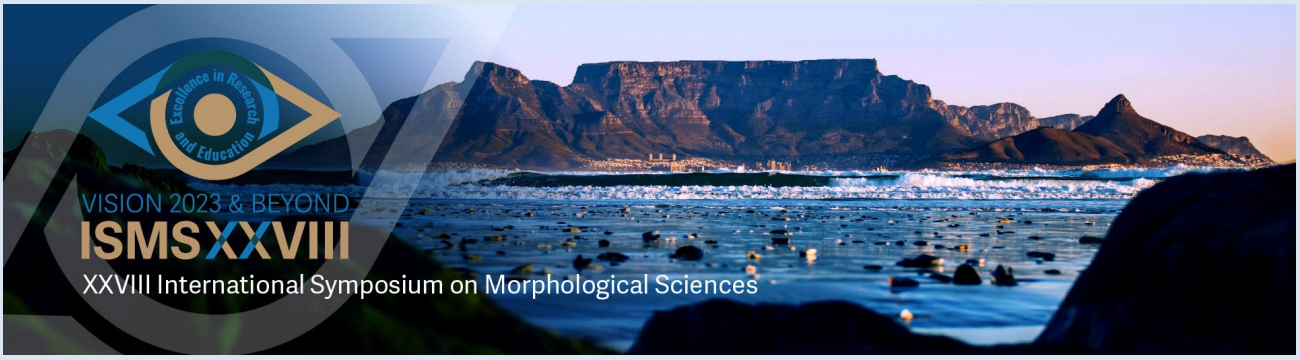
Craniofacial form and masseter muscle anatomy in relation to sex: a radiographical and cadaveric study

Ms Thembelihle Cele[1], Mr Livashin Naidu[2], Mr Okikioluwa Stephan Aladeyelu[1], Dr Sodiq Kalawole Lawal[1], Dr Carmen Olivia Rennie[1]

[1]Department of Clinical Anatomy, School of Laboratory Medicine and Medical Sciences, College of Health Sciences, University of KwaZulu-Natal, South Africa, [2]Department of Human Biology and Integrated Pathology, School of Medicine, Faculty of Health Sciences, Nelson Mandela University – Msionvale Campus, South Africa

The masseter muscle, being the strongest masticatory muscle, elevates and protracts the mandible while exerting masticatory forces during eating. Unlike facial skeletal growth, the masseter anthropometry in the South African population has received less attention in research. Growth of the masseter as soft tissue is dependent on the growth of the related facial skeleton. This study aimed to document the morphometrical differences of the masseter in relation to facial morphology according to sex. Twenty embalmed adult cadavers were dissected bilaterally (n=40). In addition, fifty CT scans were analysed bilaterally (n=100). The masseter length and width were measured on cadavers in relation to facial height, bizygomatic width and bigonial width. The masseter width and thickness were measured on CT scans in relation to the widths of the hard palate and maxillary sinus, and bizygomatic and bicondylar widths. Three points of origin were observed: anterior, posterior and on the zygomaticotemporal suture. The common insertion point of the masseter was the body of the mandible (70%). Masseter width and thickness were greater on the left side (40.49±6.20 mm and 14.30±4.07 mm, respectively). Males possessed greater mean values for masseter thickness (15.34±2.99 mm), width (42.44±6.92 mm), and length (68.28±6.50 mm) than females. The overall study showed differences in the morphometry of the masseter muscle with respect to all population groups (Black, Indian and White). The thickness of the masseter muscle was greatly affected by facial skeletal morphometry. Knowledge of the morphology and morphometry of the masseter is useful in surgical procedures of the face and forensic facial reconstruction.



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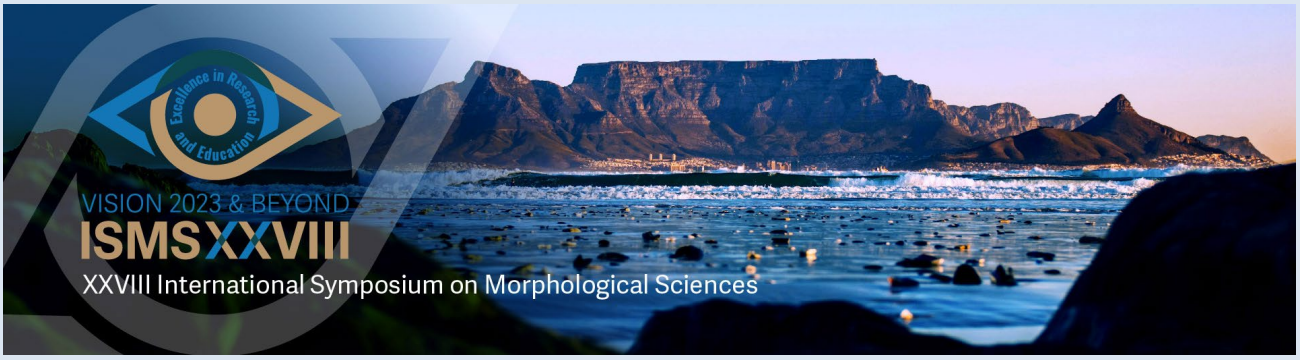
Public dissection: An ethical conundrum for anatomists

Emeritus Prof Beverley Kramer[1], Dr Brendon Billings[1]
[1]*University of the Witwatersrand, Parktown, South Africa*

The ethics of dealing with the dead persists as a pivotal aspect of training in Anatomy for both staff and students. As society changes, so new challenges surface which vex anatomists with ways in which to safeguard the dead yet improve training in Anatomy. While resurrectionists are now part of the history of Anatomy, new issues concerning the use and respect of dead bodies have arisen as society has evolved. Public dissection of human bodies first took place in the 3rd Century to understand how the body functions. Recent public dissections in both the US and UK have raised concern among anatomists regarding the ethics of such public displays and whether they fulfil a meaningful role in portraying the discipline of Anatomy. This presentation will discuss whether contemporary public dissection is acceptable or not in preserving the dignity and respect of our body donors. Central to the debate is how anatomists perceive consent and the sanctity of the human body and whether displays of public dissections are against social mores and will once again instigate the anger demonstrated by society in the 14th Century.



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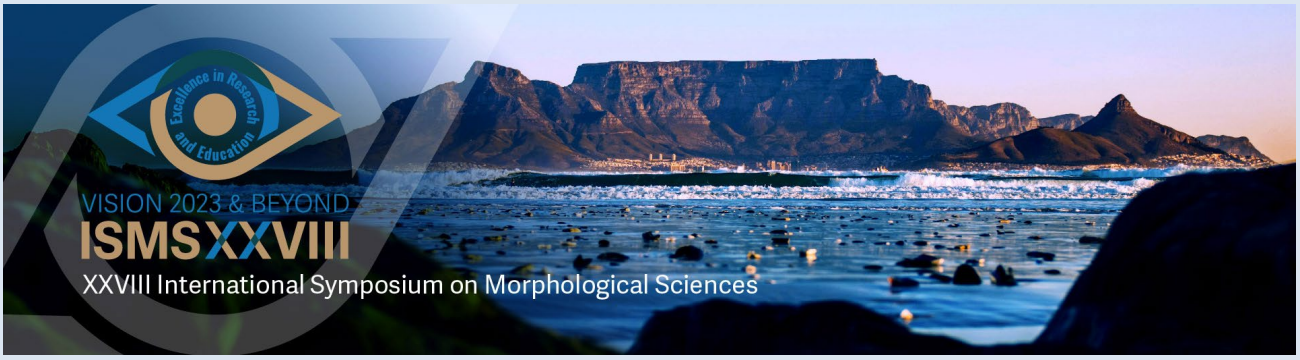
Consent, transparency and informed decision making in body donation

Dr Brendon Billings[1], Prof Beverley Kramer[2]
[1]University of the Witwatersrand, Parktown, South Africa, [2]University of the Witwatersrand, Parktown, South Africa

The ethical validity of body donor programmes which cater to cadaver-based medical training and research is centred on the premise of informed consent. This includes the provision of clear, transparent information that enables the donor to make an informed decision. However, the degree of transparency can fluctuate between consent opacity and overly explicit detail. This talk aims to highlight the interplay between these two extremes and to propose possible interventions to find a balance that best protects the donor. The use of bodily remains in the Medical Sciences changes with evolving technology, awareness, and exposure within the academic and public domain, both locally and globally. Currently, human remains are scanned, photographed, 3D printed and commercially procured using varying versions of informed consent, some of which are outdated and unethical. As such, informed consent is not a stagnant phenomenon but rather a dynamic occurrence that needs to change in response to present day challenges. International Anatomical Societies such as the IFAA do provide guidelines to develop and improve body donor programmes and acknowledge the significance of informed consent. Nevertheless, it is the responsibility of anatomists to seek and implement local strategic solutions to ensure best ethical practice to safeguard the dignity and respect of the generous donors who provided their human remains for the benefit of humankind.



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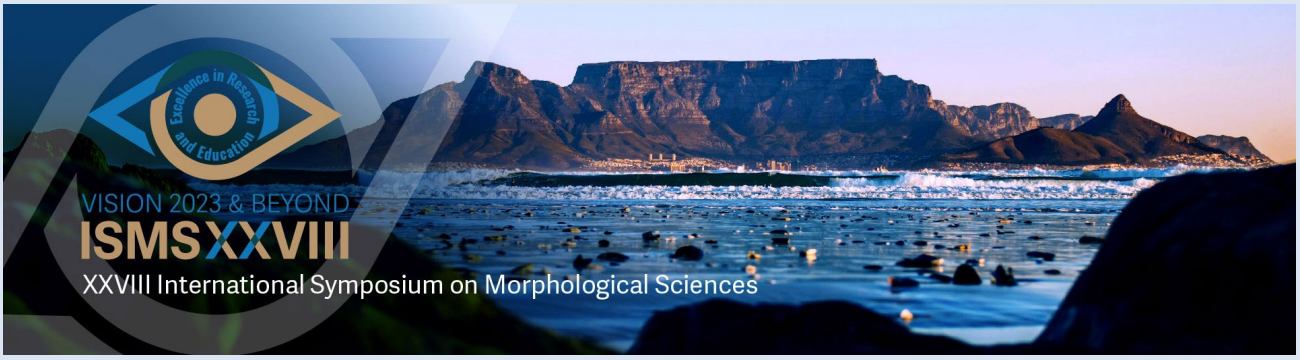
Forensic anthropology through a taphonomic lens

Dr James Pokines[1]

[1]*Boston University School of Medicine, USA*

Forensic anthropological cases can be analysed and processed, and achieve their final case resolution most effectively through a taphonomic lens. Taphonomy is the science of all processes of postmortem alteration to biological materials from their time of death until analysis. The analytical processes used to assess forensic anthropological cases proceed through stages addressing three broad questions: what is it (i.e., human, nonhuman, or non-osseous); if human, how old is it (the postmortem interval and the question of temporal jurisdiction); and from what context(s) does it come? Taphonomic data are used to answer the latter two questions, thus reconstructing the postmortem history of a skeleton back to its origin. Cases must be divided into temporal categories, recent or archaeological provenience, to determine which are the jurisdiction of the Forensic Anthropologist or of the appropriate governmental archaeological or cultural resource management agencies subsequently responsible for them. The more recent remains undergo further forensic anthropological analysis in order to categorise their depositional history. These categories include remains from aquatic, terrestrial, or buried natural contexts and some common artificial contexts, including trophy, ritual, display, and former anatomical teaching remains. The final disposition of recent remains also includes the separation of potential homicide cases from non-homicide causes of death, which is aided by the taphonomic contextual analysis. The taphonomic approach, therefore, provides for a more rational case flow, as the system is orientated toward common final disposition categories.



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An anatomical study of the pterion in a South African population of KwaZulu-Natal

Mr Mageja Gideon Mahlalela[1], Dr Pamela Pillay[1], Ms Sundika Ishwarrkumar[2]
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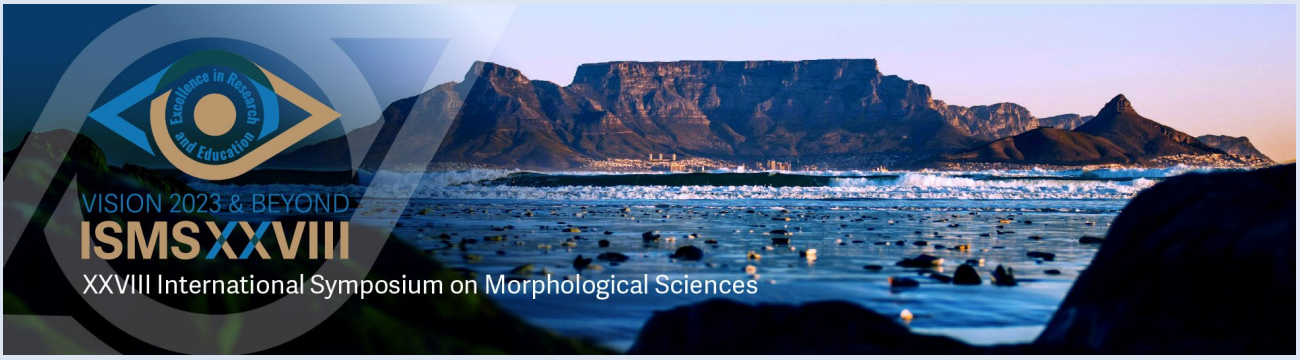
Morphologically, the pterion marks the location of the four cranial bones, viz. frontal bone, sphenoid angle of the parietal bone, squamous part of the temporal bone and the greater wing of the sphenoid bone. Population-specific differences exist in the position and union of the pterion. The pterion is an important neurosurgical landmark for surgical procedures, namely the pterional or lateral approach, which provides wide access to the base of the skull. This study was aimed at determining the position and incidence of the various sutural patterns of the pterion. Ethical clearance was obtained (BE:00002996/2021).
Thirty-six dry human skulls (pterion n=72) were obtained from the Department of Clinical Anatomy, University of KwaZulu-Natal. Morphometric parameters of the pterion were measured using a digital vernier calliper, while the morphological characteristics were examined using Murphy's classification scheme.
The mean distance from the centre of the pterion to the midpoint of zygoma was 44.4+/-4.1 mm and 45.1+/-4.6 mm in males and females, respectively. The distance from the frontozygomatic suture was 32.7+/-4.7 mm and 32.6+/-4.8 mm in males and females, respectively. Morphologically, the sphenoparietal type of pterion was the most prevalent at 55.6%, followed by the frontotemporal, stellate and epipteric type with incidences of 27.8%, 11.1% and 5.6%, respectively. Only one population was studied.
The study concluded that the sphenoparietal type of sutural pattern was the most prevalent with an incidence of 55.6%, while the epipteric type was the least prevalent (5.6%). This comprehensive data about the position and structural components of the pterion are important for neurosurgeons, forensic scientists and anthropologists.



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Treasured bodies: An examination of selected fluid-preserved pathology specimens, technical aspects and perspectives for conservation

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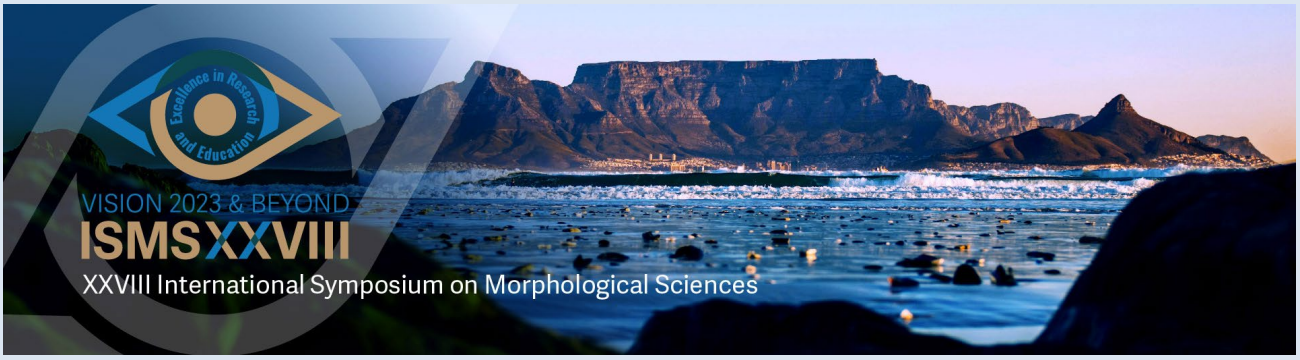
Historically, fluid-preserved collections have been recognised as a valuable resource within the discourse of science and medicine. In clinical education and practice, fluid-preserved collections specifically pertaining to pathology have been invaluable in establishing the foundation for understanding disease pathogenesis, prognosis and treatment in medical practice. Medical institutions' recent shortage of cadavers necessitates the preservation of cadaveric collections, which include archaeological, anatomical, and pathological wet specimens, for effective teaching and clinical practice. However, as a result of inconsistent cycles of use and dormancy, and the lack of knowledge and preservation skills, many fluid-preserved collections have declined in quality. Therefore, the aim of this study was to examine the relevance, preservation, and long-term conservation of fluid-preserved anatomical collections. As a case study, a technical analysis of selected pathology specimens from the University of Pretoria's W.G. De Haas Anatomy Study Resource was performed. To better categorise the specimens and understand their materiality, this study examined and documented the specimens through various historical, imaging, and analytical techniques. These techniques included provenance research, observational examination, photography, and analytical techniques such as X-Ray fluorescence spectroscopy and microscopy. The results from these non-destructive methods have provided further insight into the educational and historical significance of the selected specimens and the study resource as a whole. Furthermore, the results have expanded on the limited knowledge available concerning fluid preservation in Africa and has contributed towards facilitating the continued preservation and conservation of fluid-preserved collections in the disciplines of Medicine, and Zoology within the field of heritage conservation. 18170022(HUM012/0323).



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A complete insight on obturator nerve anatomy and its clinical implications

Prof Latha Prabhu[1], Dr Ashwin Rai[1], Prof Rajanigandha Vadgaonkar[1], Prof Mangala Pai[1], Dr B.V. Murlimanju[1], Ms Vandana Blossom[1]

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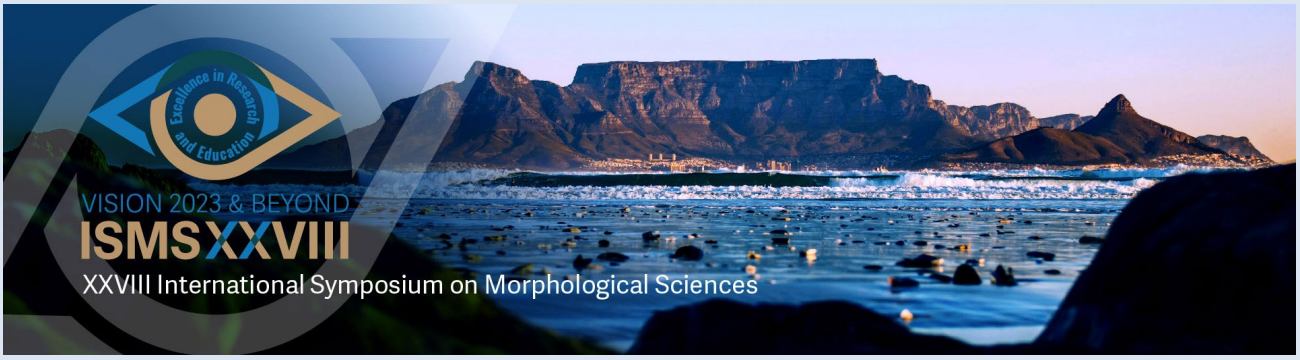
The study of obturator nerve morphology may enlighten the clinician and provide successful clinical outcomes. However, there was not much information available about this subject in Indian sample population. This was the motivation to perform this anatomical investigation. In this morphological study, we studied 50 embalmed cadavers. This anatomical study has the approval of our institutional ethics committee (IEC KMC MLR 09-18/310). Topographical location of the obturator nerve and the arrangement of structures at the obturator foramen were examined over the right and left sides. The obturator nerve was branching into the anterior and posterior divisions inside the pelvic cavity in 28 specimens (56%), at the obturator canal in 12 (24%) and there was no division of the obturator nerve in 10 cases (20%). The mean length, width and thickness of the trunk was 108.26 ± 9.53 mm, 2.84 ± 0.88 mm and 1.11 ± 0.35 mm respectively. The mean width and thickness of the anterior and posterior divisions were 2.19 ± 0.82 mm, 0.9 ± 0.1 mm, 0.99 ± 0.6 mm and 0.71 ± 0.26 mm respectively. The mean distance of the branching of the obturator nerve from the upper and lower border of the obturator foramen was 1.48 ± 0.58 mm and 3.07 ± 1.1 mm respectively. The length of anterior division of the obturator nerve was 110.88 ± 12.02 mm over the right side and 107.13 ± 7.81 mm over the left side respectively. The width of the main trunk was 2.87 ± 0.64 mm over the right side and 2.82 ± 0.64 mm over the left side respectively. The thickness was 0.94 ± 0.07 mm and 1.25 ± 0.46 mm over the right and left sides respectively. The mean width of the anterior division was 1.4 ± 0.55 mm and 1.7 ± 0.57 mm over the right and left side respectively. The anterior division thickness was 0.94 ± 0.05 mm and 0.88 ± 0.13 mm respectively over the right and left sides. The mean width of the posterior division was 0.84 ± 0.21 mm and 1.06 ± 0.83 mm over the right and left side respectively. The posterior division thickness was 0.54 ± 0.21 mm and 0.78 ± 0.29 mm respectively over the right and left sides. We believe that the morphometric data of the obturator nerve will be enlightening to the operating surgeon during the procedures like nerve transplantation.



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Investigating the antidiabetic properties of small peptides in relevant in vitro cellular models

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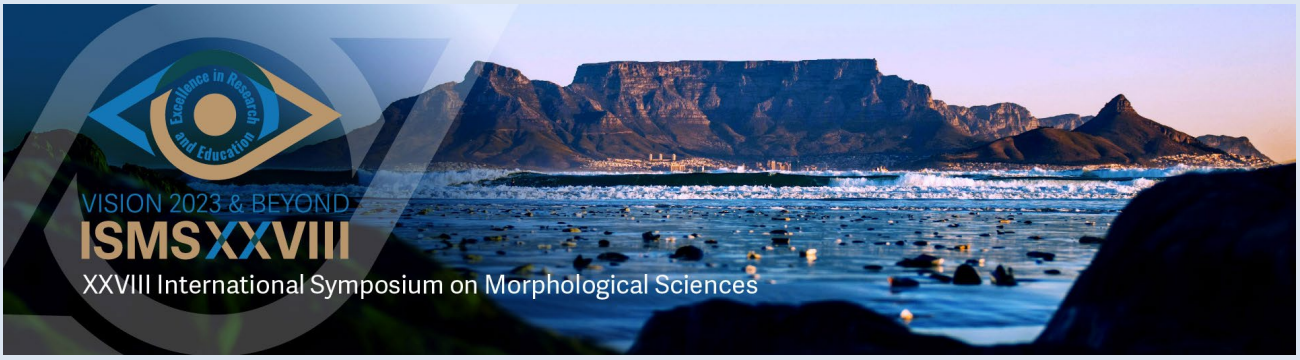
[1]University of Pretoria, Hatfield, South Africa, [2]Ahmadu Bello University, Basawa, Nigeria

Type 2 diabetes mellitus (T2DM) is a common metabolic disorder that is increasing worldwide, especially in South Africa. Obesity and liver dysfunction, such as non-alcoholic liver disease, as well as excess reactive oxygen species (ROS), and nitric oxide (NO) contribute to inflammation observed in T2DM. Peptides such as SQSPA, YPG, STYV and STY are resistant to digestion and, to various degrees, scavenge ROS and NO while additionally preventing lipid accumulation in adipocytes. This study evaluated these properties in relevant cell models. Firstly, cytotoxicity was assessed using the Crystal Violet and 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide assays in the HepG2, RAW 264.7 macrophages and the 3T3-L1 adipocytes. Morphological changes were assessed using light microscopy, phase-contrast microscopy and polarisation optical differential interference contrast (PlasDIC) microscopy. Antioxidant activity was assessed chemically using the oxygen radical absorbance capacity assay (ORAC) and the cellular antioxidant assay in relevant cells. The NO scavenging effects on the RAW 264.7 macrophage and the inhibitory effects on lipid accumulation were evaluated in the oleic acid/HepG2 and the 3T3-L1 adipocyte models. The peptides were non-cytotoxic at all concentrations up to 100µM after 48 hours of exposure, although PlasDIC revealed that the cells were enlarged. When the peptides were compared with antidiabetic drugs such as metformin, acarbose, and diprotin A, it was seen that there was also no cytotoxic effect, and PlasDIC imaging revealed similar enlargement of the cells. The antioxidant activity of the peptides was 98 – 408µM Trolox equivalents. Both STYV and STY reduced NO levels to 65% and 80% respectively as well as lipid accumulation by 10%. This study confirms the anti-diabetic properties of all the peptides, but especially of STYV and STY in relevant cell models.



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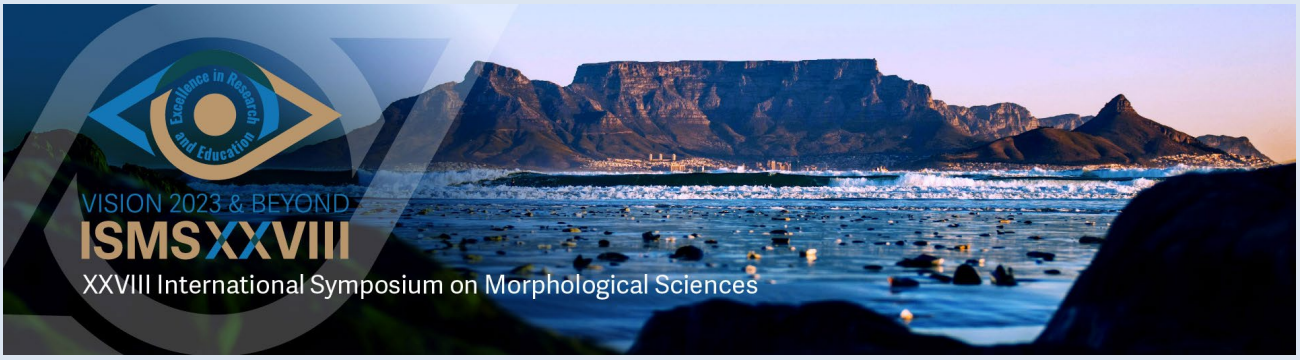
Craniofacial sex and age-at-death: Influenced by trauma?

Ms Amberly Oosthuizen[1], Mr Calvin Mole[1], Assoc Prof Jacqui Friedling[1]
[1]*University Of Cape Town, Observatory, South Africa*

The prevalence of unidentified remains cases continually burden South Africa's medico-legal services. By conducting skeletal anthropometric analyses, Forensic Anthropologists generate identifying estimates, that serve as potential investigative leads and may assist with this burden. Skeletal trauma/pathology may, however, hinder analyses by altering the structural integrity of identifying regions. This study aimed to elucidate the influence of trauma and pathology on craniofacial and innominate sex and age methodologies in a forensic population. Sex and age estimation using traditional morphometric techniques and cranial and innominate bones were initially undertaken in a cadaver (n=51) sample to validate each method and to assess trauma/pathology influences. Cadaver pooled accuracies ranged from 74.39%–85.53% (sex) and 61.45%–75.34% (age), with specific trauma and pathology variables influencing the accuracy of several morphometric methods. Based on these results, decision matrices were developed for sex and age estimation within a forensic sample (n=45), which yielded pooled accuracies ranging from 71.05%–86.84% (sex) and 84.21%–94.44% (age). Trauma/pathology did not play a large role in the accuracy of individual methods; possibly due to minimal trauma/pathology in the regions utilised by each method, a small sample size, or the robusticity of each method. Regardless, the developed decision matrices yielded greater accuracy in the assessment of age. While the interplay between population variation and observer experience is more likely to influence method accuracy, understanding the influence of trauma/pathology on anthropometric techniques is important when considering the most appropriate approach to forensic anthropological casework.



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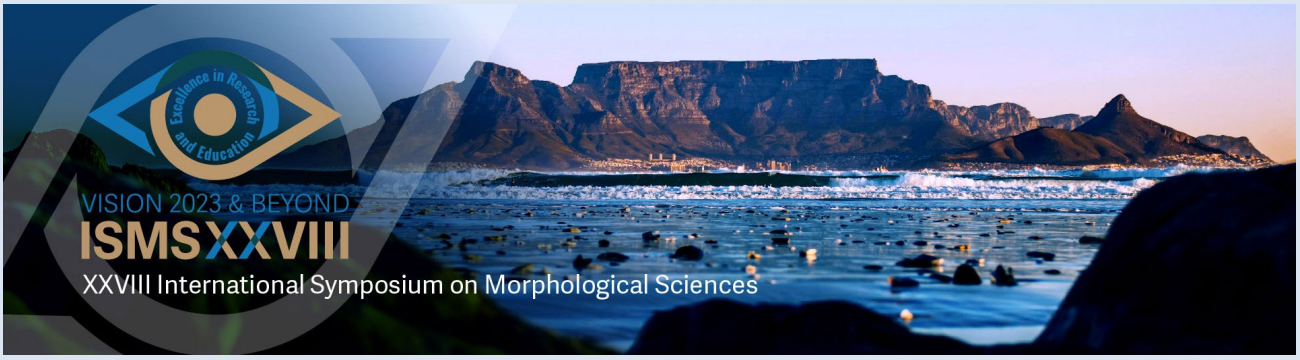
A Coloured community's perceptions on whole body donation in KwaZulu-Natal

Ms Cassandra Creamer[1], Dr Brenda De Gama[1], Dr Pamela Pillay[1]
[1]*University of KwaZulu-Natal, Westville, South Africa*

South African Higher Education Institutions acquire cadavers for medical education and research through whole-body donation programmes. However, there is a current shortage of body donors for these programmes, particularly from the Coloured population group of South Africa (SA). The term 'Coloured' refers to a population grouping of SA made up of persons with mixed ancestry. Although the Coloured population previously dominated body donation rates in the Gauteng and Western Cape provinces, a recent shift to predominantly White body donors has occurred. This study aimed to investigate the perceptions of a select Coloured community of KwaZulu-Natal towards whole-body donation and the treatment of their dead. Four hundred questionnaires comprised of twenty-one questions (both open-ended and closed-ended) were administered using convenience sampling with a total response rate of 91.5%. The questionnaires included participants' (i) biographical information, (ii) willingness towards donation and factors influencing their choice, (iii) religio-cultural perceptions and (iv) how they treat their dead. Levels of willingness for the whole-body donation were relatively low (24.9%), primarily due to strong religious beliefs. Factors statistically significant and contributing to participants' willingness were age, marital status, awareness of whole-body donation, religious views and cultural beliefs ($P<0.05$). Furthermore, burial was the preferred method of body disposal. Levels of willingness for whole-body donation may continue to remain low for this population group in KwaZulu-Natal based on the impacting factors reflected. Therefore, possible interventions through whole-body donation awareness campaigns and educational programmes in the community may gradually increase the pool of potential donors in future.



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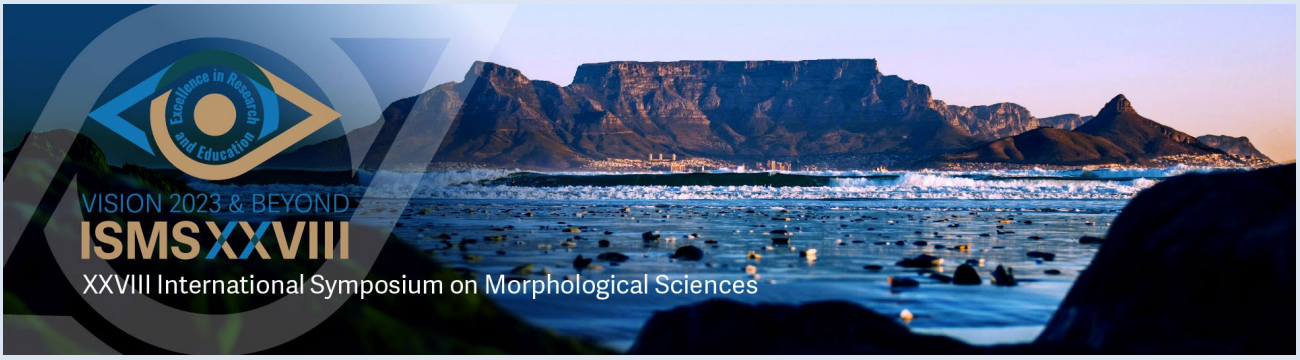
Flow diverters of the abdominal aorta intima: A morphological study

Ms Helga Gevers[1], Mr Phillipus Steyn[1], **Assoc Prof Quenton Wessels[1]**, Ms Denise Bouman[1]
[1]*University of Namibia, Namibia*

Anatomically, the aortic flow diverters are shelf-like structures on the caudal end of the arterial ostia within the intimal surface. The current study set out to explore the gross and microscopic structure of the flow diverters and find a possible association with atherosclerotic lesions. Twenty-seven abdominal aortas were removed from 10 female and 17 male formalin embalmed cadavers. The ages of the cadavers ranged from 23 to 95 years with an average age of 53.2 in years (standard deviation ± 53.2). Gross characterisation of the flow diverters associated with the coeliac trunk, superior and inferior mesenteric arteries, and renal arteries, indicated two distinct morphotypes (U- and V- shaped), n = 14 and n = 13 respectively. The U-shaped morphotype had a significantly greater angle (mean = 80.4°, standard deviation ± 2.8) than the V-shaped morphotype (mean = 58.7°, standard deviation ± 2.3) with $p < .001$. Microscopic evaluation of Haematoxylin & Eosin, and Trichrome stained specimens revealed that these entities are composed of a tunica media dome of smooth muscle which is supported by dense collagen fibres. Gross and microscopic atherosclerotic lesions were observed in several specimens, but no significant association could be linked to one morphotype. Furthermore, no significant association between sex and morphotype was found. Further research is needed into the functional role of the aortic flow diverters and the effects that the angles of the different morphotypes contribute to haemodynamic flow in humans.
Ethical clearance (Ref: 13/1/1/01 GH)



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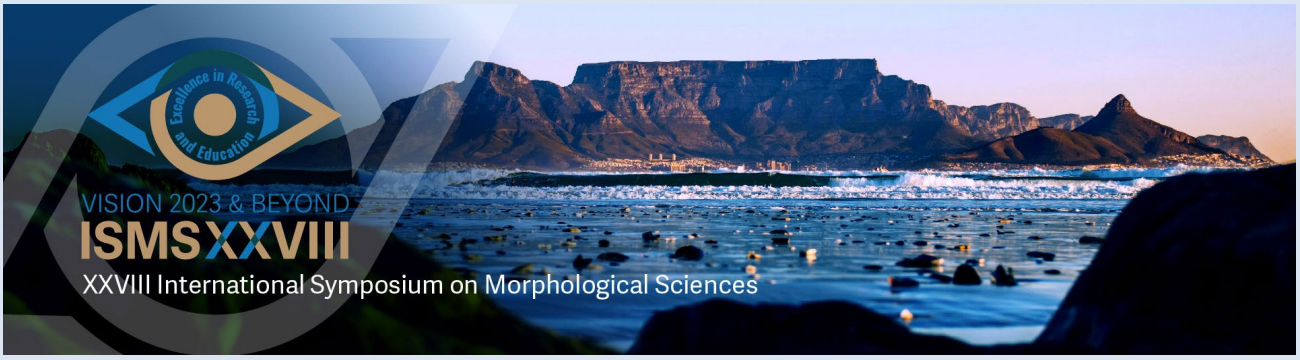
Establishing muscle architectural differences among mesocephalic, dolichocephalic and brachycephalic skull morphology

Ms Aimee Welmans[1], Dr Amanda Alblas[1], Dr Kathryn Smith[2]

[1]Division of Clinical Anatomy, Stellenbosch University, Bellville, South Africa, [2]Department of Visual Arts, Stellenbosch University, Stellenbosch, South Africa

LeRoy Riddick once encapsulated the importance of forensic identification by stating “Without proper identification of these bodies, loved ones bear the heavy burden of a continuing search for that missing person; they are denied the closure that can come with mourning” (2011). This research aims to improve the accuracy of forensic facial reconstructions in South Africa. In this prospective study, patients were recruited, not solely for research purposes, through informed consent at radiological facilities within the Western Cape. Exclusion criteria were as follows: MRI scans not including the full face, minors and scans with observable facial trauma and/or facial muscular disease/ atrophy. Twenty-two patients underwent maxillofacial MRI scans. From these scans, cephalic indices were calculated to classify patient skulls as mesocephalic, dolichocephalic or brachycephalic. Facial muscle lengths were calculated from the scans and these measurements averaged within skull shape groups. Age and sex were considered confounding variables. No interaction (p=0.58) between sex and face siding was found. No significant difference was found between left and right sides for all muscles included in the study. Sex-based differences were observed for the lateral and medial pterygoids, and masseter muscles. The medial pterygoid muscle was found to be significantly larger in the mesocephalic group in comparison to the dolichocephalic group (p=0.07). Other trends were observed, prompting further investigation with a larger sample size over an additional 4-month period. Age did not have significant effects on the muscle lengths; however, we do expect this variable to influence muscle volume. The latter will be explored as the research project continues.



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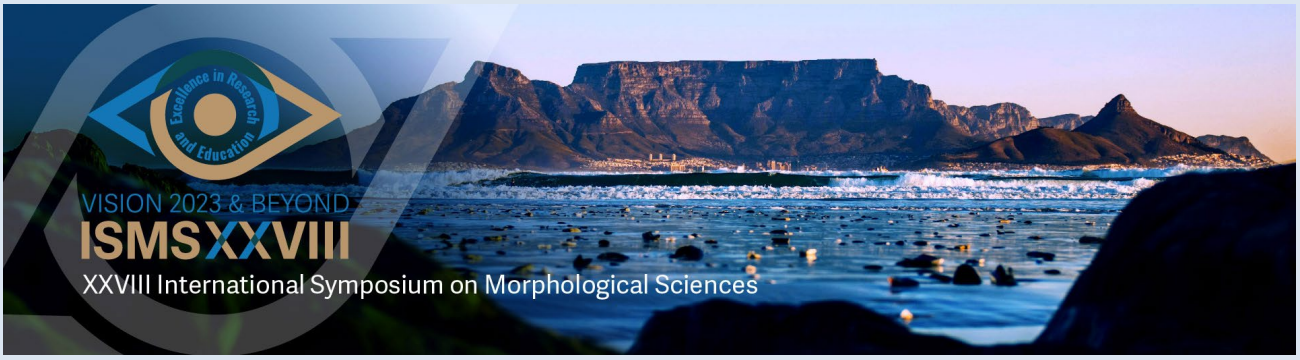
Comparative qualitative analysis of human and brown bear femoral compact bone

Dr Ramona Babosová[1], Prof Marco Zedda[2], MSc. Adela Belica[1], Dr Marián Golej[3], Dr Gabriela Chovancová[4], Dr Michal Kalaš[5], Prof Mária Vondráková[1], Prof Desiré Brits[6]

[1]Constantine the Philosopher University in Nitra, Department of Zoology and Anthropology, Slovakia, [2]University of Sassari, Department of Veterinary Medicine, Italy, [3]Earth Science Institute, Slovakia, [4]Administration of Tatra National Park in Tatranská Lomnica, Slovakia, [5]Administration of the Malá Fatra National Park, Slovakia, [6]University of the Witwatersrand, Human Variation and Identification Research Unit, South Africa

The femur of a brown bear is very similar to a human, raising problems in distinguishing the species in zooarchaeological and forensic studies. Our research aims to analyse and compare the microstructure of human and brown bear bone tissue. Nine human bone samples derived from the Student Bone Collection of the Department of Anatomy, University of Pretoria, South Africa, were compared with nine brown bear femora from the Western Carpathians subpopulation in Slovakia. Bones were provided by Tatra National Park, Malá Fatra National Park, and Italzver s.r.o., and analysed at the Department of Zoology and Anthropology, Constantine the Philosopher University in Nitra, Slovakia. Bone surfaces were manually grounded onto waterproof sandpaper. Histological specimens were observed by polarised light microscope Leica DM 750P. Qualitative histological characteristics were determined based on internationally accepted classification systems Periosteal surface of the bone was selected to differentiate between humans and bears. Subperiosteal surface of three cubs was formed by plexiform bone tissue with scattered secondary osteons. Three juvenile humans had irregular Haversian bone tissue with isolated and scattered secondary osteons. Subperiosteal zone of adult human femora varied between irregular and dense Haversian bone. A combination of primary vascular longitudinal and irregular Haversian bone tissue was commonly observed. In adult brown bears plexiform bone tissue covered by non-vascular bone tissue corresponding to external circumferential lamellae was noted. Some arrested growth lines are visible in adult and cub bears' subperiosteal zone. Our results show that plexiform bone tissue and arrested growth lines are crucial to distinguishing between the bear and human bone.

Fundings: The study was supported by the grant KEGA 039UKF-4/2021.



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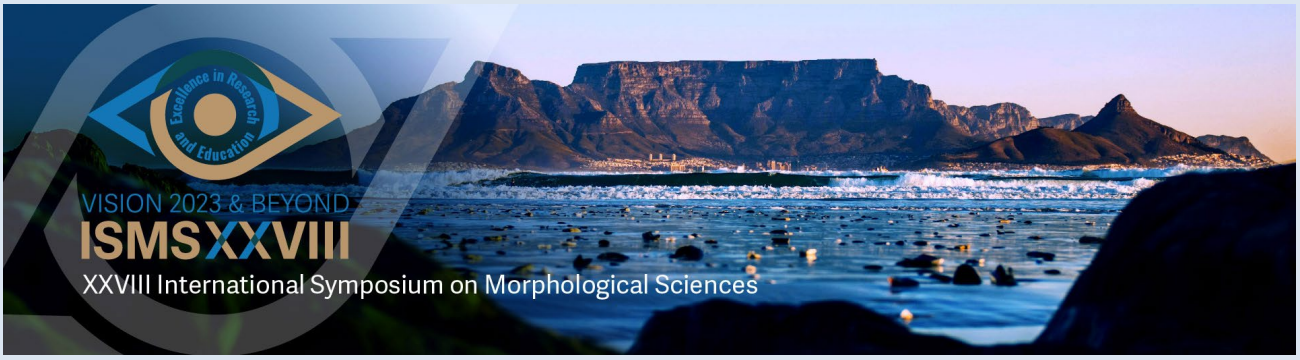
Ophthalmic artery embryology with review of current literature, anatomical variations and clinical relevance

Dr Rohen Harrichandparsad[1]

[1]*University Of KwaZulu-Natal, South Africa*

Embryology of the orbit and ophthalmic artery is complex and not completely understood. Understanding the embryology helps to explain the numerous anatomical variations seen in the origin and course of the ophthalmic artery. It is important to recognise these variations during embolisation procedures. Failure to do so will result in embolisation into the central retinal artery and blindness. In this paper we review our current understanding of the embryology of the ophthalmic artery, its anatomical variations and clinical relevance.



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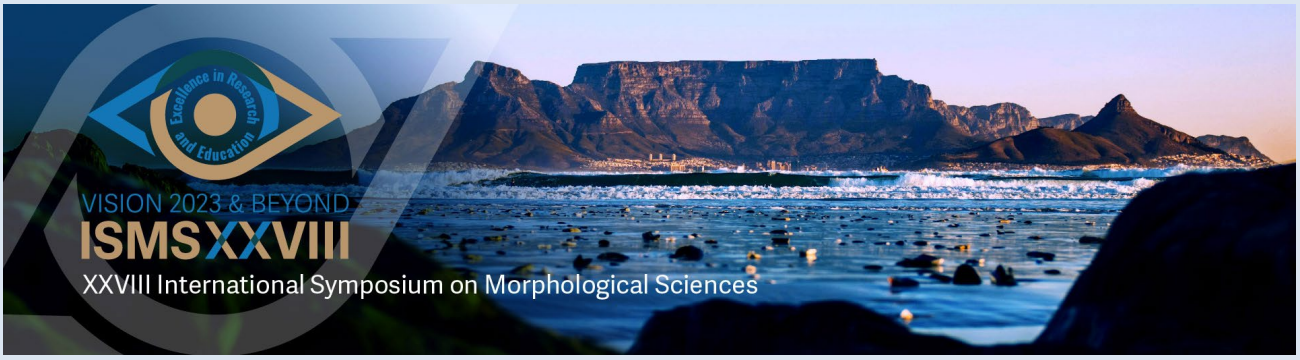
Giant congenital melanocytic nevi: Patterns of presentation

Mr Siphelele Nkosi[1], Prof Anil Madaree[2], Prof Lelika Lazarus[1]
[1]University of KwaZulu-Natal, Westville, South Africa, [2]Inkosi Albert Luthuli Central Hospital, South Africa

Congenital melanocytic nevi appear at birth caused by a proliferation of benign melanocytes in the dermis, epidermis, or both. Giant nevi are a risk factor for melanoma, caused by defects in melanocyte progenitors. Melanocytes are specialised pigment-producing cells that transfer melanin from their cellular cytoplasm to keratinocytes. Melanocytes may have a mutation that results in a lack of dendrites, leading to melanin existing in the cytoplasm. The skin's surface is divided into distinct areas known as dermatomes, which are sensory regions supplied by a single spinal nerve root. Dermatomes are an important concept in clinical practice and anatomy. The purpose of this study is to examine the correlation between giant congenital melanocytic nevi and dermatomes. Clinical photographs of nevi with a projected size larger than 20cm and a conspicuous site of the lesion(s) were analysed and obtained from the database of the Department of Plastic and Reconstructive Surgery at the Inkosi Albert Luthuli Central Hospital, Durban, South Africa. Harry D. Patton's dermatome map was used. The extent of giant congenital melanocytic nevi was analysed on the photographs, transposed onto the dermatome template, and dermatome-affected areas were tabulated. The predominant dermatomes affected were those of the head-neck [45% for the V2 region], followed by the back [35% for the T10 region]. A detailed dermatomal pattern of the affected patients will be presented. This study will contribute to the current body of knowledge on giant congenital melanocytic nevi in a South African population.
Ethics number: BREC/00004680/2022.



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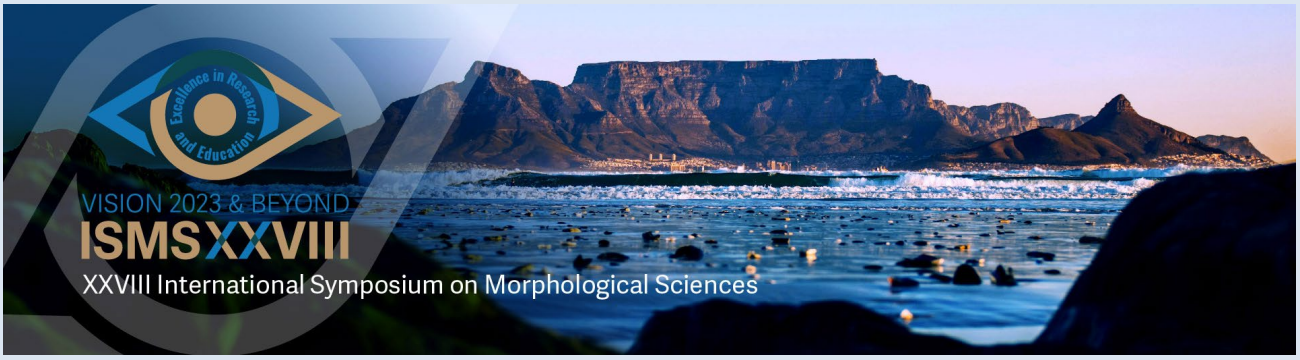
Mesorectum volumetry in males with rectal cancer: Variabilities observed in pre- and post-Neoadjuvant Radiotherapy Imaging

Ms Daniella Lamprecht[1], Prof Karin Baatjes[2], Dr Waleed Begg[3], Mr Hein Fourie[4], Dr Amanda Alblas[5], Mr Lee-roy Witbooi[6], Dr Tim Forgan[2]

[1]Faculty of Medicine & Health Sciences, Stellenbosch University, South Africa, [2]Division of Surgery, Department of Surgical Sciences, Faculty of Medicine & Health Sciences, Stellenbosch University, South Africa, [3]Division of Radiation Oncology, Department of Medical Imaging & Clinical Oncology, Faculty of Medicine & Health Sciences, Stellenbosch University, South Africa, [4]Netcare Medical Physics CoE, Netcare Limited, South Africa, [5]Division of Clinical Anatomy, Department of Biomedical Sciences, Faculty of Medicine & Health Sciences, Stellenbosch University, South Africa, [6]Department of Radiology, Tygerberg Hospital, South Africa

This study utilised magnetic resonance imaging (MRI) to describe the variability observed in the volumetry of the mesorectum pre- and post-radiotherapy, prior to surgical intervention, in a South-African sample of males with rectal cancer. Nineteen pelvic MRI scans of males diagnosed with rectal cancer, who underwent neoadjuvant long course radiotherapy (LCRT) or short course radiotherapy (SCRT) prior to undergoing a total mesorectal excision (TME), were retrospectively reviewed and analysed. Mesorectal volume was calculated after contouring individual axial slices and creating a three-dimensional compounded structure on both pre- and post-radiotherapy scans, which were subsequently described and compared. Both pre- and post-radiotherapy mesorectal volumetry displayed great variability. Mean calculated pre-radiotherapy mesorectal volume was 272.94 ± 80.30 cm^3. Post-radiotherapy volume equated to 239.19 ± 81.30 cm^3, with a percentage decrease of 12,60%, resulting in a statistically significant decrease (p=0.001). In sub-group analysis, both patient groups who underwent LCRT and SCRT showed a general and statistically significant decrease in mesorectal volume post-radiotherapy. This significant variation in the volumetry of the mesorectum pre- and post-radiotherapy observable on MRI, can have important clinical implications in the context of the TME as a change in mesorectal morphometry may require a modification of the planned surgical strategy. Therefor the information obtained from a second MRI prior to surgical intervention, can be a worthwhile addition to the available armamentarium for surgeons. This will provide insight and guide surgical decision-making, facilitating the planning of optimal treatment strategies and improve patient outcomes.



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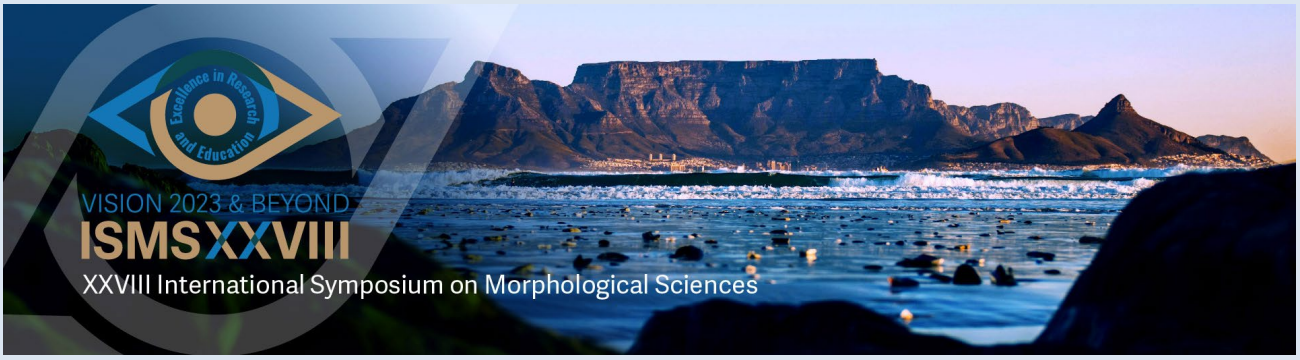
Distal inter-fascial position of the great saphenous vein

Dr Nerissa Naidoo[1], Dr Ivan James Prithishkumar
[1]*Mohammed Bin Rashid University of Medicine and Health Sciences, Dubai, United Arab Emirates*

With the volume of coronary artery bypass graft surgeries reaching almost 400,000 procedures annually, the great saphenous vein (GSV) remains as the autologous conduit of choice. The GSV, which is also a popular venous access site in hemodynamically unstable patients, has a lengthy course through the lower limb. It commences at the medial marginal vein of the foot, ascends medially along the leg and thigh, and eventually perforates the fascial roof of the subsartorial canal to drain into the femoral vein. Due to its complexity, it is also reported to present with anatomical variations. Accordingly, we present a case of variation in the course of the GSV.

Upon routine dissection of an 83-year-old Caucasian female cadaver, we observed a unilateral unusual course of the left GSV. A distal inter-fascial position of the left GSV was noted, followed by the occurrence of a fascial canal in which the GSV was lodged.

Although previous studies have described the presence of fascial coverings on the GSV in the upper leg and lower thigh regions, the distal inter-fascial disposition of it has not been observed. We postulate that the presence of the fascial canal may aid venous return and prevent excessive dilatation of the vein during incompetencies of the venous valves. Moreover, knowledge of such variations of the GSV and its related fascial envelope are especially relevant for pre-operative protocol as well as the interpretation of medical imaging.



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Proliferation and Morphological fine assessment of human periodontal ligament fibroblast cultures towards bovine pericardial membranes

Dr Sara Bernardi[1], Dr Diana Torge[1], Prof Serena Bianchi[1], Prof Guido Macchiarelli[1]
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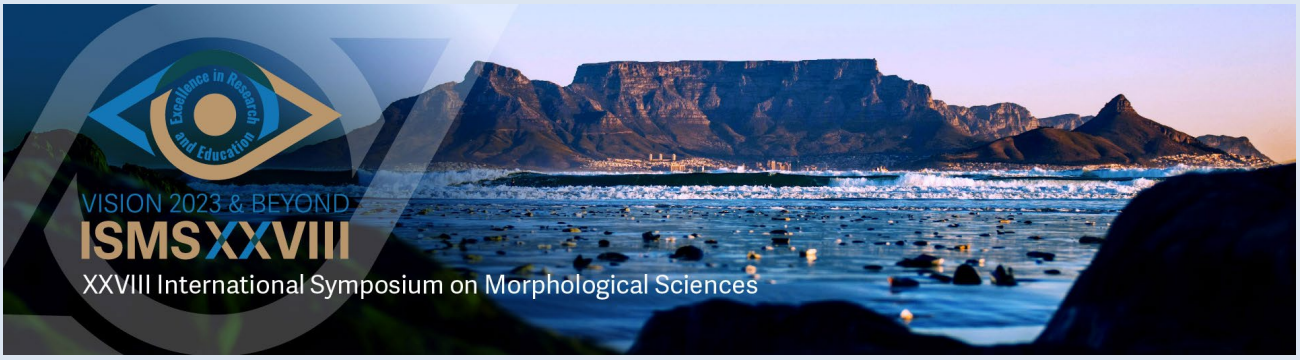
Regenerative dental medicine increased the development of performing scaffold materials. These scaffolds, which induce cell adhesion, support, and guide the tissues' growth, include membranes which are either resorbable or not. This study investigated the proliferation abilities and attachment of human periodontal ligament fibroblasts (HPLFs) over two bovine pericardial membranes with different thicknesses, namely 0.2mm and 0.4mm respectively. The HPLFs were cultured at the standard condition and exposed to the tested materials. XTT (a colorimetric assay for non-radioactive quantification) was performed to assess cell proliferation, while light microscopy (LM) and scanning electron microscopy (SEM) observation assessed fibroblast morphology at different times (T1-T2-T3). Proliferations assays reported a statistically significant difference in growth at T1 ($p<0.05$) in the cells cultured with a thicker membrane than the thinner one. LM observations showed healthy fibroblasts in contact with the membranes, appearing larger and with a polygonal shape. In addition, the SEM images displayed a thickening of the fibroblasts, which continued to adhere to the membrane's surfaces, with an enlarged polygonal shape and developed filopodia and lamellipodia. These results showed a similar cell behaviour over the two bovine pericardial membranes. Furthermore, they demonstrated a cellular migration along and within the membrane layers, binding with membrane fibres using filopodial extensions. The findings on the effects of the collagen membranes on cellular behaviour will help clinicians to choose the best type of scaffolds according to the clinical need.



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Hemifacial Microsomia: A scoping review on progressive facial asymmetry due to mandibular deformity

Mr Peterson Atiba[1,2], Dr Bukola Omotoso[1], Prof Anil Madaree[3], Prof Lelika Lazarus[1]
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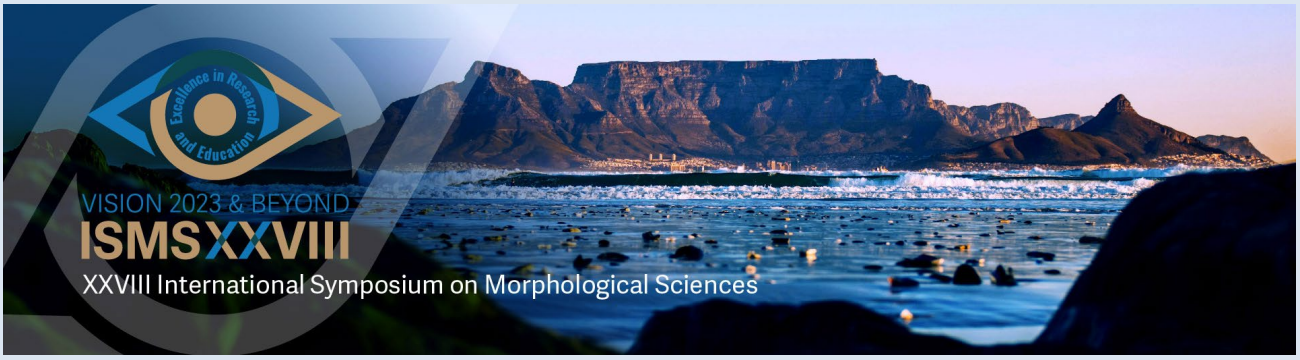
Hemifacial microsomia (HFM) is a congenital anomaly where one-half of the face is underdeveloped. Facial asymmetry (FA) is noticeable in HFM patients due to the deformed mandible and associated facial skeleton. There is a lack of consensus regarding whether FA is constant throughout life or changes with age in HFM patients. This scoping review explored the role of the deformed mandible in progressive facial asymmetry in HFM patients, highlighting its relationship with population and age groups. The review is based on a search of PubMed, Google Scholar, EBSCOhost, and Web of Science. Preferred Reporting Items for Systematic Reviews and Meta-analyses were used in the study selection. The mixed method appraisal tool assessed the included studies. The authors used a pre-set data extraction form to obtain information from the included studies. Thirteen studies met the eligibility criteria. These were from the American population (61.54%) and the European population (38.46%). The included studies utilised dentition age grouping (15.39%), inconsistent age grouping (61.54%), and undocumented age grouping (23.07%). Parameters such as gonial/intergonial angle, ramus height, mandibular length, and body length reported an increase in 20% of the five studies. The chin point and the occlusal angle reported increases in 40% and 60% of the five studies, respectively. The qualitative assessment of the included studies revealed that most parameters for determining FA in HFM increase with age. FA is progressive in HFM patients. There is a crucial need to document African studies which detail progressive changes in the mandible and facial structures of HFM.



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Utilising forensic case information to inform taphonomy research in the Western Cape, South Africa

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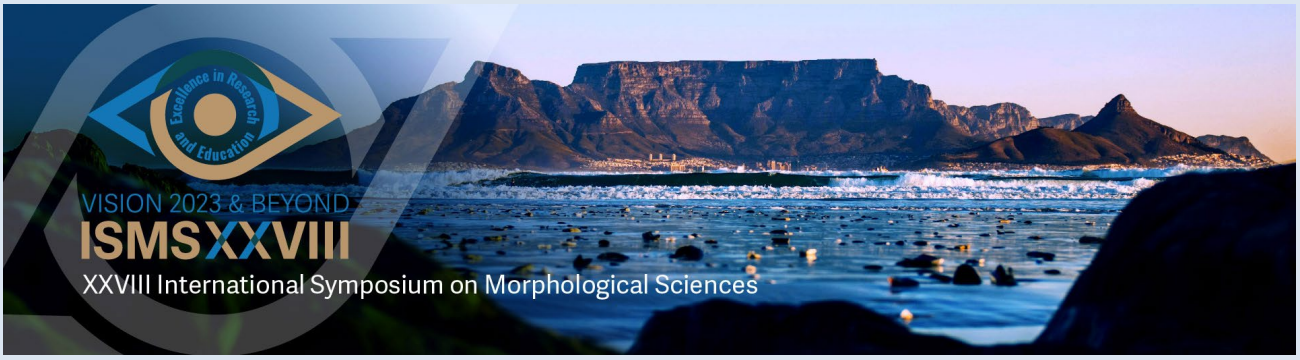
Accurate post-mortem interval (PMI) estimations are critical for forensic identification and reconstructing contextual information. The accuracy and precision of PMI estimations can be impacted by a lack of regional taphonomy standards. Therefore, this study aimed to identify regional recovery hotspot areas and discovery contexts to inform taphonomy research. A total of 172 cases (174 individuals) examined by Forensic Anthropology Cape Town (FACT) between 2006 and 2018 in the Western Cape province, South Africa, were retrospectively reviewed. Approximately 31% (54/174) of cases did not have PMI estimations. PMI estimations were significantly associated with complete skeletons, unburnt remains, absence of clothing and entomological evidence ($p < 0.05$ in each case). After FACT formalisation significantly fewer PMI estimations were provided ($p < 0.0001$). Due to fragmentation, absence of clothing and entomological evidence, one-third of PMI estimations were wide and open-ended ranges, reducing their usefulness ($p < 0.05$ for each). Half (51%; 87/174) of decedents were discovered from high-crime areas while the rest (47%; 81/174) were found in low-crime areas. Common areas and contexts of discovery were identified. Vegetated areas were the most common site of discovery (23%; 40/174), followed by the roadside (15%; 29/174). Decedents were discovered exposed (35%; 62/174), covered with items such as bedding or shrubs (14%; 25/174) or buried (10%; 17/174). Utilising forensic case information, we provide insight into gaps in local taphonomy research and emphasise the need for regional studies. Our data demonstrate the value of similar studies worldwide.



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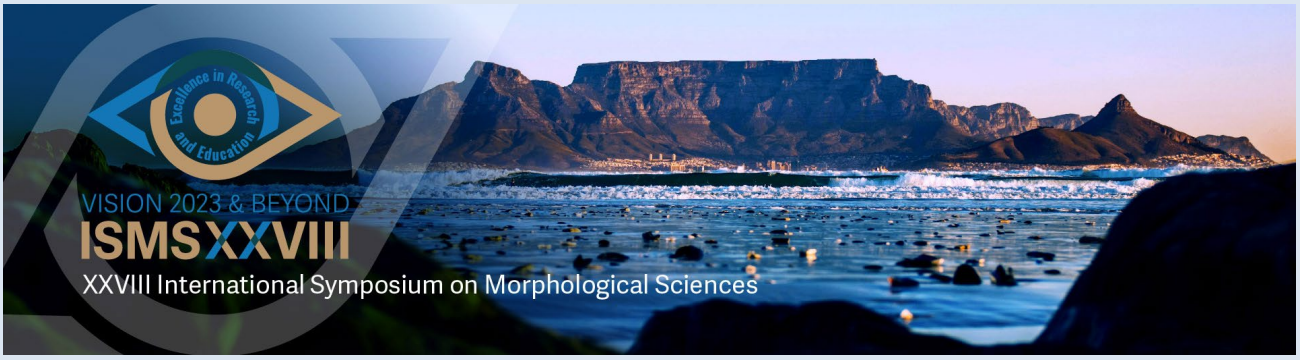
Sexual dimorphism of the human patella bone in a South African Western Cape population

Mr Thom Kaledzera[1,2], Dr Amanda Alblas[1], Dr Nadine Rampf[1]

[1]Stellenbosch University, Northern Suburb, South Africa, [2]Kamuzu University of Health Sciences, Chichiri, Malawi

The patella bone presents with a considerable amount of sexual dimorphism. However, there is limited information regarding patellar sexual discriminant functions that applies to a South African Western Cape population. Thus, this study aimed to evaluate the level of sexual dimorphism in a sample of human patellae from a South African Western Cape population. The study randomly selected 104 paired patellae of known demographic information. Six dimensions, namely maximum height, maximum breadth, maximum thickness, height of articular facet, lateral articular facet width, and medial articular facet width, were measured using a sliding digital calliper. Maximum height (T-test, $p=0.008$) and maximum thickness (T-test, $p=0.014$) were the only dimensions that showed statistically significant side differences. All six patellar measurements from both sides were significantly greater in males than females (T-test, $p<0.001$). Left-sided measurements showed greater sex differences than the right. After applying a discriminant functional analysis to the left patellar measurements, maximum height displayed the highest level of sex estimation accuracy (90.4%), whereas medial articular facet width presented the least (73.1%). Combination of all six measurements provided sex estimation accuracy of 86.5%. However, the best measurement combination included maximum height and maximum breadth, yielding a 90.4% correct sex estimate. After applying the derived discriminant functions to the right patella measures, the estimation accuracies decreased by 1.9% to 17.3% for all functions. These results show that patellar measures can be used to accurately estimate sex. However, caution must be taken when applying left-derived models to right-sided patellae, as it affects the estimation accuracy.



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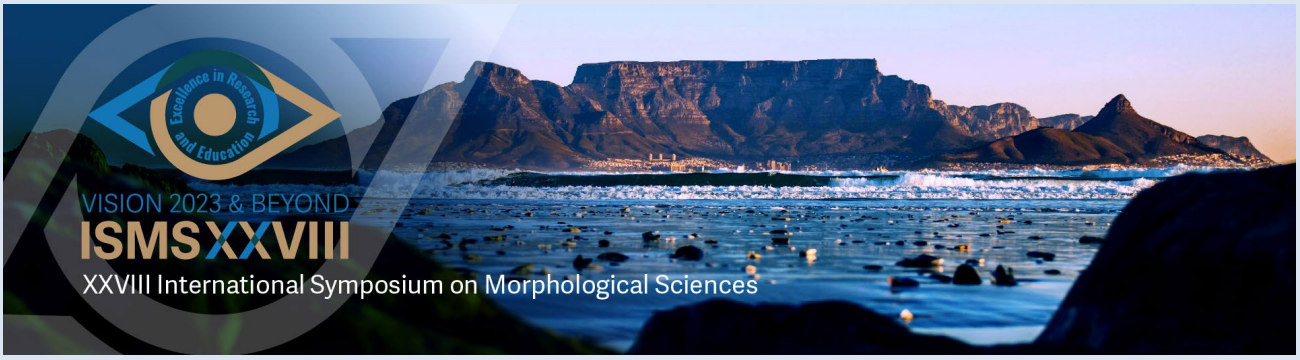
A new method of estimating age-at-death from the patella bone in South African Western Cape population

Mr Thom Kaledzera[1,2], Dr Amanda Alblas[1], Dr Nadine Rampf[1]

[1]Stellenbosch University, Northen Suburbs, South Africa, [2]Kamuzu University of Health Sciences, Chichiri, Malawi

Age estimation from unidentified human skeletal remains is essential in medico-legal disputes. Currently, the pubic symphyseal face and iliac auricular surface are noteworthy indicators of adult ageing. However, as the pelvis might not be recoverable in some medico-legal cases, alternative methods need to be derived for other skeletal components. Thus, this study was conducted to derive a new method of estimating age-at-death from the patella bone in a South African Western Cape population. The study randomly sampled 104 patellae of known age and sex. Each patella bone was scored based on the severity of bone lipping at the base and the development of auricular marginal osteophytes. A composite scoring system was used to integrate the two scores and produce a representative score for each patella bone (0, 1, 2, 3). The relationship between patellar morphological changes and age-at-death was evaluated using a point biserial correlation. A one-way ANOVA was used to assess age differences between composite scores. In both sex groups, age-at-death displayed a strong and positive linear correlation with bone lipping (rpb=0.715 in males, rpb=0.713 in females) and marginal osteophytes (rpb=0.635 in males, rpb=0.884 in females). Statistically significant age differences were observed between all composite scores ($p<0.001$), except between composite scores 2 and 3 ($p=0.967$). These findings led to the development of a novel technique for estimating age-at-death using the patellar composite scores. The contribution of this study could be helpful to forensic anthropologists, particularly if they intend to estimate age-at-death in the absence of the pelvis.



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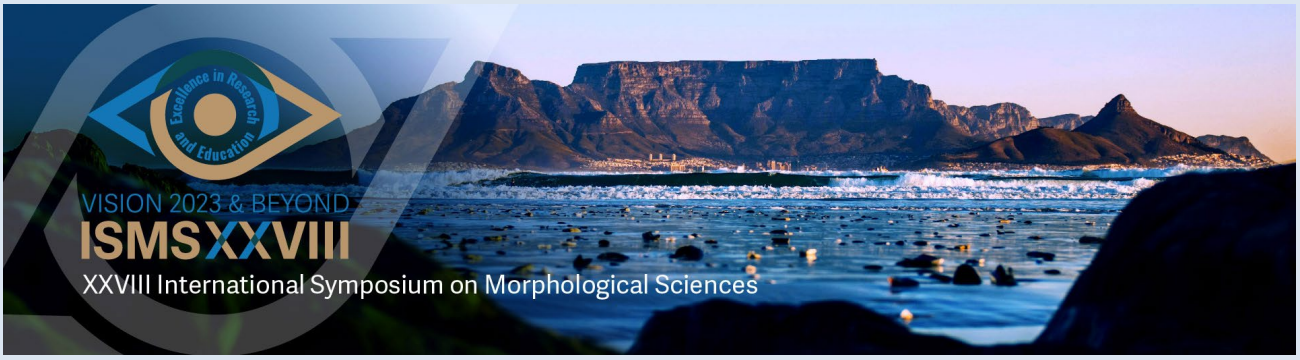
Assessing variation in ear size of South African populations for 3D cranio-facial approximation

Ms Helena de Villiers[1], Dr Alison Ridel[1], **Ms Meg-Kyla Erasmus[1]**
[1]*University of Pretoria, Prinshof, South Africa*

Knowledge of variation in ear size is important for facial approximation methods but remains understudied in a South African context. This study aims to evaluate the influence of sex and population affinity on ear size using cone-beam computed tomography scans. Ten landmarks were placed on the soft-tissue ear of 101 black (43 female, 58 male) and 94 white (54 female, 40 male) South African adults. Mahalanobis distances were used to measure six inter-landmark distances: ear height, ear width, lobule height, lobule width, conchal height, and attachment height. An ANOVA identified significant height variations between populations and sex groups ($p < 0.05$), while variation further increases within population-specific sex groups ($p < 0.001$). White South Africans have longer mean ear lengths (64.36mm) than black South Africans (58.71mm), whereas mean ear widths were similar between groups (36.01mm and 35.53mm respectively). A Pearson's test was applied to test for correlations between inter-landmark distances for development of regression formulae, however, ear height and width were only moderately correlated ($r^2 = 0.695$). Strong correlations were observed between the ear and lobule height ($r^2 = 0.767$). Correlations were stronger when assessing population and sex groups separately, indicating a need for separate regression formulae per group. These findings will be used to create accurate regression formulae that take population affinity as well as sex into consideration. Applications for this research could further also extend into pre-operative planning for reconstructive surgeries of the ear resulting from congenital deformation, trauma, or pathology.



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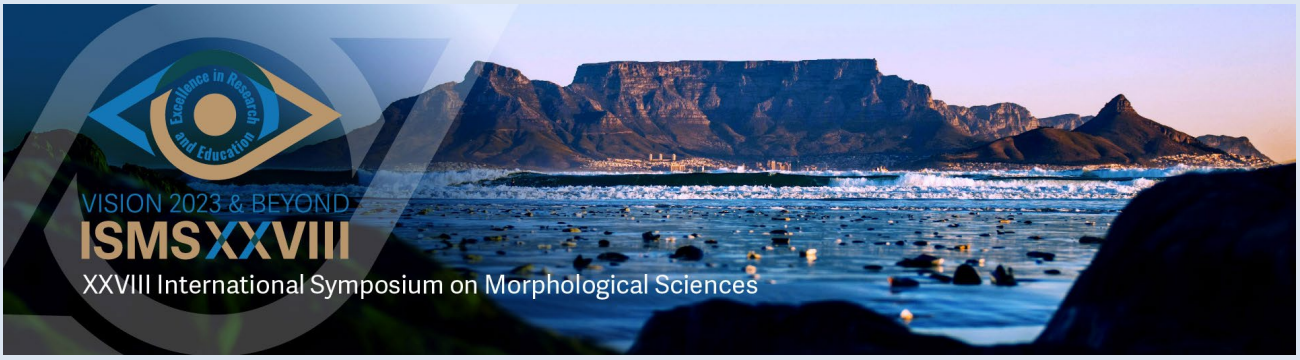
Estimating socio-cultural identity within black South African groups using sub-specific discriminate 3D shape matrices

Dr Alison Ridel[1], Prof Ericka L'Abbe[1]
[1]*University of Pretoria, Arcadia, South Africa*

The probable identification of an unknown individual is based on the presence of quantifiable phenotypic variations and the relationship of these variations to the individual's socio-cultural identity. Therefore, this study aims to create sub-specific discriminate shape matrices to estimate socio-cultural identity among black South Africans, with a particular emphasis on developing standards for predicting mid-facial variation within this population. A total of 191 adult South Africans, representing nine modern black South African socio-cultural groups, namely Pedi, Sotho, Swati, Tsonga, Tswana, Venda, Ndebele, Xhosa and Zulu, were obtained from the Pretoria Bone Collection in the Department of Anatomy at the University of Pretoria. Three-dimensional (3D) modelling of the relevant anatomical area was performed using an EinScan H 3D scanner. The 3D anatomical extraction was performed by placing 41 standard craniometric landmarks and 378 sliding landmarks (interpolation factor = 1 mm) on 3D models using the Avizo 9.4 software. The analysis of variance showed that variations in midfacial shape were statistically significant ($p < 0.001$) for all shape configurations, including sub-specific discriminate shape matrices, separately. Additionally, cross-validated linear discriminant function analysis yielded an accuracy of between 79.59% and 100% for all shape configurations and sub-specific discriminant shape matrices, thereby reflecting the discriminative power of socio-cultural groups within the black South African population. Finally, geometric morphometric approaches for socio-cultural estimation using the midface retain the objects' geometry and analyses subtle structural differences. Consequently, innovative 3D approaches may estimate socio-cultural identity within the modern black South African population more accurately.



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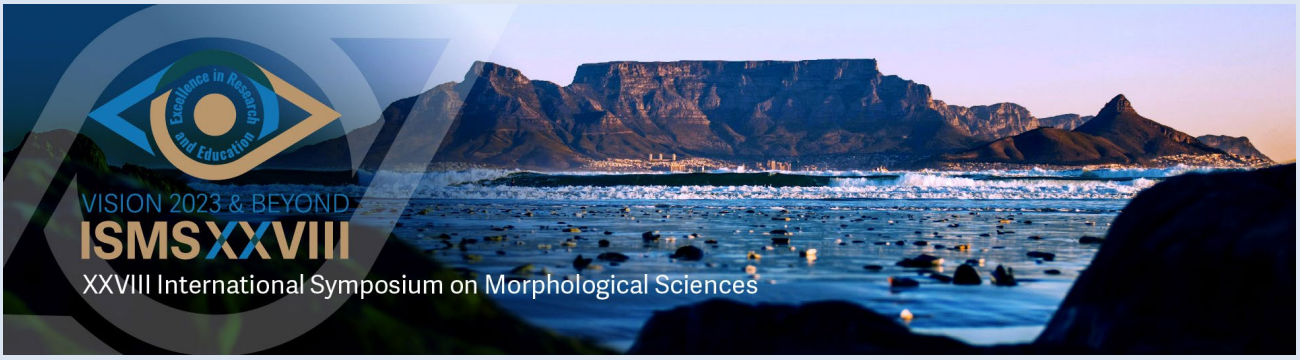
Digital protocol for the prosthetic rehabilitation of a midfacial defect using statistical shape modelling (SSM)

Dr Alwyn Fortuin[1], Dr Alison Ridel[1], Dr Charles Bradfield[1]
[1]*University of Pretoria, Arcadia, South Africa*

The processes involved in fabricating a conventional midfacial prosthesis consist of several time-consuming visits, complicated impression techniques that are uncomfortable for the patient, and wax sculpting that requires advanced artistic skills. This technique, however, is still used in the contemporary digital era due to the colour match achieved by the hand-mixing and mould casting of medical-grade silicone materials. Digital tools have been developed to facilitate the design process of prosthesis fabrication. The digital prosthetic design also eliminates several laborious steps in fabricating a conventional midfacial prosthesis. However, a significant disadvantage of the digital process is the fabrication of the final silicone prosthesis from the virtual concept due to the monotonous colour of the medical-grade silicones available for additive manufacturing. This research aimed to develop a digital protocol to fabricate a midfacial prosthesis using statistical shape modelling (SSM) combined with additive manufacturing of the wax try-in and conventional silicone flasking techniques to restore a midfacial defect caused by a squamous cell carcinoma, which resulted in a total maxillectomy and subsequent surgical removal of the midfacial area of a patient. The statistical shape modelling (SSM) approach developed by Ridel and collaborators for facial reconstruction was adapted for the fabrication of a midfacial prosthesis that combines digital and conventional fabrication techniques to produce a cost-effective and time-efficient treatment solution.



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In-vitro effects of epigallocatechin gallate on cell viability and adhesion of melanoma and endothelioma cells

Ms Aminat Adigun[1], Dr Priyesh Bipath[1], Dr June Serem[1], Dr Yvette Hlophe[1]
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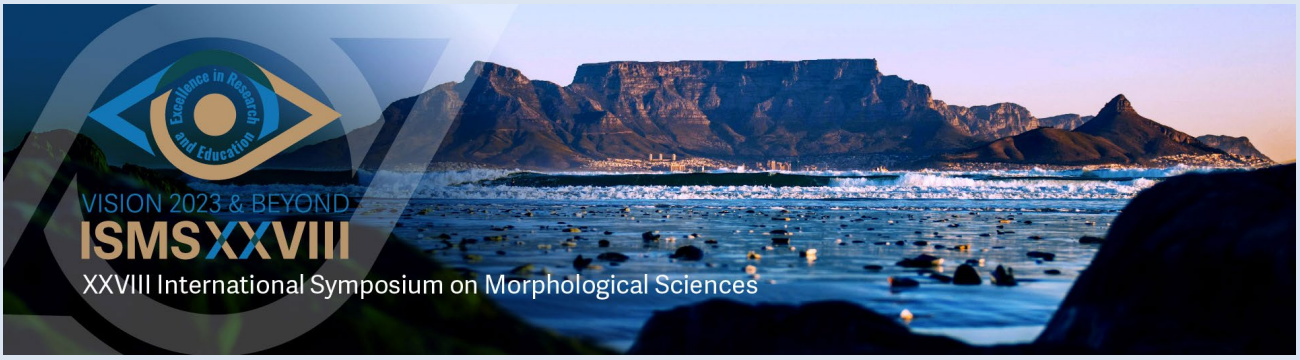
Melanomas account for only 1- 4% of skin cancers; however, patients have a higher mortality rate than their non-melanoma counterparts. Haemangioendotheliomas are rare cancers that have few treatment options due to the unknown nature of their pathophysiology. Epigallocatechin gallate (EGCG) is a polyphenol with properties that promote anti-cancer effects. Melanoma (B16F10), endothelioma (sEnd.2) mouse cell lines and a non-cancerous control cell line, murine macrophage (RAW 264.7), were used to observe the cytotoxic and anti-proliferative effects of EGCG on the cancerous cell lines. Crystal violet assay was used to calculate the half-maximal inhibitory concentration (IC50) of the cancerous cell lines. The IC50 was calculated to be 141.4 µM for the B16F10 cells and 107.1 µM for the sEnd.2 cell line at the 48-hour timeline. Morphology studies at these IC50's were conducted using Haematoxylin and Eosin staining and polarisation-optical transmitted light differential interference contrast. The treated B16F10 and sEnd.2 cells indicated features of apoptosis, namely cell rounding and chromosome condensation. Flow cytometry was used to measure cell death mechanisms using cell cycle assay. An adhesion assay was used to determine the adhesive capabilities of EGCG after plates were treated with extracellular matrix protein (fibronectin) on the cancer cells. EGCG and the positive control decreased cellular adhesion of the B16F10 cells. In conclusion, adhesion was seen in EGCG-treated cancer cells. In addition, EGCG induced cell death in the B16F10 and sEnd.2 cell lines and not in the control RAW 264.7 cell line.



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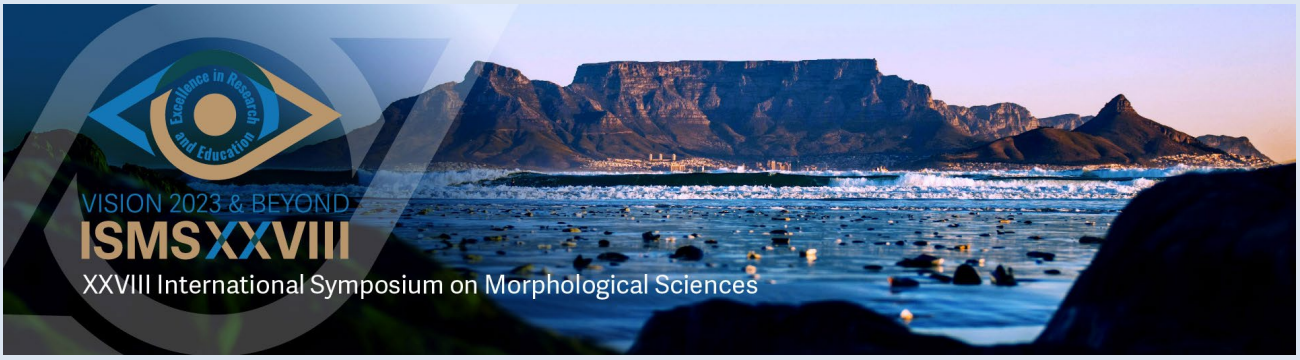
An anatomical study of the facial vein and its morphological variations

Ms Prelene Naidoo[1], **Mr Livashin Naidu[2]**, Dr Carmen Rennie[1]
[1]University of KwaZulu-Natal, Westville, South Africa, [2]Nelson Mandela University, Bethelsdorp, South Africa

The facial vein is one of the major venous drainage pathways of the face. Knowledge of its variable anatomy is vital for surgical procedures in the head and neck region, particularly those involving microvascular anastomoses or vein compression. The present study aimed to investigate the origin, course, termination, relations, and variations of the facial vein.
The materials and methods were as follows: Twenty adult embalmed cadavers were utilised to dissect out the facial vein bilaterally (n=40), from its origin until formation and termination of the common facial vein (BREC/00004346/2022).
The results revealed the following: Numerous variations in course (regarding relations, divisions formed, and tributaries received) and termination of the facial and common facial veins were identified. Variations were categorised into four main groups (Group A: Course variation = 45%, Group B: Termination variation = 7.5%, Group C: Course and termination variation = 22.5%, Group D: No variations = 25%) and into more detailed types and subtypes. Course variations included cases of absence of communication with the retromandibular vein, communication with an undivided retromandibular vein, and formation of variable divisions. Termination variations included cases in which the facial or common facial veins drained into either the anterior jugular, external jugular or subclavian veins. Eight cadavers (40%) had displayed unilateral variation, while 11 (55%) displayed bilateral variation and one (5%) displayed bilateral standard anatomy.
In conclusion, the facial vein displayed a high frequency of variations. Knowledge of its standard anatomy and variations will benefit surgeons performing procedures in the head and neck region by facilitating identification and differentiation of vessels.



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Morphology and morphometry of the anterior clinoid process in a select South African population

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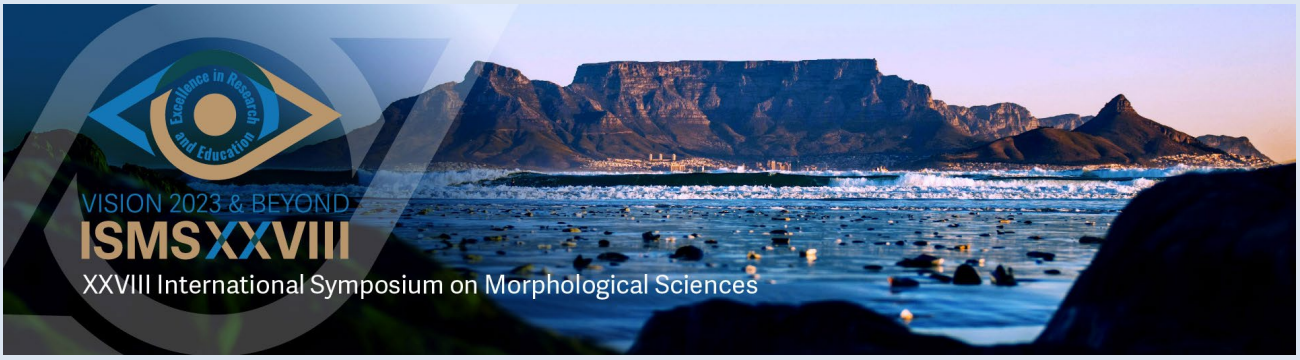
University Of KwaZulu-Natal, School of Laboratory Medicine & Medical Science, Westville, South Africa

The anterior clinoid process (ACP) is a bony protrusion formed by the lesser wing of the sphenoid, which lies between the internal carotid artery and optic nerve. The union of the anterior and middle clinoid processes forms the carotico-clinoid foramen (CCF). Removal of the ACP has been suggested for specific surgical procedures on the cavernous sinus, such as anterior clinoidectomy. In order to avoid surgical complications, it is essential to be aware of the variable dimensions that exist for the ACP and CCF for different population groups. This study intended to investigate the morphology and morphometry of the ACP and document the CCF's prevalence in a South African sample. Twenty-two open crania (n=44) were obtained from the University of KwaZulu-Natal. The length, basal width and thickness of the ACP was measured using a digital vernier calliper. The APC's mean length, basal width and thickness on the right were 9.6±1.1mm, 10.6±1.5mm and 5.5±0.7mm, respectively. The left side was 10.2±1.3mm, 12.2±1.3mm and 4.9±0.8mm, respectively. The left ACP was significantly longer, wider and thinner than the right ACP ($P \leq 0.05$). Type I (short & broad) ACP was the most prevalent type occurring in 75% of the population. In addition, the CCF was observed in 18.9% of cases and 75% had a bilaterally complete CCF. The ACP in our study differs from other populations globally regarding type, dimensions and prevalence of the CCF. These characteristics should be considered when interpreting skull base radiographs and planning anterior clinoidectomy.



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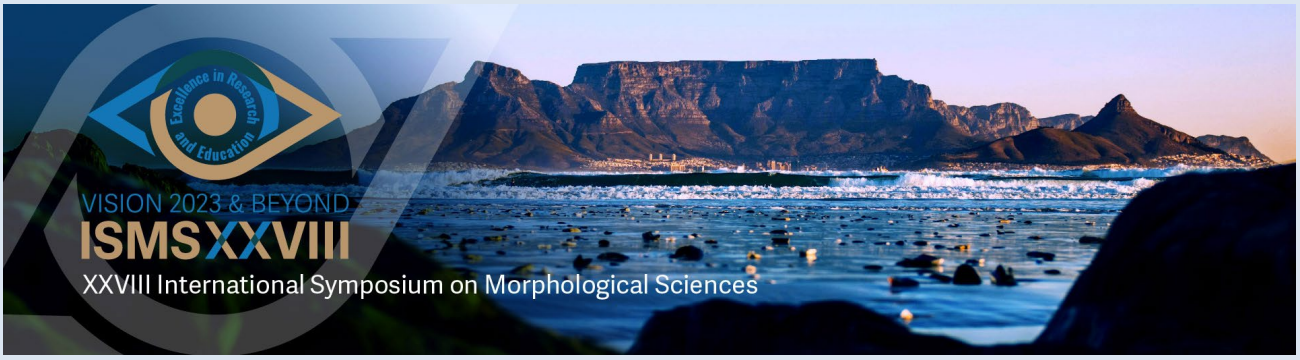
Three-dimensional virtual reconstruction of shoulder movement for a human musculoskeletal digital twin

Yu-Hee Kim[1], Yoonhee Shin[2,3], Il Kim[4], Kyong-Ha Lee[5], Kwangnam Choi[5], **Prof Seung-Ho Han[2,6]**
[1]Advanced Biomedical Research Institute, Ewha Womans University Seoul Hospital, Gangseo-gu, Republic of Korea, [2]Ewha Medical Academy, Ewha Womans University Medical Center, Gangseo-gu, Republic of Korea, [3]College of Nursing, Ewha Womans University, Seodaemun-gu, Republic of Korea, [4]Surgical Mind, Seo-gu, Republic of Korea, [5]Division of National S&T Data, Korea Institute of Science and Technology Information, Yuseong-gu, Republic of Korea, [6]Department of Anatomy, Ewha Womans University College of Medicine , Gangseo-gu, Republic of Korea

Demand for digital reconstructions of the human body, the 'human digital twin', is increasing. Areas where human digital twins can be used include supporting disease diagnoses and predicting various treatment outcomes. Human digital twins can be generated for the whole skeleton, individual organs, and/or biomedical data, and our research interest is the reconstruction of the musculoskeletal system. Information about the musculoskeletal system structure in anatomical position is well-defined, but information regarding joint movement is lacking. Therefore, the purpose of this study was to visualise human shoulder movements as a first step toward developing a digital twin of human musculoskeletal system. Computed tomography images of the shoulders of 58-year-old male obtained at Ewha Womans University Seoul Hospital (approved by the Institutional Review Board; no. 2023-02-037) were used for three-dimensional (3D) modelling of the three bones (scapula, clavicle, and humerus) and nine muscles involved in six shoulder movement (flexion, extension, abduction, adduction, internal rotation and external rotation). Next, these were used to animate reconstructions of muscle contraction, relaxation and rotation. Finally, 3D visualisation application that can virtually simulate shoulder movement were established. In summary, reconstruction of the human shoulder musculoskeletal system and movement using a patient's CT data has been demonstrated. Further work is required to develop an algorithm to match real-world data with human digital twins. These studies will provide a framework for the development of human digital twins that include comprehensive whole-body modelling, which will develop into useful tools for the virtual reality-based healthcare provider training. (Grant number: HG22C0035, K-22-L01-C03)



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Unexpected double anatomic variation related to common hepatic and left gastric arteries

Assist. Prof Hurriyet Cetinok[1,2]

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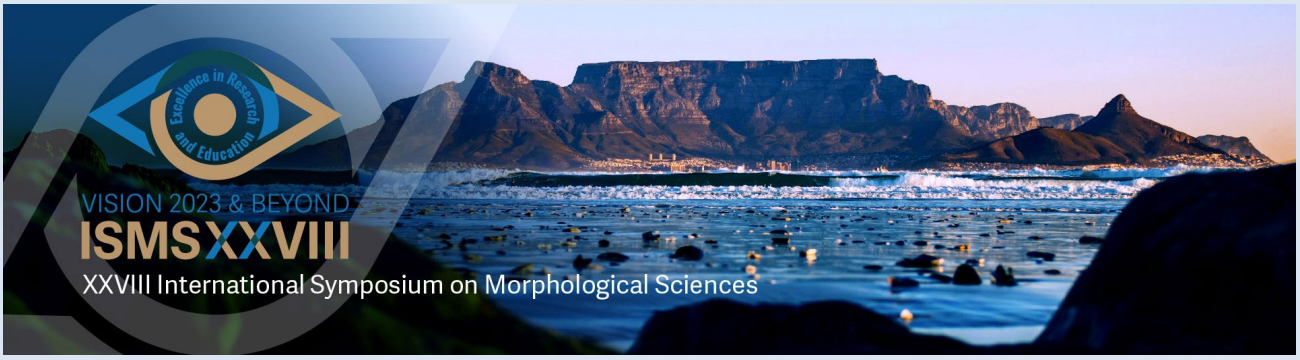
Acknowledging potential anatomical variations in the branching pattern of the abdominal aorta (AA) is mandatory for radiological diagnosis leading up to abdominal surgery and organ transplants. It may also limit vascular damage during such procedures. In this study, the anatomical variations and relationships of the branches of the AA were evaluated in 20 Anatomy course cadavers (13 males, 7 females), aged 50-96. The vertebral level at which the coeliac trunk (CT), superior mesenteric artery (SMA) and inferior mesenteric artery (IMA), left renal artery (LtRA) and aortic bifurcation (AB) occurred were noted. Additionally, the transverse, longitudinal, and linear distances of each were measured. In one cadaver (male aged 73), the common hepatic artery (CHA) arose from the AA and the left gastric artery (LGA) arose from the CHA. The SMA, IMA, and LtRA arose from the aorta at the middle 1/3 part of L1, between the intervertebral disc of L2-3, and between the intervertebral disc of L1-2, respectively. AB was found at the 1/3 middle part of L4. Variations of the hepatic artery (20-50% occurrence) have been reported previously, as well as the CHA arising from the AA (2% of subjects). There is no previous report that these variations occur in the same individual. This is thus the first case where the variations are in one cadaver, namely CHA arising directly from the AA and LGA arising from the CHA. Despite the rarity, surgeons, radiologists and anatomists should be aware of these variations, amongst others. In this study, ethical approval was not required since the study was conducted on cadavers used for teaching purposes in the Albert Einstein College of Medicine C&DA Department according to the exemption categories in Enstein-IRB-citation104(d).



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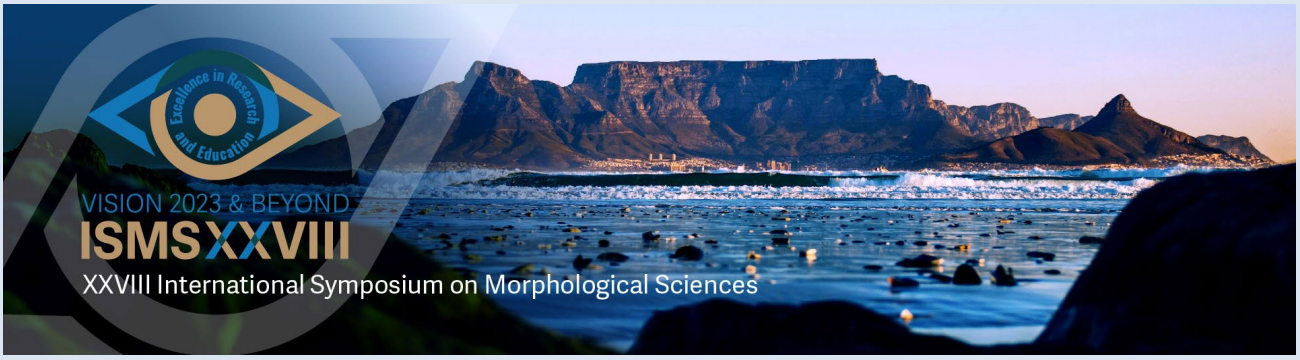
Atypical masses in rat bone tissue: a green Rooibos tomography study

Ms Johara Khan[1]

[1]*Stellenbosch University, South Africa*

High-fat (HF) and high-sugar (HS) diets impart complex diet-specific effects on bone metabolism and structural integrity. Natural products like Rooibos are commonly used to regulate metabolism, however tomography Rooibos research is limited. This study aimed to evaluate effects of obesogenic feeding and a green Rooibos extract (Afriplex GRT™, GRT) on femora of male Wistar rats using nano-computerised tomography (nCT). Rats, sourced from Stellenbosch University's Animal Research Facility (ACU-2021-6786) were randomly assigned to one of three dietary groups (n=24 each), namely control (C), high-sugar (HS) or high-fat (HF) for 17 weeks. Afriplex GRT™ supplementation occurred from weeks 11-17 for half the animals in each diet group (n=12 each). Soft tissue was removed from femora prior to nCT scanning. Upon observation of nCT scans, atypical masses were clearly visible in the femoral shaft as well as the distal and proximal aspects (n=17, 25%). Thickening of both the distal and proximal growth plates were observed, which extended into the distal trochlear condylar junctions. Specifically, masses were observed in the C-GRT group (n=9, 90%) while no masses were visible in the C, HF or HF-GRT groups. In addition, more masses were observed in the HS-GRT group (n=5, 27%) compared to the HS group (n=3,28%). It can be speculated that these masses may be a result of osteoblastic (femoral shaft) or chondroblastic activity (growth plates). However, similar masses have apparently not been described elsewhere in the literature. Future studies will focus on bone densitometry, bone histomorphometry and immunohistochemistry to explore markers associated with osteo- and chondrogenesis.



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A geometric morphometric analysis of the pars basilaris and pars lateralis

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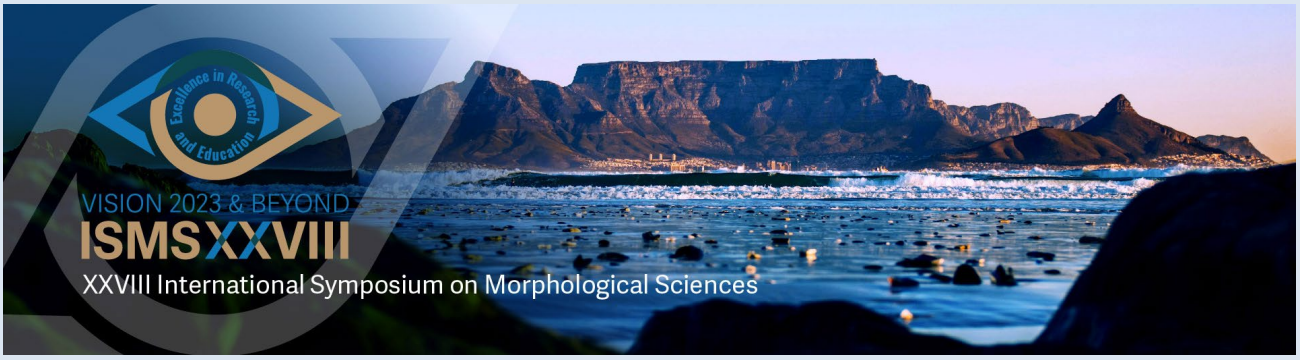
The pars basilaris and pars lateralis contribute to the development and growth of the foramen magnum, and as such hold significance across evolutionary, clinical, and forensic contexts. While some studies have documented the postnatal growth of the pars basilaris, little is known about both skeletal elements across the early prenatal and late prenatal stages of growth. Thus, the study aimed to investigate changes in the morphology of both skeletal elements in a fetal and postnatal South African human sample. The disarticulated pars basilaris and pars lateralis of 106 South African immature individuals aged between 20 gestational weeks and 7.5 postnatal months were sourced from the Johannesburg Forensic Paediatric Collection, University of the Witwatersrand. The sample was grouped into age categories: early prenatal: 20-30 gestational weeks (n=33), late prenatal: 30-40 gestational weeks (n=41) and postnatal: birth-7.5 months (n=32). A series of fixed and floating landmarks were digitised on the intracranial aspect of both elements, using a Microscribe G2 digitiser. Data analysis assessed size and shape using principal component analysis, wireframes and ANOVA. The lengths and widths of both elements were significantly different between the subsequent age categories. Pars basilaris shape transitioned from triangular to hexagonal. The plate of the pars lateralis transitioned from crescent-shaped to quadrilateral. Shape changes were driven by the differential growth rates of the maximum width and length, as shown by the PCA biplots. Wireframes show that the regions of both bones that contribute to the foramen magnum were relatively stable across age categories, thus reinforcing that growth of the cranial base is associated with development of the brain and neurovascular structures.



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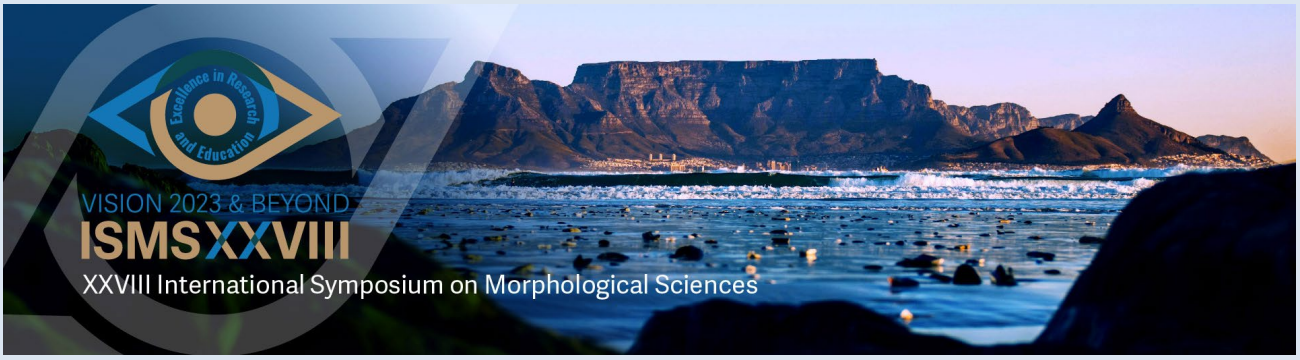
Osseous characteristics of tibial attachment site of anterolateral ligament and its significance in Segond fractures

Master Gao-Lin Zhu, Bechelor Shi-Jun Gao, Bechelor Zun-Wen Zheng, Master Jing Cheng, Dr Wen-Bin Jiang, Prof Hong-Jin Sui, Prof Sheng-Bo Yu
Department of Anatomy, Dalian Medical University, China

A Segond fracture occurs at the anterolateral ligament (ALL) tibial attachment, and its occurrence suggests serious injury to the joint, but the exact mechanism of avulsion injuries is not known. The study aimed to elucidate the morphological characteristics of cancellous bone in the tibial attachment region of the ALL to explain the susceptibility of the anterolateral region of tibial plateau to avulsion injuries. Twenty-three formalin-fixed adult knee joints were used, three for dissection and 20 for the P45 sectional plastination technique, including 10 for ALL and 10 for anterior cruciate ligament (ACL). The results showed that the ALL inserted on the lateral tibial plateau at the midpoint between the Gerdy tubercle and the fibular head. At its attachment site, mild thickening of cortical bone (CB) was observed. Below the CB, irregular thin and mesh-like bone trabeculae were presented. Furthermore, trabecular anatomical parameters showed that in the ALL-tibial attachment site, the trabeculae were present with the porosity of 0.761, anisotropy of 0.803, and number of bone trabeculae of 1.202/mm. The t-test showed that the trabeculae of the ALL-attachment site were significantly thinner than that of ACL in aspect of the porosity ($P<0.0001$), degree of anisotropy ($P<0.0001$), and trabecular bone number($P<0.0001$). In summary, the CB was just mildly thickened in the ALL-tibial attachment site, and there was no apparent anchoring zone of cancellous bone for ALL. This study elucidates the susceptibility factors associated with the occurrence of Segond fractures at the tibial attachment site of ALL. Ethics number: 2020-006



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The co-existence of anatomical variants in the hepatic arterial supply and biliary tree

Mr Jason Wagner[1], Assoc Prof Geney Gunston[1], Prof Eduard Jonas[1,2]

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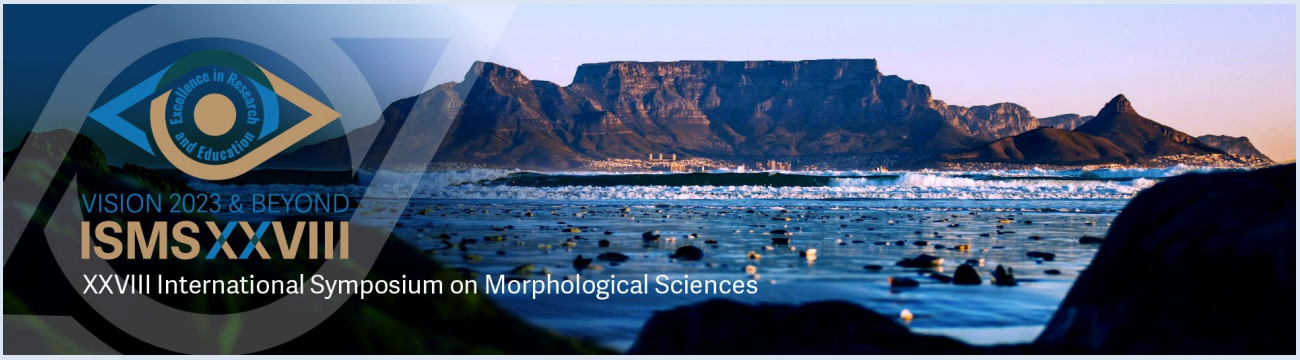
Variation in the hepatobiliary system is common, and rarely occurs in isolation. The purpose of this study was to determine if an association between variation in the hepatic arteries and bile ducts exists, and to report the combinations in which they occur.

The methodology involved the use of contrast-enhanced computerised tomography abdominal angiograms of 744 patients which were retrospectively analysed for the presence of variant arterial anatomy. After 640 patients were excluded for having standard anatomy, the magnetic resonance cholangiopancreatography scans of the remaining 104 patients were analysed to determine the proportion of patients having both hepatic arterial and biliary variations. Images were from the HREC approved pancreatic and liver surgery registries at Groote Schuur Hospital.

The results revealed that sixty-four (62.5%) patients had variations in both their hepatic arteries and intrahepatic biliary tree. The most common arterial variant, found in 27 (26.0%) patients, was an accessory left hepatic artery (LHA) arising from the left gastric artery (LGA). The most common biliary variant was a trifurcation, found in 29 (27.9%) patients. The most frequent combination, seen in 16 (15.4%) patients, was a replaced LHA from the LGA and biliary trifurcation. In the literature, a replaced LHA refers to this vessel arising from an artery other than the proper hepatic artery.

In conclusion, no overall association was found between the presence of hepatic arterial variants and intrahepatic biliary tree variants. However, most patients had variations in both their hepatic arteries and intrahepatic biliary tree. Knowledge of the combinations in which these variants occur may help to lower the risk of iatrogenic injury during surgery, in particular cholecystectomy, liver resections and transplantation.

Ethical approval was obtained from the Human Research Ethics Committee (number 590/2020).



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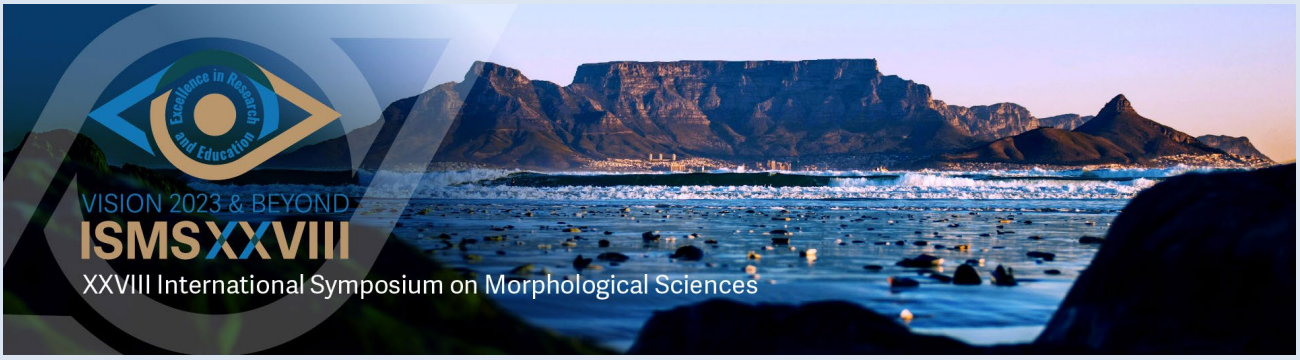
Morphological Characteristics of the Medial Patellofemoral Ligament and its Clinical Significance

Master Jing Cheng[1], Bachelor Zhe-Xian Li, Mater Xu-Hui Zhang, Master Gao-Lin Zhu, Master Jia-Wei Wang, Master Shu-Jun Lyu, Master Qing Shao, Assoc Prof Nan Zheng, Prof Hong-Jin Sui, Prof Sheng-Bo Yu
[1]*Department of Anatomy, Dalian Medical University, China*

This project aimed to investigate the morphological characteristics of the medial patellofemoral ligament (MPFL) in its attachment area at the patellar end, and to provide more comprehensive anatomical parameters for the selection and fixation of grafts in clinical reconstructive surgery of MPFL. Twenty-three formalin adult knee joints were used (Ethics number: Biomedical Ethics Committee of Dalian Medical University 2020-006), ten for gross anatomy, ten for P45 sectional plastination technique, three for histological analysis. A Canon camera was used to record all observations. The study focussed on the attachment zone of MPFL at the patellar end, including the tendon of vastus medialis oblique (VMO) and vastus intermedius (VI) muscles, the patella and the patellar ligament. The MPFL showed a strong connection to the tendon and the superior medial horn of the patella, while the other portions were less robust. Histological slices showed that the MPFL is incorporated into the quadriceps tendon. By observing P45 sections, it was noted that the MPFL is a bundle of fibres originating from the tendon of VMO. The fibres of the patellar end were denser and thicker compared to those of the femoral end as a result of tendinous fibres from the VMO and VI. The trabecular bone of the patella showed a stable triangular support pattern. In conclusion, the MPFL originates from the quadriceps tendon, maintaining a close connection with VMO and VI. This involvement of the tendon should be considered in MPFL reconstruction, providing an anatomical basis for improved MPFL reconstruction and biomimetic design of grafts by simulating a more realistic morphology.



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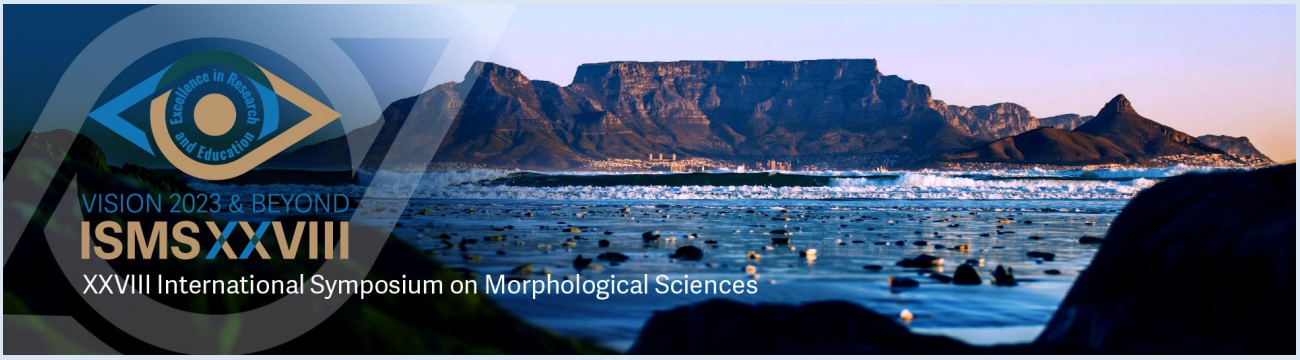
Combination antiretroviral therapy worsens/exacerbates fructose and streptozotocin induced diabetic skeletopathy in the Sprague-Dawley rat humerus

Mr Vaughan Perry[1], Dr Idemudia Eguavoen[2], Prof Ejikeme Mbajiorgu[2], Prof Robert Ndou[1]
[1]Sefako Makgatho Health Sciences University, Ga-Rankuwa, South Africa, [2]The University of the Witwatersrand, Parktown, South Africa

Type 2 diabetes mellitus prevalence and associated skeletopathy is increasing globally. With high prevalence of HIV, the use of combination antiretroviral therapy (cART) has compounded this problem. Diabetic skeletopathy in individuals enrolled for cART is unknown; therefore, this will be investigated in this study. Ethical clearance was granted by the Animal Research Ethics Committee (2018/011/58/C), and the study was carried out at the Central Animal Services, University of the Witwatersrand. Twenty-four male Sprague-Dawley Rats were allocated into untreated, Atripla (cART), Diabetic (DBT) and Diabetic and Atripla (DBT+cART) groups. Diabetes was induced through a high fructose diet and Streptozotocin. Diabetes was confirmed through oral glucose tolerance tests, serum insulin levels, blood fasting glucose, and body mass measurements. Diabetic rats were treated for 90 days with cART and terminated with a lethal, intraperitoneal pentobarbital dose. Bilateral humeri were harvested and fixed in 10% buffered formalin before Micro-focus X-ray Computed Tomography for assessment of trabecular morphometric parameters. Osteometry and bone strength tests were conducted. The DBT+cART group had shorter humeri although the bicondylar breadth was similar among all groups. The DBT+cART and the DBT group had the lowest bone volume to total volume ratio (BV/TV) and showed diminished trabecular thickness (TbTh) but with more trabeculae (TbN). Trabecular were more spaced (TbSp) in the cART group only. The break force was lowest in the DBT+cART. Therefore, diabetic skeletopathy is worsened in cART as demonstrated by the shorter bones with least BV/TV, TbTh and break force in the DBT+cART treated group. We recommend increased bone health monitoring among diabetic patients using cART.



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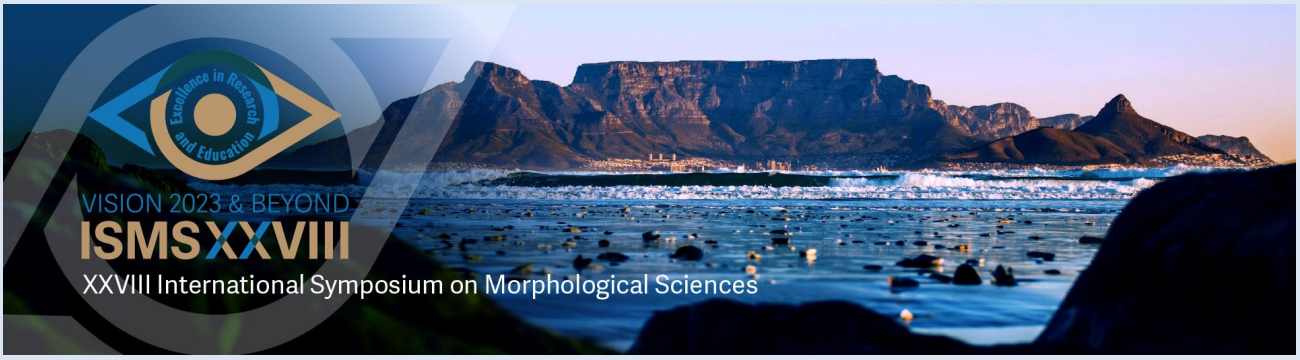
Dimensions of the orbital region for biological profiling in a South African sample

Ms Soné Van Der Walt[1,2], Prof Ericka N L'Abbé[2], Dr Alison Ridel[2], Prof Anna C Oettlé[1,2]
[1]Sefako Makgatho Health Sciences University, South Africa, [2]University of Pretoria, South Africa

The dimensions of the orbital region correlate with other regions of the face and exhibit variation between sexes and populations. Based on these variations, the dimensions of the orbital region should be considered for the estimation of the biological profile in the forensic context. The study aimed to set up mean values for the linear orbital dimensions and to determine the discriminant ability of possible dimensional variations between groups. Retrospective Cone beam computed tomography scans of 207 adult South Africans (45 black females, 52 black males, 57 white females, 52 white males) were analysed. Three- dimensional (3D) modelling and landmark placement on 3D reconstructions were performed using MeVisLab © v.3.0.2 software. Euclidean inter-landmark distances were calculated: orbital breadth, orbital height and orbital index, for each side, as well as interorbital distance and bizygomatic breadth. Geometric morphometric methods were used to quantify the shape of the orbital region. South African males had larger dimensions than females, with black females presenting with the smallest dimensions and white males with the largest dimensions. Discriminant function analysis (DFA) achieved a 78.16% accuracy for sex estimation considering bizygomatic breadths and orbital breadths only, while all linear dimensions combined yielded a 75.24% accuracy for population affinity. Conversely, considering 3D shape variations after Procrustes analysis eliminating size differences, DFA yielded an accuracy of 70.81% for sex and 98.38% for population affinity estimation. We conclude that sex variations in the dimensions of the orbital region are essentially size driven, while population differences are shape driven and could prove helpful in the estimation of the biological profile.



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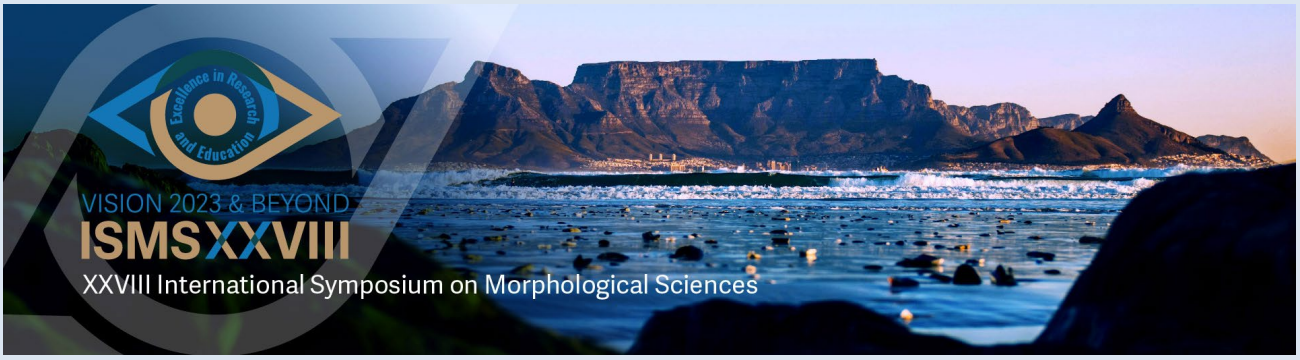
Histomorphometric effect of Betel Quid with and without tobacco on the liver of adult mice

Dr Abdulrahman Mohammad[1]

[1]*Sulaiman Alrajhi University, Qassim, Saudi Arabia*

Betel Quid (BQ) is the 4th most consumed drug following caffeine, alcohol, and tobacco. The International Agency for Research on Cancer recently classified Betel Quid with no tobacco as a human carcinogen. BQ is estimated to be consumed by nearly 10% to 20% of the global population and Areca Nut is chewed worldwide by nearly 600 million individuals; however, this is concentrated mainly in South-east Asian nations, East and South Africa, Europe, and the American nations. The purpose of this study was to investigate the effect of Betel Quid on the histomorphometric changes on the liver of adult mice and to compare the histomorphometric effects, if any, between the BQ with and without tobacco on the liver of adult mice. With respect to the methodology and theoretical orientation, this analytical case-control study was done on 30 adult mice, irrespective of sex, in the Postgraduate Laboratory of Isra University Hyderabad, Pakistan. After sacrificing the animals, morphological and histological abnormalities of the liver were separated and studied in three equal groups, namely BQ with tobacco, BQ without tobacco and a control group. The findings revealed significant histomorphometric changes found between the control group and only the BQ group for the weight and size of the liver ($p < 0.001$), as well as between the control group and BQ with tobacco group ($p < 0.001$). No significant difference was found between the two intervention groups. There were no differences for gender on the histomorphometric changes along the three groups. In conclusion, the data presented shows that chewing of BQ alone is as harmful to the liver as BQ with tobacco.



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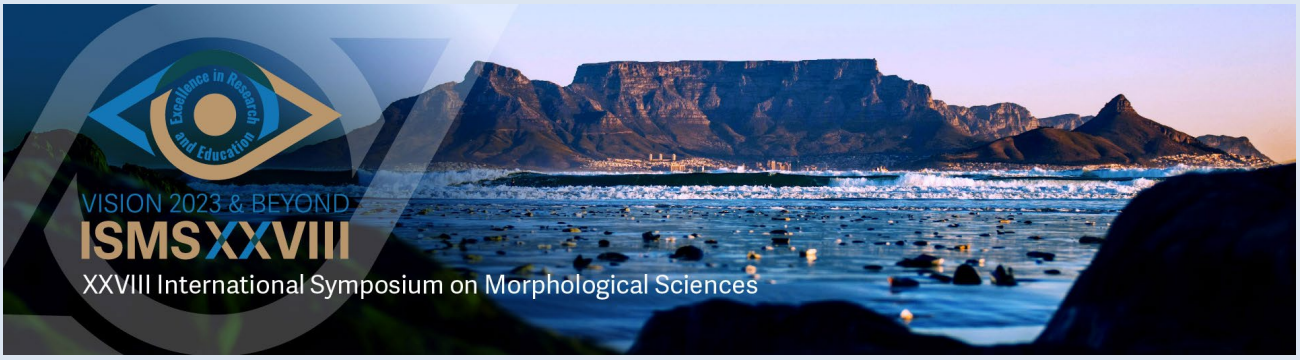
Intellectual property agreements for three-dimensional imaging research: Research oversight and protection of African human data

Assoc Prof Victoria Gibbon[1], Dr Brendon Billings[2]

[1]Division of Clinical Anatomy & Biological Anthropology, Department of Human Biology, University of Cape Town, Observatory, South Africa, [2]School of Anatomical Sciences, University of the Witwatersrand, Parktown, South Africa

Three-dimensional (3D) imaging of the deceased is increasingly being applied in human Anatomy and Biological Anthropology, which can impact living people connected to the deceased, both biologically and culturally. Unlike traditional forms of data, 3D images are easily transferable, can be 3D printed and used for digital reconstruction. The ease of their transfer makes them available for use without the knowledge and perMsion of the stewards and / or donors. Repository stewardship of human remains requires the duty-of-care and responsibility of the deceased in their care. This is often achieved through an oversight committee/body and rigorous ethical standards. African human data are desirable for a variety of reasons, including but not limited to, its genetic diversity and importance for understanding human origins. Therefore, African institutions of Anatomy and Biological Anthropology are susceptible to extractive science, parachute research (outside researchers using local resources to obtain samples, then leave without giving back results) and ethics dumping (conducting research in areas with less ethical regulation than their own region). Consequently, this can lead to independent personal repositories of African data being shared across the globe without the knowledge or consent of stewards and / or donors. Institutions are encouraged to implement legally binding intellectual property agreements to prevent or limit unauthorised 3D data trade and ensure data ownership stays with the source institute. This layer of protection retains research oversight to the repository and prevents unnecessary re-scanning, leading to improved research integrity and better ethical oversight. Examples of implementation, challenges and emerging issues for stewards will be discussed.



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A cadaveric study on the variations of the ascending pharyngeal artery

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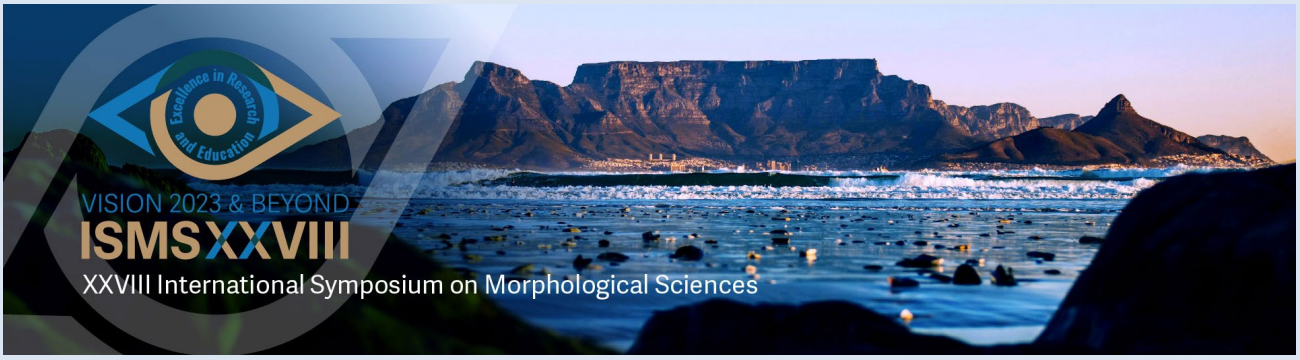
[1]Department of Anatomy, School of Medicine, Faculty of Health Sciences, University of Pretoria, Pretoria, South Africa

The origin of the ascending pharyngeal artery is highly variable. In the case of head and neck cancers, endovascular embolisation is an effective adjunctive therapy before surgery. The vascular territory of head and neck cancers vary, and a complete understanding of the ascending pharyngeal artery anastomoses and variations is critical in embolisation planning. This study aimed to evaluate the morphology of the ascending pharyngeal artery in 30 cadavers bilaterally (n=60), housed at the Department of Anatomy, University of Pretoria following ethical approval (174/2022). The location and distance from the carotid bifurcation to the point of origin of the ascending pharyngeal artery were measured, as well as the diameter at its point of origin. The position of the origin of the ascending pharyngeal artery was also classified according to standard anatomical directions. The origin of the ascending pharyngeal artery was found to be from the external carotid artery (80% of cases), the carotid bifurcation (18.3% of cases) and the internal carotid artery (1.7% of cases). The mean distance from the carotid bifurcation to the point of origin of the ascending pharyngeal artery was 13.25 mm, with a mean diameter at this point of 2.25mm. The ascending pharyngeal artery most commonly originated posterolaterally as the second branch of the external carotid artery (35% of cases), No conclusive relationships or correlations were observed regarding the ascending pharyngeal artery and measurements conducted in this study. Further studies on the variations of the ascending pharyngeal artery are needed to improve the accuracy and understanding of its origin.



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Morphometric analysis of the adult plantaris muscle: A South African cadaveric study

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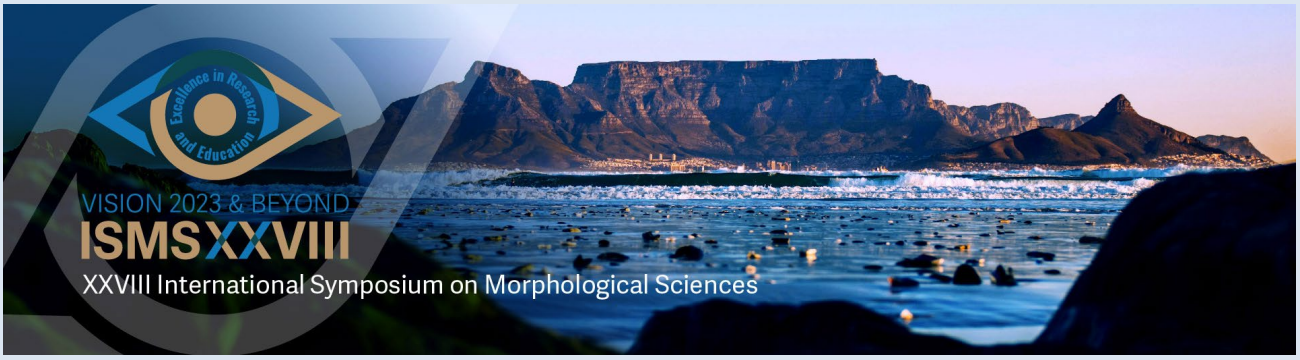
[1]*Department of Anatomy, School of Medicine, Faculty of Health Sciences, University of Pretoria, Pretoria, South Africa*

The plantaris muscle is often debated in the literature regarding its morphology and function. This muscle is a regressed, small muscle with a long thin tendon located in the superficial muscle layer of the posterior compartment of the leg. Its clinical relevance pertains to the tendon being grafted in reconstructive surgeries. The aim of this study was to classify the origin, course and insertion of the plantaris muscle in 30 cadavers, bilaterally, following ethical approval (177/2022). Observations on the classification of the origin and insertion of the muscle belly and tendon were noted. Digital images were taken and analysed using Image J to measure the muscle belly width and length as well as muscle tendon length. The mean muscle belly length was 93.77mm, the mean muscle width was 10.43mm and mean tendon length was 338.9mm. The origin and insertion of the muscle were classified using combinations of various points of origin. The most commonly encountered point of origin (23.64%) was the lateral femoral condyle with connections to the supracondylar ridge and gastrocnemius muscle, and in 29.09% of the cases the tendon inserted onto the medial aspect of the calcaneal tendon. There were no correlations between the measurements collected and the sex and/or stature of the individuals, and no differences between left and right sides within an individual. Therefore, stature cannot be used as an indication for pre-operative tendon length prediction, with variations predominantly observed unilaterally. A need exists for the classification of the plantaris muscle attachments to be defined and standardised.



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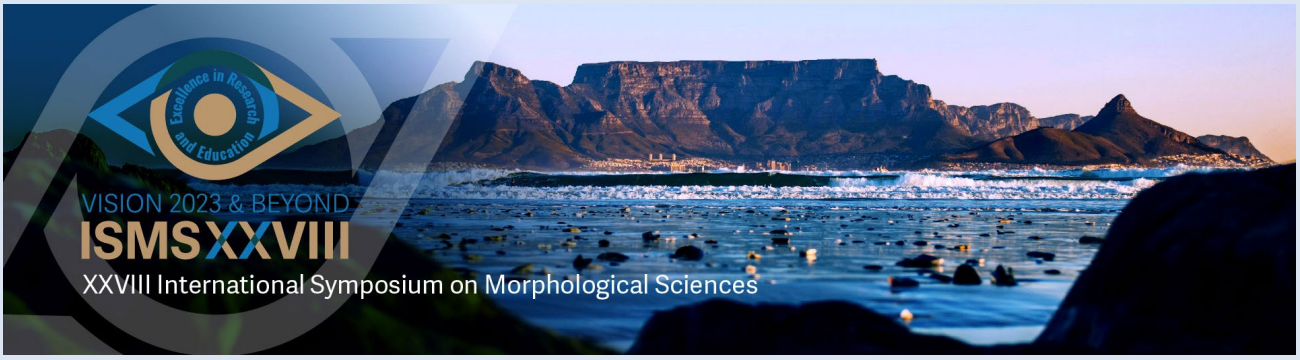
A quantitative analysis of orbital dysmorphology in anterior synostotic plagiocephaly using computed tomography

Ms Nivana Mohan[1], Prof Anil Madaree[1], Prof Lelika Lazarus[1]
[1]*University of KwaZulu-Natal, South Africa*

Anterior synostotic plagiocephaly (ASP) is caused when one coronal suture fuses prematurely, resulting in severe craniofacial asymmetry. The orbit is a crucial craniofacial feature that is significantly compromised in ASP and may be challenging to repair. Computed tomography (CT) scans were used in this study to document and compare the morphometry of the orbit on the ipsilateral (synostotic) and contralateral (non-synostotic) sides in a select cohort of South African patients with ASP. Using a set of anatomical landmarks on two-dimensional CT scans of 18 consecutive patients diagnosed with isolated and non-syndromic ASP at a regional hospital in South Africa between 2004 and 2020, the dimensions of the orbit on the ipsilateral and contralateral sides were measured. Differences were calculated between the ipsilateral and contralateral sides and expressed as a percentage of the contralateral side. The results of this study revealed that there was significant orbital asymmetry. The length-infraorbital rim (IOR), height and surface area dimensions increased significantly (t-test; $p<0.001$) for the ipsilateral orbit, with the height being the most affected (24.6%). The remaining orbital dimensions (length-supraorbital rim (SOR), breadth and volume) decreased significantly (t-test; $p<0.001$), with the length-SOR parameter being the most affected (-10.8%). Additionally, it was noticed that the ipsilateral SOR was shifted more cranially than the contralateral SOR, on average by 3.89mm. These measurements may aid surgeons in corrective surgery by indicating the degree of asymmetry on each side, making it easier to design the approach and determine the extent of surgical correction of the afflicted orbit.

Ethical clearance (BREC/00002129/2020



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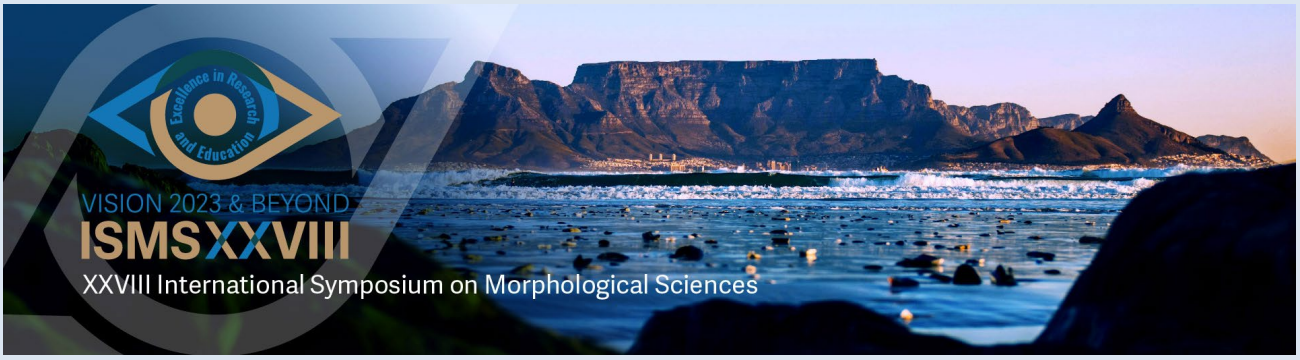
Analysis of cranial fossae indices in scaphocephaly and its correlation with severity

Ms Vensuya Bisetty[1], Prof Anil Madaree[1], Prof Lelika Lazarus[1]
[1]*University of KwaZulu-Natal, South Africa*

Scaphocephaly is the most prevalent form of craniosynostosis, in which the sagittal suture closes prematurely resulting in a long and narrowed abnormal skull shape. Literature regarding the extent of deformity at the level of the three cranial fossae in scaphocephalic patients is limited. Understanding the development and anatomy of the anterior, middle and posterior cranial fossae (ACF, MCF and PCF) is essential to define the severity of the deformity and this may influence the appropriate surgical procedure. This study, therefore, aimed to analyse and compare the ACF, MCF and PCF in different degrees of severity of scaphocephaly. Maximum lengths and widths of each cranial fossa were measured in 24 consecutive cases of scaphocephaly using fixed anatomical landmarks on 2-dimensional computed tomography scans. Patients were stratified into three groups according to the degree of severity, which was determined by calculating the cephalic index (CI), i.e., mild [CI: >70%], moderate [CI: 65-70%] and severe [CI: 60-65%]. The length to width ratios of the cranial fossae were calculated and expressed as percentages, and then compared. This study found that all three cranial fossae were affected in scaphocephalic patients, with the MCF being most affected in all three degrees of severity. There is also a progressive increase in the ACF and PCF size as the degree of severity increases. These findings could aid craniofacial surgeons in identifying the cranial fossa most affected in different degrees of scaphocephaly in order to determine the most suitable surgical approach.

Ethical approval for this study was obtained from the Biomedical Research Ethics Committee of the University of KwaZulu-Natal (BREC/00002084/2020).



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A morphometric analysis of the metopic indices and orbits in trigonocephaly

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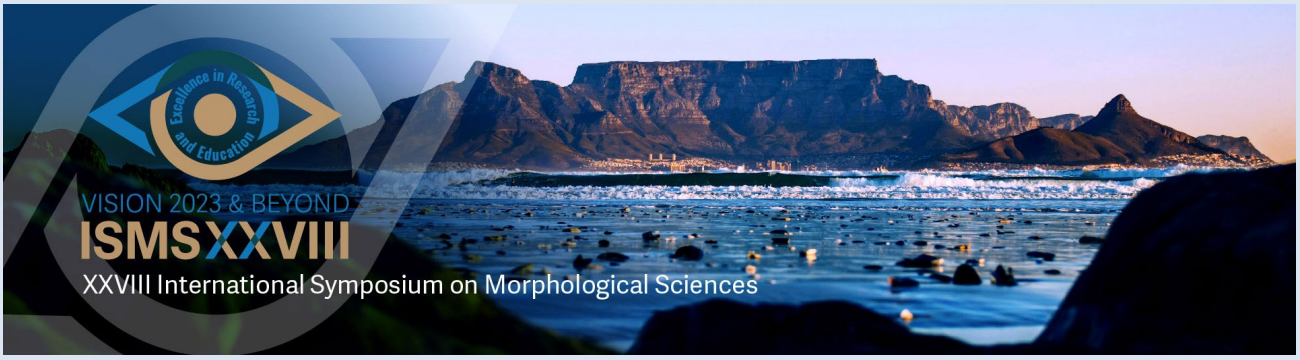
Trigonocephaly is characterised by a shortening of the anterior cranial fossa resulting in a triangular shaped forehead, hypotelorism and bitemporal narrowing. Currently, the evaluation regarding which metopic indices to utilise in the severity assessment of trigonocephaly remains controversial. This study aimed to determine the metopic indices and orbital morphometry in non-syndromic trigonocephalic patients utilising specific cranial landmarks.

Metopic indices and orbital dimensions were calculated on computed tomography scans of trigonocephalic patients (n=8) and normal controls (n=8) with a mean age of 1.08 years and 1.86 years, respectively. Means of the frontal and endocranial bifrontal angles, and dimensions of the orbital height, width, and interorbital distance were analysed. Orbital ratios were calculated and expressed as percentages.

The findings were that in both trigonocephaly and normal controls the endocranial bifrontal angle was more acute (mean: 81.95° vs. 84.97°) than the frontal angle (mean: 89.53° vs. 90.79°), respectively. The mean interorbital distance was significant: 14.21mm in trigonocephaly and 15.86mm in normal controls.

The significance is that the use of metopic indices could further assist clinicians by providing a more accurate method to assess the severity of trigonocephaly, thus determining which surgical treatment to undertake. Additionally, the degree of hypotelorism correlates to trigonocephaly severity, and therefore knowledge of the orbital dimensions aids in improving the orbital walls in surgical correction. Orbital ratios were significant in trigonocephaly pertaining to laterality when compared to controls. This study presents preliminary data and additional parameters related to the metopic suture and orbits currently do not form part of this investigation.

Ethical approval number: BREC/00004342/2022



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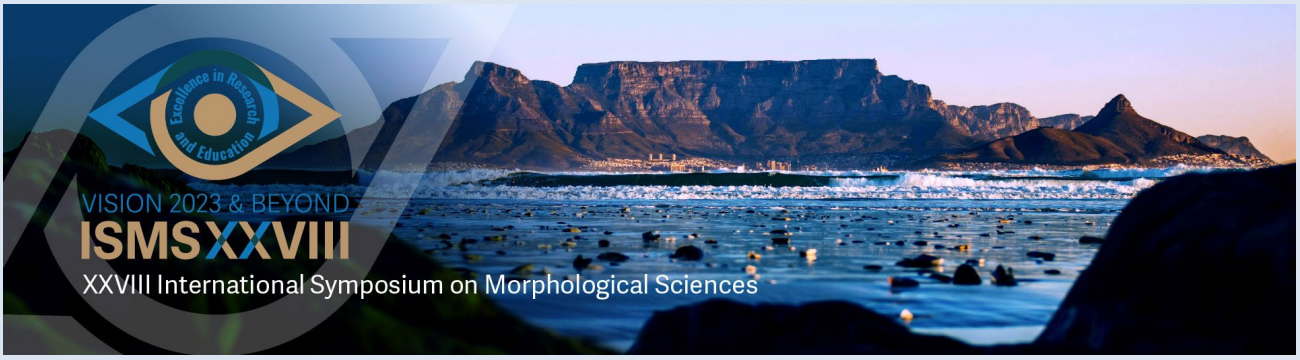
An anatomical investigation of the confluence of the sinuses

Ms Matshidiso Mtshali[1], Dr Lané Prigge[1], Dr Gerda Venter[1]
[1]*University Of Pretoria, South Africa*

The confluence of the sinuses is a highly variable structure which is important in the venous drainage system of the brain. The purpose of this study was to investigate the drainage patterns of the confluence of the sinuses using two modalities namely osteological and cadaveric specimens from a sample of the South African population. This was achieved through the investigation of 391 dried skull specimens and 26 adult cadaveric specimens, following ethical approval (Research Ethics Committee reference number 234/2021). For the osteological sample, correlations on the drainage morphology were observed. The drainage patterns in the cadaveric specimens were investigated to compare the drainage patterns within the dura mater to the bony impressions within the posterior cranial fossa. There was no statistically significant relationship found between the drainage patterns and the sex of the osteological sample. The most common drainage pattern recorded in the osteological and cadaveric samples were the asymmetric right dominant type (48,8%) and the drainage of the superior sagittal sinus into the right transverse dural venous sinus (48,8%) respectively. When observing the drainage patterns within the dura mater, in only 80% of cases did it correspond to the same pattern seen in the bony impressions. This study was the first in a Sub-Saharan African population, with a large osteological sample size. These findings suggest that an osteological sample alone may not be a reliable modality. The variable drainage patterns of the confluence of the sinuses are of clinical significance for neurosurgical procedures, and further investigation is warranted.



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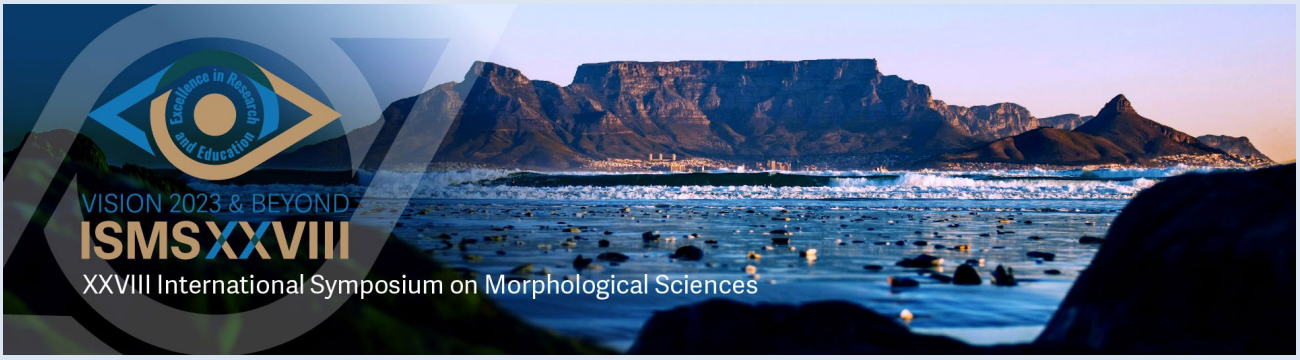
A review of new findings in fascial system anatomy

Dr Rebecca Pratt[1]

[1]*Oakland University, Rochester, United States*

Anatomy means “to cut apart”, to take what is whole and reduce it to pieces. Scientists have been investigating, documenting and teaching Anatomy under this rule for 800 years. Most United States Health Care training has Anatomy curricula grounded in an artificial view of the human form with the fascial system responsible for uniting the body largely devalued and dissected away. This farewell to fascia in the Medical curriculum leaves many future United States physicians forgetting that the body is completely united, that no single part of the body functions independently. The fascial system is currently at the forefront of research on movement, pain, fitness recovery, disease control and tumour containment. Recent research on hyaluronan of the extracellular matrix as well as gross anatomical dissection demonstrates that if the body’s overall structure is sub-optimal, its functioning and capacity for self-healing will be inhibited as well. Therefore, the fascial system is continuously adapting to the body’s needs, habits and health changes. In 1899, A.T. Still, wrote: “In every view we take of the fascia a wonder appears. The part the fascia takes in life and death gives us one of the greatest problems to solve. (…) By its action we live and by its failure we die.” In this presentation the structure and function of the fascial system, the significant clinical results in fascial research and global fascia education will be discussed.



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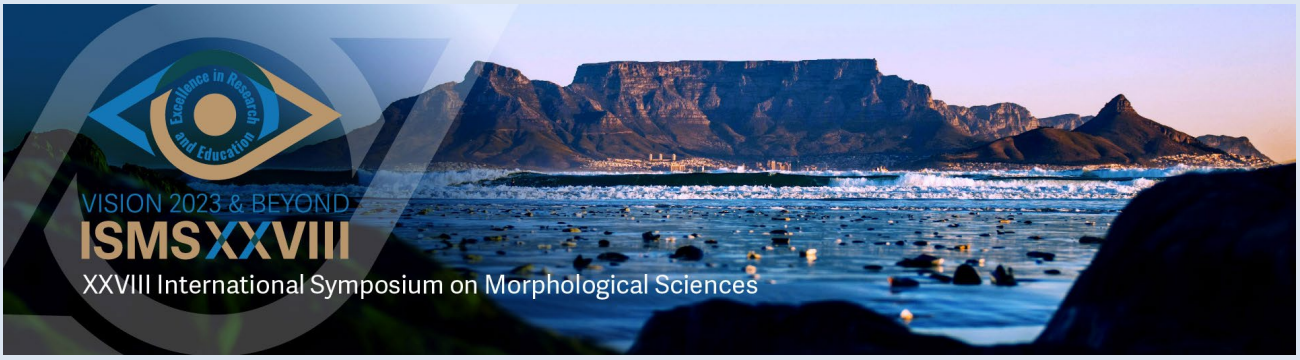
Ethical considerations of developing an Anatomy programme within a South African context

Mr Joastin Naidoo[1], Mr Livashin Naidu[1], Dr Zithulele Tshabalala[1]
[1]*Nelson Mandela University, South Africa*

Globally, the discipline of Anatomy and the use of cadaveric material has been surrounded by controversy and has a tainted history. This, coupled with South African history, necessitates an approach to developing an Anatomy programme which envelopes high standards of ethical practice and transparency. Furthermore, due to the diverse population of South Africa, various cultural and religious beliefs need to be factored in when approaching the use of cadaveric material for learning and teaching. This viewpoint paper seeks to describe methods and processes implemented during the development and creation of an Anatomy programme at the first South African medical school of the post-Apartheid era. One of the key focuses when developing the programme was recognising the non-scientific background of various stakeholders as well as the physical and social environments in which the medical school has been established. Therefore, adopting an approach to transparency surrounding the use of cadaveric material on the concepts of Africanisation and “ubuntu” has led to positive results in the education of staff, students, stakeholders and communities on the importance of Human Anatomy in Health Sciences Education. Additionally, educating students in extra-curricular sessions regarding the laws and ethical standards of body donation and care of cadavers has resulted in their positive conduct within and external to the dissection hall. Consideration of these approaches is imperative in the development of future Anatomy programmes in South Africa and may be implemented in current programmes within the country to maintain high ethical standards and facilitate a national stance that humanises Anatomy.



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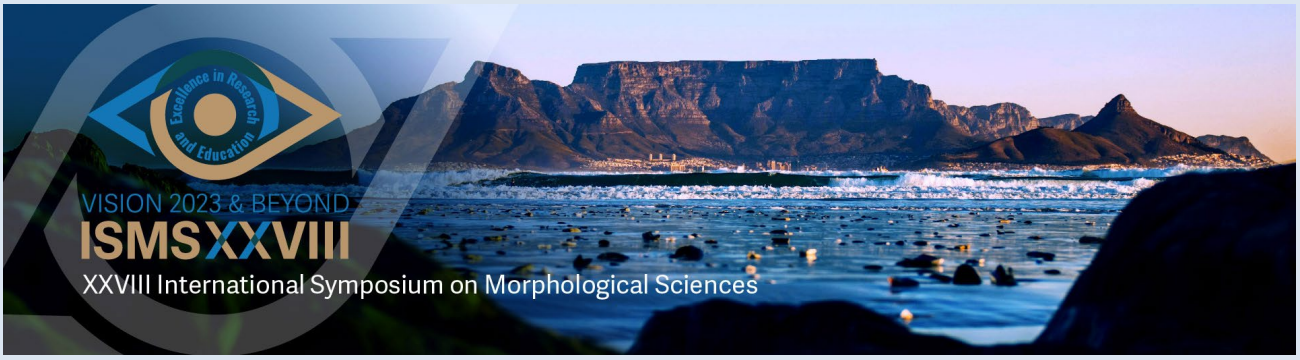
A cadaveric case report on a novel, bilateral tripartite variation of the anterior digastric muscle

Therese Weidenkopf[1], Jialin Chen[1], Dr Kelly Harrell[1]
[1]*Virginia Commonwealth University School of Medicine, United States of America*

The purpose of this case report is two-fold: (1) describe digastric muscle variations observed in an anatomical donor within the submental triangle, and (2) highlight potential clinical implications related to anomalous muscles. Collectively, anterior and posterior digastric bellies function to stabilise the hyoid bone during swallowing to prevent a food bolus from entering the airway passage. The muscles also aid in phonation, jaw opening, and chewing. Anterior neck dissection of a male donor revealed bilateral pairs of extraneous muscles (n=4) attached to and within the depth plane of right and left anterior digastric muscles. Muscle pair #1 demonstrated lateral attachment to the common digastric tendons on the respective sides and medial attachment to the contralateral muscle along a midline raphe at the hyoid median ridge. Muscle pair #2 demonstrated anterior attachment to the mandible, medial to the digastric fossa and posterior attachment to the medial muscle fibres and raphe of pair #1. Innervation (mylohyoid nerve) and vascular supply (submental artery) of the variants were identified and were consistent with those of the anterior digastric muscles. The clinical relevance of these variations relates primarily to surgical and radiological procedures in the submental region. Digastric muscles serve as important landmarks and potential autografts in surgical neck procedures, where the posterior belly is used to identify structures such as internal jugular vein, various carotid arteries, and hypoglossal nerve, and the anterior belly is commonly used for submental flap reconstruction. The description of novel anatomical variations is necessary to ensure proper planning for surgical and radiological procedures in this region.



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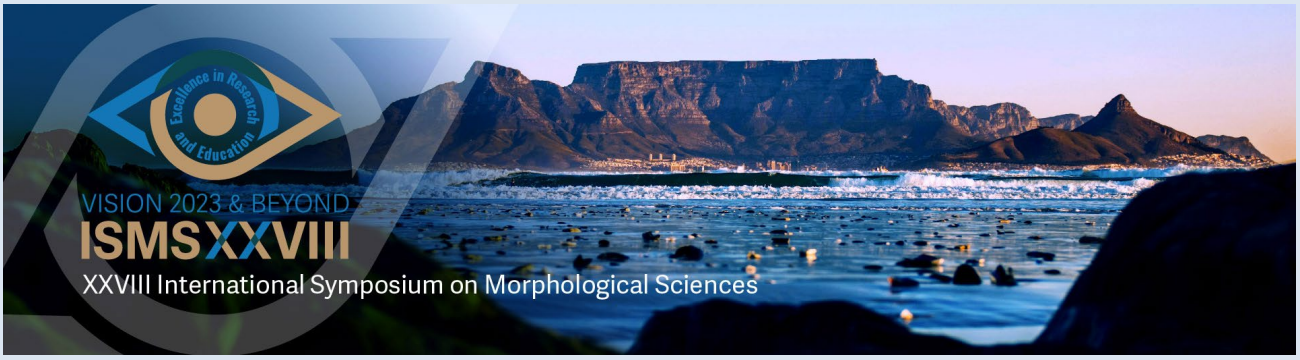
Promoting axon regeneration by inhibiting RNA N6-methyladenosine Demethylase ALKBH5

Dr Dong Wang[1], Ms Tiemei Zheng[1], Dr Songlin Zhou[1], Mr Mingwen Liu[1], Dr Susu Mao[1], **Prof Bin Yu[1]**

[1]Key Laboratory of Neuroregeneration of Jiangsu and Ministry of Education, NMPA Key Laboratory for Research and Evaluation of Tissue Engineering Technology Products, Co-innovation Center of Neuroregeneration, Nantong University, China

A key limiting factor of successful axon regeneration is the intrinsic regenerative ability in both the peripheral (PNS) and central nervous system (CNS). Previous studies have identified axon regeneration regulators that act on gene expression in injured neurons. However, it is less known if RNA modifications play a role in this process. N6-methyladenosine (m6A), the most abundant internal modification of mRNA, plays prominent roles in diverse physiological and pathological processes in mammals. Here, we systematically screened the functions of all common m6A modification-related enzymes in axon regeneration and reported ALKBH5, an evolutionarily conserved RNA m6A demethylase, as a regulator of axonal regeneration. In the PNS, the level of ALKBH5 in adult rat dorsal root ganglion (DRG) neurons was significantly reduced following sciatic nerve injury. Furthermore, the knockdown of ALKBH5 in vitro or in vivo enhanced sensory axonal regeneration, whereas overexpressing ALKBH5 impaired axonal regeneration in an m6A-dependent manner. Mechanistically, injury-reduced ALKBH5 decreased the stability of Lpin2 mRNA through increasing m6A modification in its 3' untranslational region (3'UTR) and thus inhibited the formation of lipid droplets and further promoted axon regeneration in DRG neurons. Moreover, in the CNS, knockdown of ALKBH5 enhanced the survival and axonal regeneration of retinal ganglion cells after optic nerve injury. All of these results suggest a novel mechanism regulating axon regeneration and point to ALKBH5 as a potential target for promoting axon regeneration in both the PNS and CNS.



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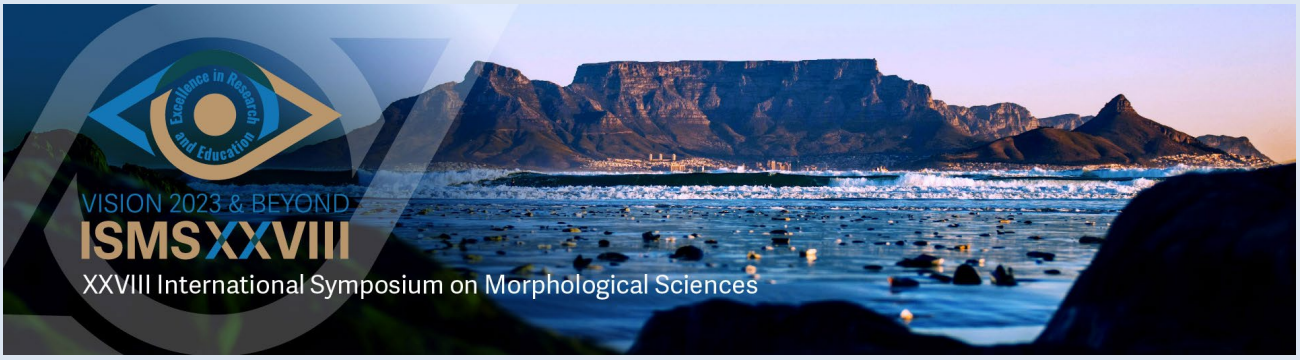
Incidental observation of bone modification by ants (Crematogaster cf. liengmei) in Cape Town, South Africa

Mr Adeyemi Adetimehin[1], Mr Calvin Mole[1], Dr Devin Finaughty[1,2], Dr Marise Heyns[1,3]
[1]University of Cape Town, South Africa, [2]University of Kent, United Kingdom, [3]Ulster University, United Kingdom

Various insect groups have been reported to modify the skeletal remains of vertebrates for the purpose of inhabitation or feeding. Anecdotal reports on the modification of skeletal remains by ants exist but are rare. In November of 2022, during data collection for an ongoing winter decomposition and insect successional study in Cape Town, South Africa, a vertebrate bone was encountered incidentally in the vicinity of the Table Mountain National Park. At the time of observation, the bone was colonised only by the ant species, Crematogaster cf. liengmei. Several ants were observed feeding on and removing bone particles and soft tissue remnants on the bone. A closer observation revealed striae/furrows on the epiphysial ends of the bone. Earlier in June of 2022, a 60kg pig carcass deployed in the same area and period as part of the winter decomposition trial was similarly colonised by this ant species a day after deployment. The ants' feeding activities on the carcass resulted in soft-tissue modification particularly on the right ear. Due to the similarity in the striae/furrows observed on the bone encountered incidentally, and the bitemarks inflicted by the same ant species on the right ear of the pig carcass, it was strongly suspected that the striae/furrows were inflicted by this ant species. We suggest the need for further studies on the role of Crematogaster cf. liengmei as taphonomic bio-agents and how the striae/furrows created by this ant species on the vertebrate bone could be differentiated from those inflicted by other vertebrate and invertebrate scavengers.



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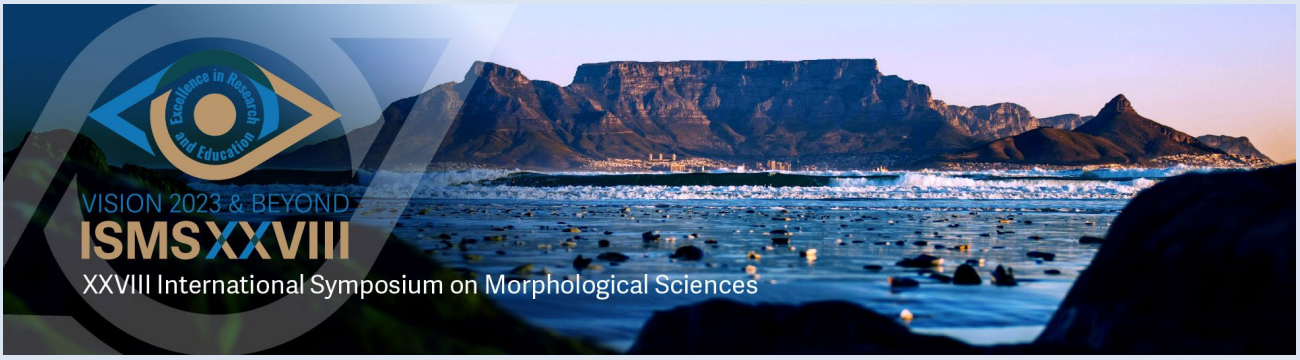
Understanding disability implications resulting from degenerative joint disease in a southern African skeletal sample

Ms Jessica Gavin[1], Prof Lorena Nunez Corrasco[1], Dr Craig Keyes[1], Dr Anja Meyer[1]
[1]*University of the Witwatersrand, South Africa*

Age-related skeletal changes, like degenerative joint disease (DJD), are often used to estimate age in forensic settings, yet these changes also reflect the living experience of individuals as they progress through life. This study set out to assess how skeletal ageing affected individuals' Activities of Daily Living (ADL's) through the use of a novel scoring system translating DJD severity into disability. A sample obtained from the Raymond A. Dart Collection of Modern Human Skeletons was used for this study. The sample consisted of 150 southern African individuals between the ages of 35 and 90 years were assessed for signs of DJD in each of the major joint regions. The severity of DJD was then translated into various ADL's (transferring, eating, talking, object manipulation, walking and posture changes: head rotation; twisting and bending) that may have been affected. Results from this study indicated moderate impacts in transferring (52,67%), walking (50,67%), and eating (41,33%) activities for all individuals. Females presented with significantly higher ADL's for all activities except posture changes whereas problems with eating and talking were more often seen in southern African white individuals. Differences between different socioeconomic status (SES) groups were also noticed with the lower SES group showing increased levels of impairment related to posture changes which may relate to activity differences when age is controlled for. Results from this research highlights the necessity to continually create and test new methodologies that could potentially yield valuable insights around disability and understanding individuals' life histories and the challenges they faced.



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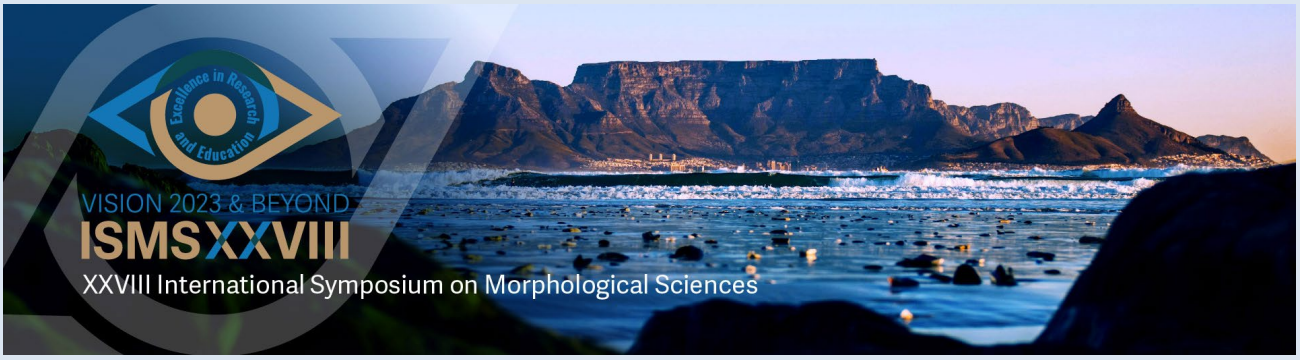
"Change what you can, manage what you can't": Student mental well-being amidst the COVID-19 pandemic

Prof Lelika Lazarus[1], Ms Vensuya Bisetty[1], Ms Courtney Barnes[1], Prof Nalini Govender[2]
[1]*University of KwaZulu-Natal, South Africa,* [2]*Durban University of Technology, South Africa*

Mental health problems have been well-identified in university students and have become a matter of global concern over the years. Due to overwhelming academic workloads and performance expectations, undergraduate health science students are at a higher risk of developing psychological distress and mental health disorders during their course of study compared to other students. The COVID-19 pandemic has had a significant impact on mental health amongst the general population. The extent of the pandemic's impact on the mental health and well-being of health science students in South Africa is still unclear. This study therefore aimed to identify the array of psychological impacts that COVID-19 had on a university student population. A sample of fourth-year Health Science students was selected using purposive sampling, on the basis that they were exposed to the pandemic from their first year of study. Two focus group interviews (n=5/group) were conducted. Data collection continued until saturation was reached. All interviews were voice-recorded, transcribed verbatim and coded. Content analysis was performed. Four broad themes emerged during data analyses, viz. physical and emotional challenges, financial stressors, reflection on online learning and stress relievers, and factors that discourage students from seeking mental health support. Although these are preliminary findings, they can be used by higher education authorities to plan and implement appropriate strategies to help students to navigate through and overcome the negative psychological consequences associated with future pandemics. This will ensure that students safeguard their mental health, especially during a pandemic as this would directly affect their quality of life.

Provisional ethical clearance number: (HSSREC/00003014/2021).

Kindly note that this is a multinational study and provisional ethical approval has been granted pending gatekeepers perMsions from other institutions. PerMsion has been granted to conduct the study at UKZN. Thus, the submitted abstract reflects preliminary data obtained from UKZN students only.



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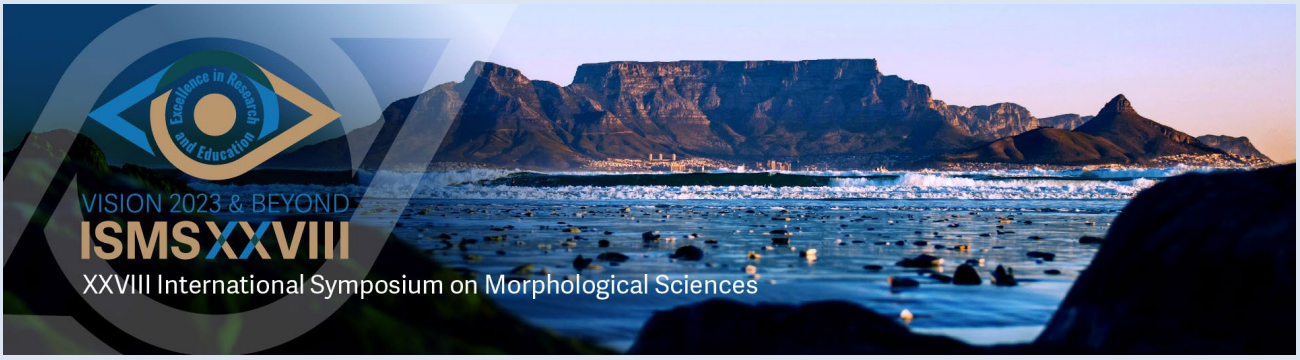
Presence of microplastics in the human placenta: Ultrastructural insights

Prof Stefania Annarita Nottola[1], Dr Loredana Cristiano[2], Dr Roberto Matassa[1], Sig. Ezio Battaglione[1], Prof Giuseppe Familiari[1], Prof Antonio Ragusa[3]

[1]Department of Anatomy, Histology, Forensic Medicine and Orthopaedics, Sapienza University, Italy, [2]Department of Life, Health and Environmental Sciences, University of L'Aquila, Italy, [3]Department of Obstetrics and Gynecology, Università Campus Bio Medico, Italy

Microplastics (MPs) have been found almost everywhere they have been searched for, including the human placenta, blood, meconium and breastmilk, but their exact location and toxicity to humans have not been reported to date. The aims of this study were, firstly, to locate MPs within the intra/extracellular compartment in the human placenta, and, secondly, to understand whether their presence and location are associated with possible structural changes of cell organelles. MPs were localised in human placentas obtained after delivery from 10 consenting women, using variable pressure scanning electron microscopy and transMsion electron microscopy. The study revealed the presence and localisation of fragments compatible with MPs in the human placenta. The authors hypothesised that there was a possible correlation between their presence and important ultrastructural alterations of some cell organelles (mitochondria and endoplasmic reticulum) in the placental tissue, mainly in the syncytiotrophoblast. These alterations could be the result of a prolonged attempts to remove and destroy the plastic particles inside the placental tissue. The presence of virtually indestructible particles in the term human placenta could contribute to the activation of pathological traits, such as oxidative stress, apoptosis and inflammation. These traits are characteristic of metabolic disorders underlying obesity, diabetes and metabolic syndrome, which have their roots in oxidative stress damage and organelle dysfunction, partially accounting for the recent epidemic of non-communicable diseases. A further investigation of in vitro systems will aim to better correlate the presence of MPs and the structural changes we have found and verify mitochondrial and endoplasmic reticulum stress with their related markers.



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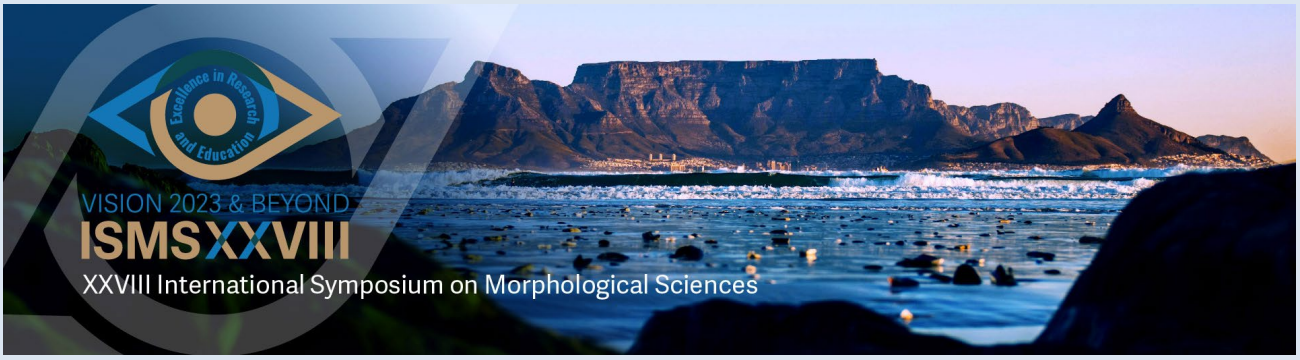
Anatomical study into the morphometry and topography of the clavicle and its nutrient foramen

Ms Ayanda Shandu[1], Mr Joastin Naidoo[2], Prof Lelika Lazarus[1]
[1]*University of KwaZulu-Natal, Westville, South Africa,* [2]*Nelson Mandela University, Summerstrand, South Africa*

Clavicular fractures are the most common fracture in the shoulder girdle, with 80% occurrence in the middle ⅓ of the bone's shaft, where the nutrient foramen is generally located. Anatomical differences in the clavicle are crucial when designing internal fixation devices, such as intramedullary nailing, for fracture repair. This study aimed to determine morphometric variations between right and left clavicles and to describe the topography of the nutrient foramen in a select South African population. Various metrics and parameters of the clavicle were measured and assessed in 100 (right: 45, left: 55) dried clavicles, obtained from the Discipline of Clinical Anatomy, University of KwaZulu-Natal. Measurements were conducted by use of a Vernier calliper and angles of curvature were measured using a protractor. The mean maximum length, linear length, midpoint, and maximum breadth of the acromial ends were greater in the right clavicles than the left, with no statistical significance (P =0.631, 0.618, 0.7897 and 0.51, respectively). In both right and left clavicles, the average medial angle of curvature was 152°. The average lateral angle of curvature was larger on left (149°) than on the right (148°). The nutrient foramen was predominantly found on the posterior surface (50.55%) and in the middle ⅓ (71.43%) of the shaft. When considering intramedullary nailing techniques, it is critical to recognise anatomical variations in length, breadth of the ends, and curvature of the clavicle. Recognising topographical variations of clavicular nutrient foramina is imperative for the preservation of arterial supply to prevent iatrogenic complications during surgical procedures.



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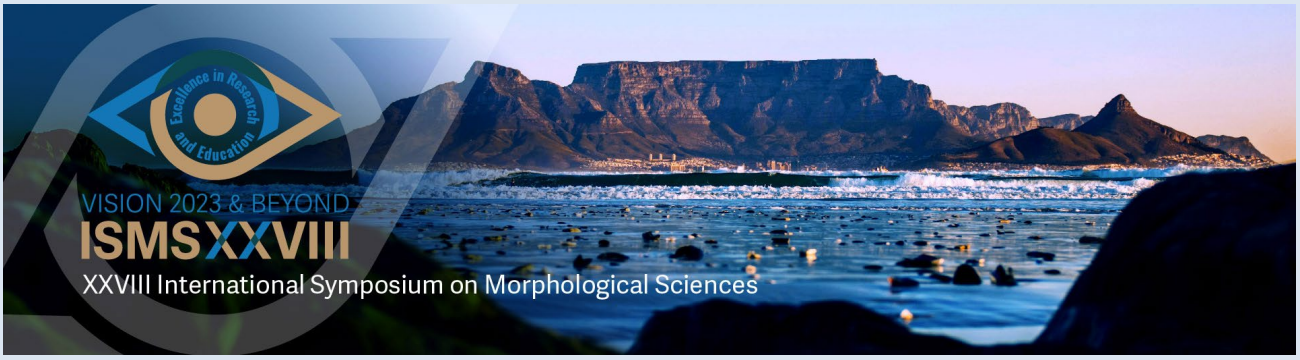
Resveratrol on expression of microglial cells and astrocytes in frontal cortex, hippocampus and dentate gyrus

Dr Yelluru Rao[1], Prof Bolumbu Ganaraja[2], **Dr B.V. Murlimanju[1]**, Dr Pooja Suresh[3], Dr Teresa Joy[4], Prof Sheetal Ullal[5], Prof Poornima Manjrekar[6], Dr Bolumbu Sharma[7]

[1]1Department of Anatomy, Kasturba Medical College, Mangalore, Manipal Academy of Higher Education, Manipal, Karnataka, Bejai, India, [2]2Department of Physiology, Kasturba Medical College, Mangalore, Manipal Academy of Higher Education, Manipal, Karnataka, Bejai, India, [3]3Department of Pathology, Kasturba Medical College, Mangalore, Manipal Academy of Higher Education, Manipal, Karnataka, India, [4]4Department of Anatomy, College of Medicine, American University of Antigua, Coolidge, Antigua, West Indies, Antigua, [5]5Department of Pharmacology, Kasturba Medical College, Mangalore, Manipal Academy of Higher Education, Manipal, Karnataka, India, [6]6Department of Biochemistry, Kasturba Medical College, Mangalore, Manipal Academy of Higher Education, Manipal, Karnataka, India, [7]7Countess of Chester NHS Hospital, Department of Orthopaedics, Chester, Cheshire, CH2 1UL, United Kingdom

The objective of this study was to evaluate the effect of resveratrol and a combination of resveratrol and donepezil on the numerical expression of microglial cells and astrocytes. This was studied in the frontal cortex, hippocampus, and dentate gyrus of colchicine-induced Alzheimer's disease model albino Wistar rats. Three months old male albino Wistar rats, which were bred in-house, and weighing 220-250g were used. The experiment consisted of six groups, with six animals in each group. The immunohistochemical study was done in all the groups. Nikon trinocular microscope was used for screening, and the imaging software. Immunohistochemical staining for glial fibrillary acidic protein was carried out to identify the astrocytes. Alzheimer's disease group has shown increased microglia when compared to all treatment groups with statistical significance ($p<0.001$). When compared to the resveratrol 10 group, resveratrol 20, resveratrol 10/10, and donepezil+resveratrol groups have shown a significant decrease in the microglia ($p<0.001$). Alzheimer's disease group has shown decreased astrocytes than resveratrol 10, resveratrol 20, and donepezil+resveratrol groups with statistical significance ($p<0.05$). In response to the inflammatory conditions of Alzheimer's disease, there was activation of microglia in the frontal cortex and different regions of the brain. The neurodegeneration produced by oxidative stress has induced the production of reactive astrocytes in the brain. However, resveratrol reduced the microglial activation by suppressing the pro-inflammatory mediators, and it also promoted the activated astrocytes to clear the microglia. The combination therapy of donepezil and resveratrol was more beneficial, which indicates the synergistic effect of these two drugs.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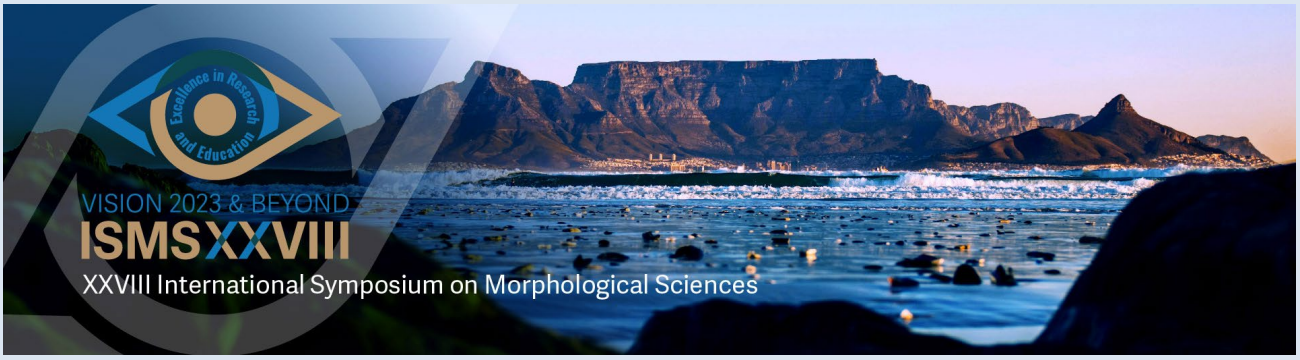

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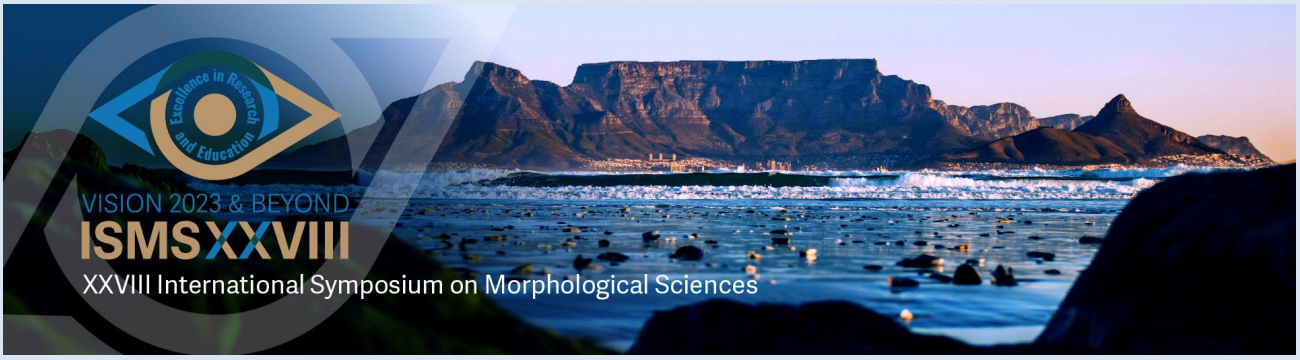
Histochemical properties of the iliocapsularis muscle: Are there implications for hip function?

Ms Kerryn-Anne Mac Dermott[1,2], Ms Kerri Keet[1], Prof Tertius Abraham Kohn[2]

[1]Division of Clinical Anatomy, Department of Biomedical Sciences, Faculty of Medicine and Health Sciences, Stellenbosch University, South Africa, [2]Department of Medical Biosciences, Faculty of Natural Science, University of the Western Cape, South Africa

The iliocapsularis muscle is an important landmark in anterior approaches to hip arthroplasty. Researchers have proposed that its function is to stabilise the anterior hip joint and limit impingement of the hip capsule in hip flexion. This study aimed to determine the skeletal muscle properties of iliocapsularis and to compare these to that of iliacus and vastus lateralis. Muscle samples from 11 recently deceased unembalmed bodies (83±9 years) were harvested and analysed for muscle fibre type distribution, fibre cross-sectional area (CSA), and relative mitochondrial density (ethical approval S21/04/058 and BM21/7/8). Iliocapsularis had predominantly type I fibres (63±12%), followed by type IIA (32±13%) and IIX (5±3%) fibres. Iliacus had a similar type I (61±8%), IIA (31±7%), and IIX (8±8%) fibre distribution. Vastus lateralis had equal amounts of type I (47±12%) and IIA (40±11%) fibres, and fewer type IIX (13±10%) fibres. Iliocapsularis and iliacus observed higher relative mitochondrial density than vastus lateralis. Iliocapsularis had larger type I fibres (3607±1422 µm²) than type IIA (1849±1306 µm²) and IIX (1379±900 µm²) fibres. Iliacus and vastus lateralis also had larger type I fibres (3320±1182 µm² and 4235±882 µm², respectively) than type IIA (1790±987 µm² and 2738±1650 µm², respectively) and IIX (1428±769 µm² and 2170±1355 µm², respectively) fibres. No previous study has examined the iliocapsularis on a muscle fibre level to assist with describing its implications for hip function. The predominant oxidative type I fibre distribution of iliocapsularis supports the proposed function. Conclusive knowledge of its function allows for more informed decisions regarding patient rehabilitation following anterior approaches for hip arthroplasty.



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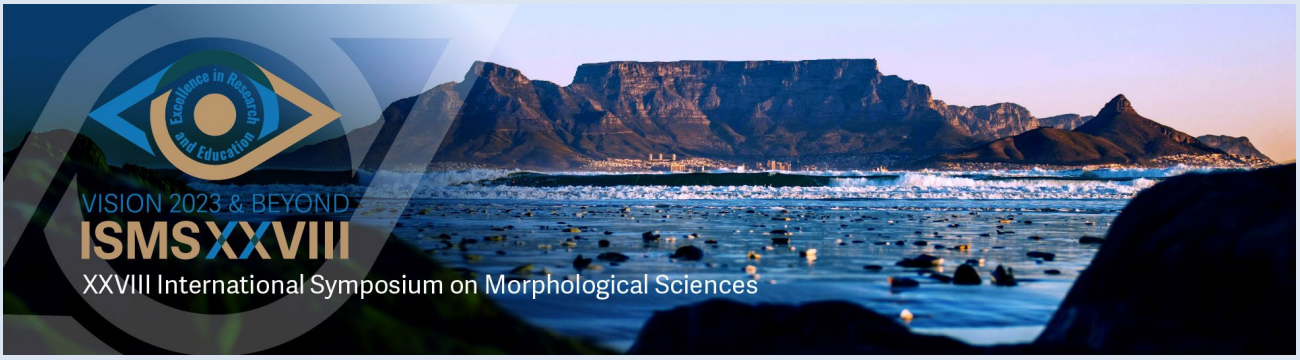
Morphological and morphometric analysis of the distal humerus

Ms Angel Cele[1], Ms Vensuya Bisetty[1], Prof Lelika Lazarus[1]
[1]*University of KwaZulu-Natal, Westville, South Africa*

The humerus is identified as one of the bones less likely to be severely damaged and is considered favourable for sex estimation. This study aimed to analyse and compare the morphology and morphometry of the distal humerus in a Black South African population. The distal ends of 140 dry humeri were obtained and examined from the Department of Clinical Anatomy at the University of KwaZulu-Natal. The distal ends were examined and four morphological features were documented, viz. (i) olecranon fossa shape, (ii) angle of the medial epicondyle, (iii) trochlear extension, and (iv) the presence of a supratrochlear foramen. Two morphometric parameters: (i) breadth of the epicondyle and (ii) width of the trochlea were measured, using a digital vernier calliper. This study showed variation in the morphological features between males and females. Males presented with a triangular-shaped olecranon fossa, flat medial epicondylar angle, an asymmetrical trochlear extension, and lower occurrence of the supratrochlear foramen. Females presented with an oval-shaped olecranon fossa, raised medial epicondylar angle, symmetrical trochlear extension, and higher occurrence of the supratrochlear foramen. The average epicondylar breadth was 61,8 mm and 54,8 mm in males and females, respectively. The average trochlear width was 18,8 mm and 16,8 mm in males and females, respectively. In conclusion, this study found significant differences between the male and female humeri morphological features. These findings may be used in sex estimation methods for the Black South African population. (BREC/00002991/2021)



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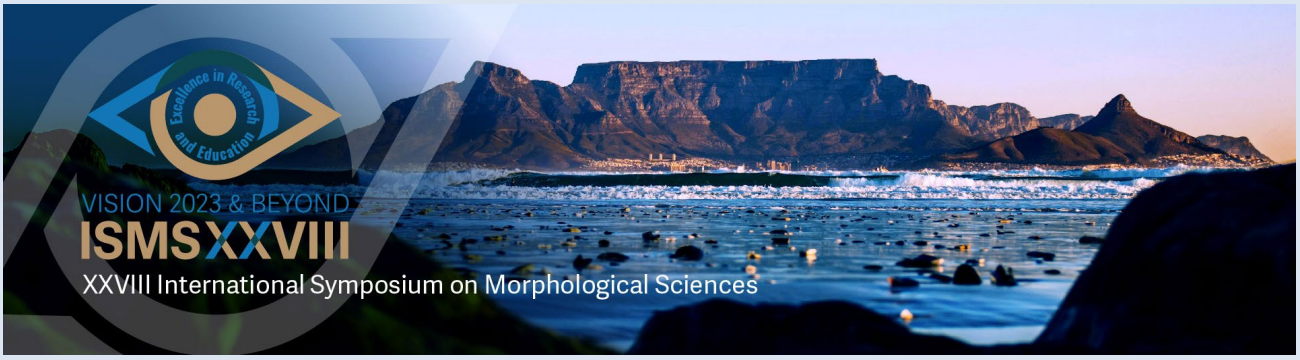
Assessing the long-term effects of burial on domestic pig remains in the South African Highveld

Ms Claudia Landsman[1], Prof Jolandie Myburgh[2], Dr Anja Meyer[1]
[1]*School of Anatomical Sciences, Faculty of Health Sciences, University of the Witwatersrand, Parktown, South Africa,*
[2]*Department of Anatomy, Faculty of Health Sciences, University of Pretoria, Hatfield, South Africa*

Forensic taphonomy has become an integral part of understanding the post-mortem fate of human and/or analogue remains in various contexts. Burial environments, like other methods of body disposal, expose remains to unique conditions that have been shown to result in specific decomposition rates, taphonomic alterations and changes to the immediate environment. This study examined taphonomic alterations in a long-term burial environment to understand the interrelated relationships between soil composition, burial environment and dry bone taphonomy. The study comprised 39 Sus scrofa domesticus carcasses buried in shallow graves on the Miertjie le Roux experimental farm, Gauteng, for a period of six years. Results indicated the presence of six taphonomical alterations including differential depositional soil staining, adipocere formation, bone weathering, acidic soil corrosion, plant activity and animal activity. Interesting findings include differential staining of the left and right sides, attributed to the cadaver decomposition island. The presence of adipocere was associated with increased overall preservation and completeness of remains, darker depositional staining, soils with higher organic content, and subsurface grass species that typically prefer wetter soils. This suggested that some graves were waterlogged, therefore, promoting adipocere formation. Soil analyses indicated that the presence of the carcass generally lowered the pH of the burial environment. Differences in soil acidity observed between graves indicated that a more basic pH promoted adipocere formation and increased skeletal preservation. This study has shown how differences between graves located in the same immediate area can lead to different taphonomic effects, illustrating the need to understand individual burial micro-environments.



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Breast hypertrophy: Psycho-social well-being of patients before and after breast reduction surgery

Ms Nokubonga Khwela[1], Prof Lelika Lazarus[1], Prof Anil Madaree[1]

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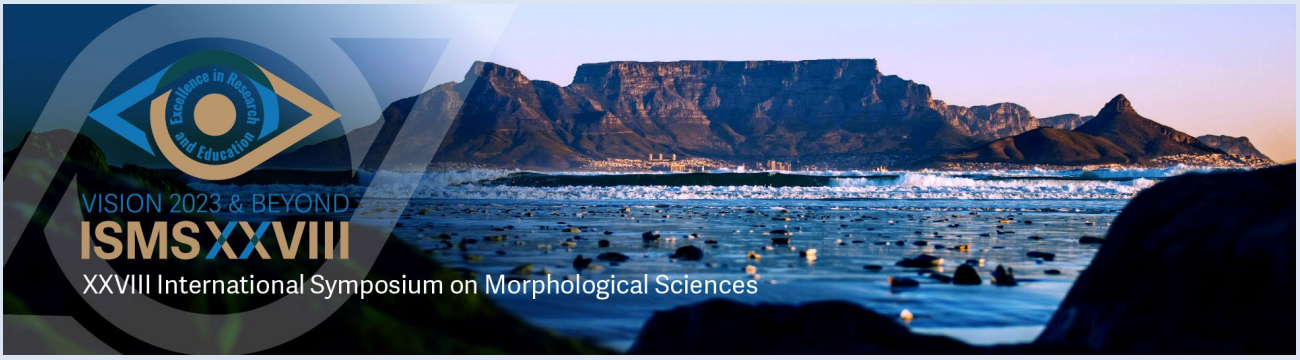
Breast hypertrophy is an uncommon disorder wherein breast tissue grows excessively, leading to the development of large breasts. It is a frequent condition among women worldwide which can affect different aspects of their lives, including their psycho-social well-being. Breast reduction is one of the commonly used methods in treating breast hypertrophy. The purpose of this study was to investigate the psychosocial well-being in patients before and after having breast reduction surgery. Two questionnaires (pre-operative and post-operative) were prepared and distributed to patients undergoing breast reduction surgery. Questionnaires were formulated to investigate the psychosocial effects of having breast hypertrophy. Patients were recruited on their adMsion day for the surgery (the day before the surgery). A total of 18 patients were registered for this study. 34% of the patients expressed a very low self-esteem, 28% stated that they were not confident about themselves, and 34% were uncomfortable with their bodies before the surgery. 39% of patients expressed that they were very unhappy with the negative comments they received from people, and 34% said they were not pyscho-socially affected by breast hypertrophy. 56% of patients stated that their self-esteem improved and 78% noted an increase in their self-confidence after the surgery. 56% of patients were now comfortable with their bodies after the surgery. The study shows that breast reduction has a positive effect on the psycho-social well-being of patients, as revealed by their responses after surgery, namely improved self-esteem, self-confidence and comfortability with their body.



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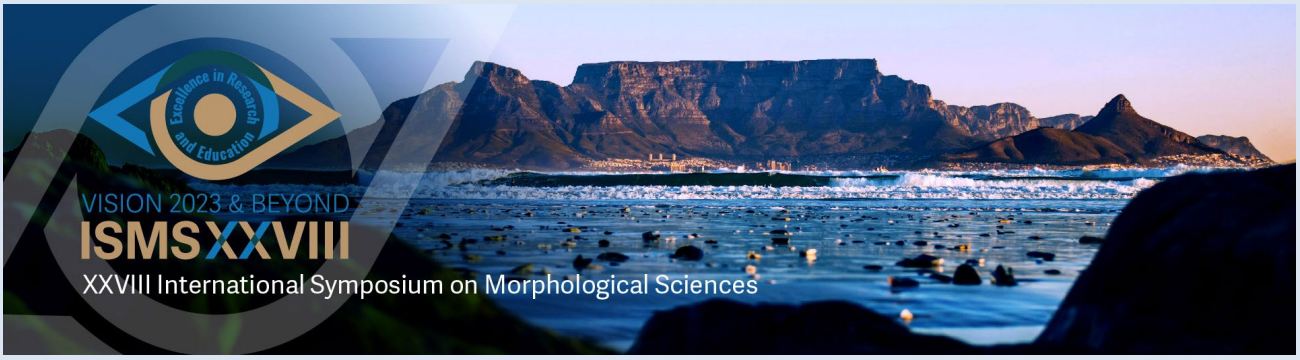
Movements and morphological characteristics of the sacroiliac joint

Prof Dai-Soon Kwak[1], Ms Seon Jin Shin[1], Dr Anna Jeon[1]
[1]*The Catholic University of Korea, South Korea*

Many studies conclude that the sacro-iliac joint (SIJ) allows for limited movement. However, some of the studies using spinopelvic parameters mention high pelvic incidence (PI) change. Moreover, with the development of imaging techniques such as EOS system and vertical CT / MR, interest in sacro-iliac joint movement and sagittal balance is increasing. Therefore, in this study, the movements of the sacro-iliac joint were investigated. We compared the morphological parameters of the sacro-iliac joint between groups with small and with larger movements. We used 38 fresh cadavers (male 18, female 20). The mean age was 84.25 (81~92) years, and the mean height was 155.47 (142~161) cm. The changes in angle between the sacrum and hip bone were measured in the sitting and prone positions. Six optical markers were fixed on the surface of the bone directly, and five motion tracking cameras were used. After measuring the SIJ movement angle when weight bearing, the group with small movement and large movement were classified, and the difference in joint surface shape between the groups was determined. Based on the SIJ movement angle of 2 degrees, they were classified into the two groups. In the group with small movement, the representation of males was much higher, namely 14 males and 5 females, and in the group with large movement, the representation of females was considerably higher at 4 males and 15 females. There was no statistical difference in the articular surface shape of the SIJ between the two groups.



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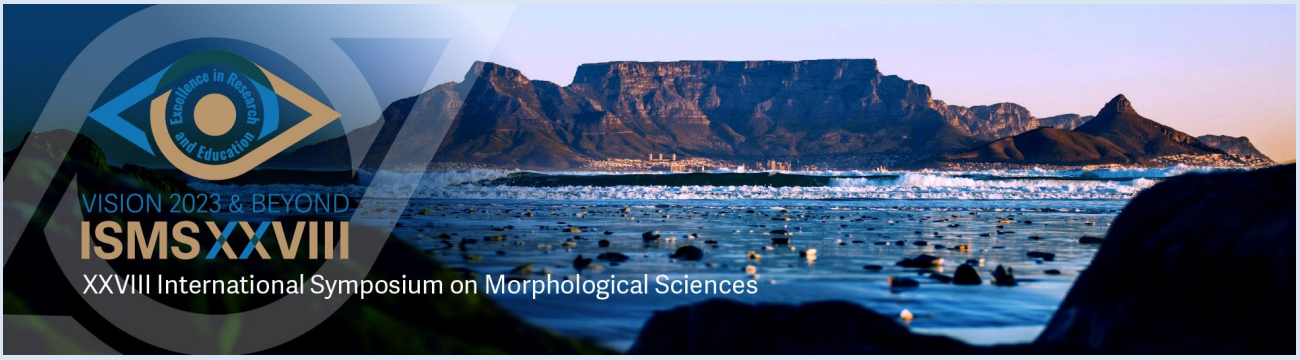
Evaluation of the Acsádi-Nemeskéri Complex Method for adult ageing on a Black South African sample

Ms Amanda Valeria Mokoena[1], Dr A Meyer[1]

[1]*School of Anatomical Sciences, Faculty of Health Sciences, University of the Witwatersrand, South Africa*

Age estimation techniques that make use of multiple traits have been recommended to account for population variability and to adjust for the inherent bias that may be found when using single skeletal indicators. The Acsádi and Nemeskéri Complex Method is a multifactorial method that utilises four skeletal indicators and a weighting system to assess age. It makes use of the pubic symphysis, endocranial sutures, and internal structural changes in the proximal femur and humerus (observable through radiographs). Acsádi and Nemeskéri (1970) reported an error margin of ±2.5 years when using all four indicators. Despite this, the method has been criticised for its small sample size, the statistical validity of the averaging procedure, and its constant under- and overestimation of age for older and younger individuals, respectively. This study aimed to test the Complex Method's performance on a black South African sample (n = 103) with individuals of known ages-at-death. Blind analysis using phase descriptions of each skeletal indicator was used to estimate age. The results indicated that the Complex Method overestimated the age of younger individuals (25 years for females; 24 years for males) and underestimated the age of older individuals (23 years for females; 26 years for males). Only 10.7% of the individuals from the pooled sexes, namely 9.3% of the males and 12.2% of the females, fell within ±2.5 years of the true age when using all four skeletal indicators. Given the method's poor performance, revised population- and sex-specific standards need to be developed before any further use in this sample.



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Variation in the shape of the pelvic inlet of a South African female sample

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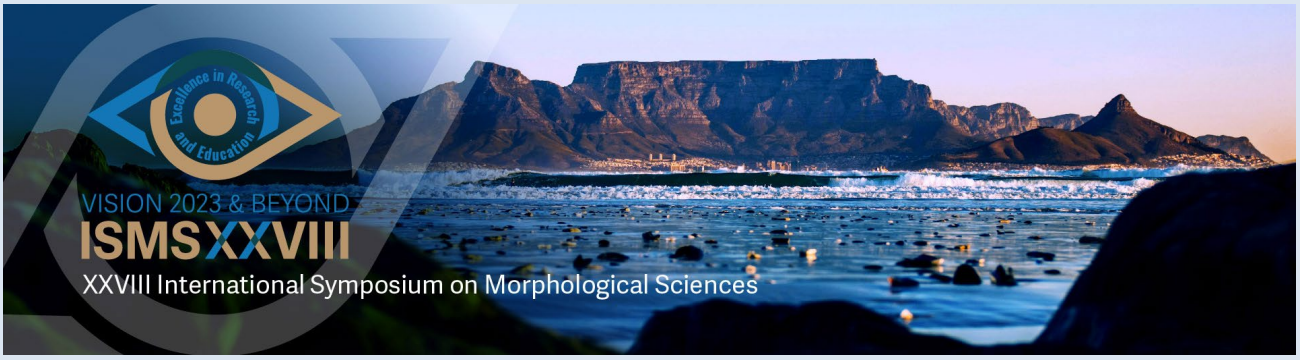
As the pelvic inlet is the entrance to the birth canal, its shape can affect vaginal delivery. Four shapes have been established: gynaecoid, platypelloid, android and anthropoid. These shapes determine whether the mother is suitable for childbirth or if alternative procedures should be planned. A typical rounder female inlet is gynaecoid, which is considered the most suitable for accommodating the fetal head during childbirth. The dimensions of the anteroposterior and transverse diameters of the gynaecoid pelvic inlet shape transect each other approximately halfway. Although it is known that pelvic inlet shapes vary amongst populations, literature on South African populations is limited. This study aimed to record the dimensions and classify the pelvic inlet of modern South African females using computed tomography (CT) scans. The methodology involved the use of sixty archived CT scans of South African females (18-65 years of age) which were obtained from the records of the Radiology Department at Steve Biko Academic Hospital. Landmarks were placed on bony structures of the pelvis using MeVisLab © v.3.0.2 and recorded as 3D coordinates and Euclidean distances calculated for inlet shape calculations. The result revealed that gynaecoid was the most prevalent, followed by anthropoid, android then platypelloid. Geometric morphometric analysis indicated that a significant difference in shape exists, yet some overlap was also found. In conclusion, the four pelvic inlet shapes do exist in South African females, and they are most likely adapted for natural childbirth, as the most prevalent gynaecoid inlet is the shape that favours vaginal delivery.
Ethical clearance no: (SMUREC/M/125/2022)



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“Our mind is our sanctuary”: Impact of Covid-19 pandemic on the mental health of students

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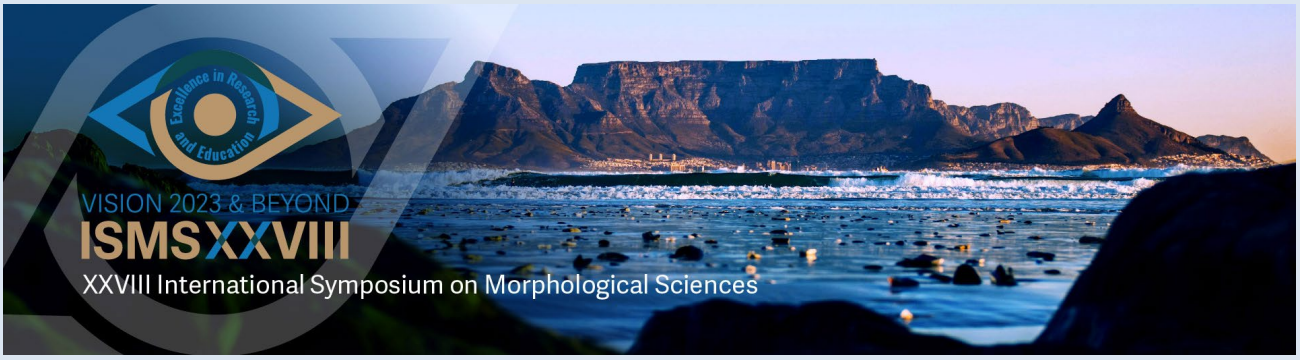
[2]*Department of Basic Medical Science, Faculty of Health Sciences, Durban University of Technology, Durban, South Africa*

The Covid-19 pandemic disrupted Health Science and Medical Education in universities nationally, resulting in an increase of depression, anxiety and obsessive-compulsive disorders amongst students. Hence, this study aimed to determine the impact of the pandemic on the mental health of pre-selected Health Science and Medical students.
The methodology involved one questionnaire comprising demographic information, Covid-19 related questions, and a Depression, Anxiety, and Stress Scale (DASS-21) which was distributed to 846 third-year Health Science and Medical students at the University of KwaZulu-Natal and the Durban University of Technology.
The findings were as follows: The total response rate was 6.7% (57/846). Of the total response rate, 16% were diagnosed with a psychiatric disorder and 35.7% stated that they received no financial assistance for their academic studies. Additionally, students were concerned that the pandemic would hinder their theoretical knowledge (42.9%), practical/clinical skills (53.6%), and affect future prospects in their medical careers (48.2%). Findings from the DASS-21 suggest that students experienced excessive nervous energy (39.3%), had difficulty relaxing (21.4%), displayed very little enthusiasm (48.2%), experienced unvalidated fearful feelings (23.2%), and felt that life was meaningless (17.9%).
The significance is that the preliminary data from this study has the potential to inform medical educators and campus healthcare officials on additional strategies to support the mental health of students, post-pandemic, and in future pandemics, thus assisting in decreasing the rise of mental health disorders amongst students. Furthermore, support can be provided in reducing student's fears regarding professional skills thereby alleviating such stressors.

Provisional ethical approval number: HSSREC/00003014/2021.



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Adult hippocampal neurogenesis in various species of birds and its functional implications

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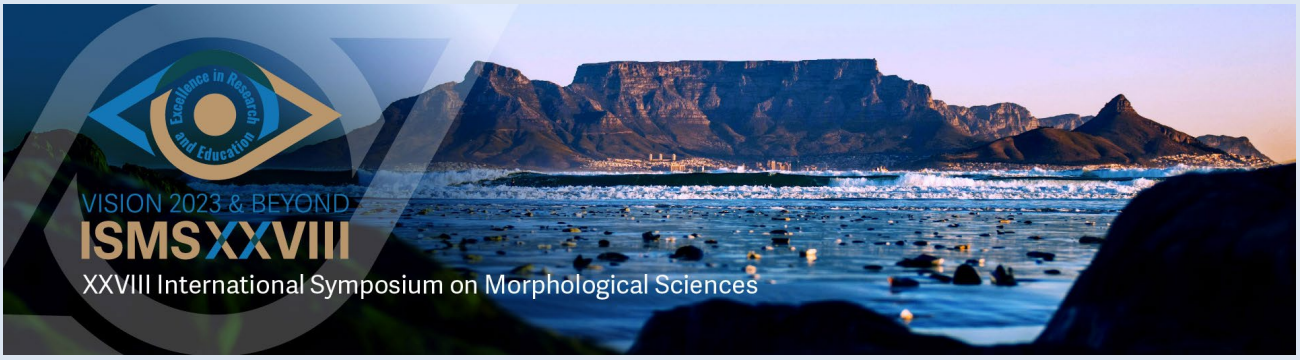
To compare the distribution of immature neurons in the hippocampus and area parahippocampalis in birds from various orders using doublecortin immunochemistry. The current study utilised two brains of each of the emu, ostrich, grey parrot, pied crow and racing homer pigeon. The brains were serially sectioned in coronal plane and the free-floating sections were stained using doublecortin immunohistochemistry. Doublecortin is a marker for immature and migrating neurons. The hippocampus and the area hippocampalis regions were mapped and qualitatively assessed for the presence of the doublecortin antibody. The emu and ostrich brains showed a moderate density of doublecortin immunoreactivity in the ventral and dorsal hippocampus and the area hippocampalis. The triangular layer of the ventral hippocampus in the ostrich showed a high density of doublecortin positive cells. The grey parrots exhibited a moderate density of doublecortin in the dorsal hippocampus, area hippocampalis and ventral hippocampus particularly in the triangular and lateral layers but low density in the medial layer. In the pied crow, the dorsal hippocampus and area parahippocampalis exhibited low densities of doublecortin positive cells, but the ventral hippocampus showed moderate density especially in the triangular and lateral layers. The racing homer pigeon, its ventral hippocampus had a moderate density of doublecortin positive cells in the triangular and lateral layers but very low density in the medial layer. The dorsal hippocampus and area parahippocampalis regions however, showed a high density of doublecortin positive cells. All species examined showed active neurogenesis in the hippocampus and area hippocampalis regions. These brain regions are involved in learning and memory which is important in cognition and environmental adaptation, particularly during foraging and homing.



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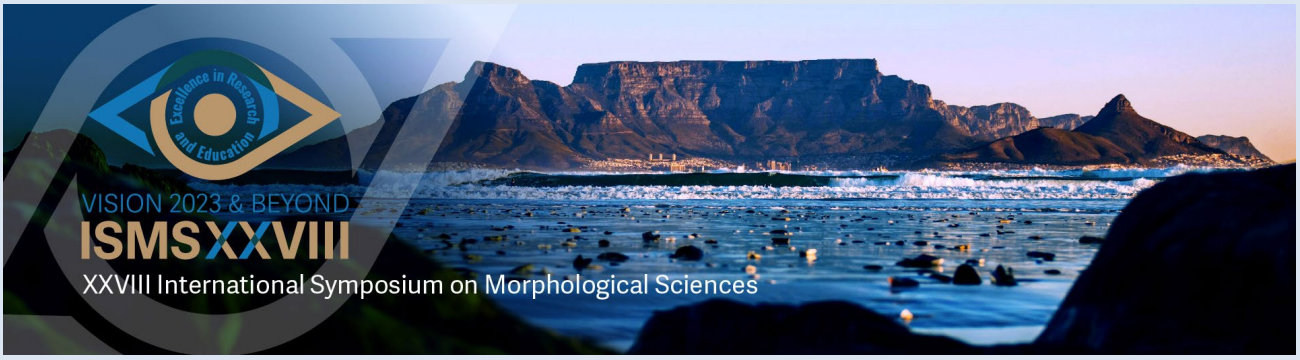
Entheseal changes as markers of physical activity in southern African hunter-gatherer/herders from the Holocene

Dr Elizabeth Dinkele[1], Assoc Prof Victoria Gibbon[1]
[1]*University Of Cape Town, South Africa*

Variations in fibrocartilaginous entheses on human skeletal remains can be assessed as markers of physical activity. Spatial and temporal variations in activity markers can provide insight into ways that environmental conditions, social organisation and material culture shaped lifeways in past populations. The aim of this study was to determine whether activity markers reflect variations in spatial ecologies, and/or lifeways in southern African hunter-gatherer/herders from the Later Stone Age. The Coimbra method was used to assess fibrocartilaginous entheses in the humerus, ulna and radius. Descriptive statistics and negative binomial regression analyses were computed to evaluate the associations between sex, age, ecological biomes and temporality (relative to the infiltration of pastoralism at 2000BP). Our sample comprised 118 individuals (males=67; females=42), most representative of the fynbos (59/118), forest (30/118) and succulent karoo (16/118) biomes. Ecological biomes were widely associated with activity markers in the upper limb, however, no significant associations were identified by sex or temporality relative to 2000BP. Individuals from the forest biome region had more prominent entheseal changes in the supinator (p=0.04), biceps brachii (p=0.0004), triceps brachii (p=0.03), brachioradialis (p=0.01) and brachialis (p=0.001) muscles than individuals from the fynbos biome. The complex pattern of physical activity in hunter-gatherers/herders suggests that entheses reflect ecological variations in resource search and handling in southern Africa during the Later Stone Age. This study provides intriguing evidence of the central role that regional ecology played in driving activity patterns regardless of social or cultural organisation during the Later Stone Age.



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Perforated gastric ulcer masquerading as myocardial infarction- an anatomical case report, observed in a cadaver

Prof Latha Prabhu[1], Prof Prakash Shetty[2], **Prof Rajanigandha Vadgaonkar[1]**, Dr B.V. Murlimanju[1]
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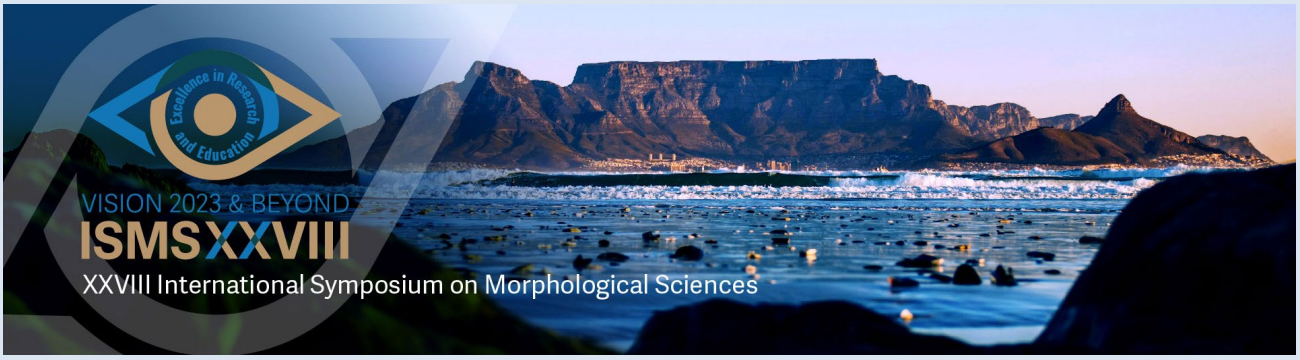
Case report: During routine cadaveric dissection, it was observed that there was a large blood clot inside the lumen of stomach. After removing this blood clot, it was found that there was an ulcer located on the posterior wall of the stomach, which had eroded the left gastric artery. This suggested that the patient died because of haemorrhagic shock. The medical records of this cadaver were procured and revealed that a male patient aged 60 years was admitted to the hospital with a history of chest discomfort, and this patient expired in spite of the best suitable treatment. The cause of death was reported as myocardial infarction and congestive cardiac failure. Later, his body was donated to the anatomy department for teaching purposes. However, we were then able to suggest that this was a case of perforated gastric ulcer, which was misdiagnosed as myocardial infarction at the hospital. The hypothesis for the incorrect diagnosis was the elderly age, male gender, heart burn and sudden death, which misled the treating physicians. This case study was approved for the presentation of the findings by our institutional ethics committee (IECKMCMLR-03/2023/101)



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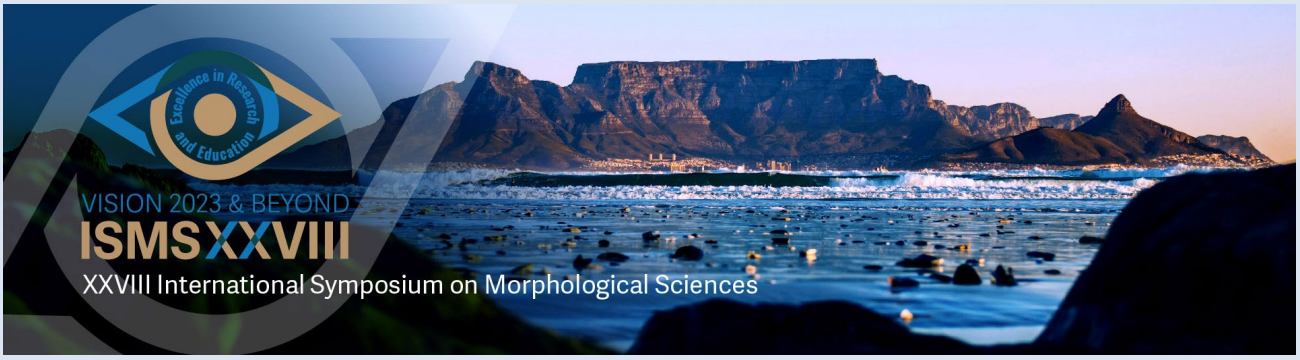
The effectiveness of online assessments according to students and lecturers at a Gauteng medical school

Ms Soné Van Der Walt[1], Dr Adéle du Plessis[2]
[1]*Sefako Makgatho Health Sciences University, South Africa,* [2]*University of Namibia, Namibia*

Due to the Covid-19 pandemic, contact invigilated assessments were suspended and emergency remote teaching and learning followed. Although a blended learning strategy has been adopted, is it unknown how effective non-invigilated online assessments, conducted on Blackboard (Learning management system), accompanied by a lock down browser is and whether it should be pursued. The study aimed to determine the effectiveness of online Anatomy assessments as perceived by medical students and Anatomy lecturers at the Sefako Makgatho Health Sciences University. A Google Forms based survey with qualitative (open ended) and quantitative (multiple choice and Likert scale) questions was distributed via Blackboard. The survey consisted of three sections: A) Socio-demographics; B) Questions aimed at determining the effectiveness of online assessments for academics and C) for students. The students had a 18.8% response rate and academics 70%. Students' knowledge could not be tested effectively according to 57.1% of academics (CI [18.4- 90.1]). Feedback followed 57.1% of assessments, although only perceived as successful by 42.9% (CI [6.2- 7.95]). The responses of the students mimicked the lecturers, as only 48.1% (CI [34.3-62.2]) felt that their knowledge was adequately tested, and 68.5% of students (CI [54.5-80.5]) noted that all components could not be tested effectively by using online assessment methods only. Technical difficulties, including data availability, connectivity and load shedding, negatively influenced the delivery of online assessments and usefulness of the lockdown browser. We conclude that online assessments could not replace invigilated assessments but could have a role as an adjunctive method of assessment.



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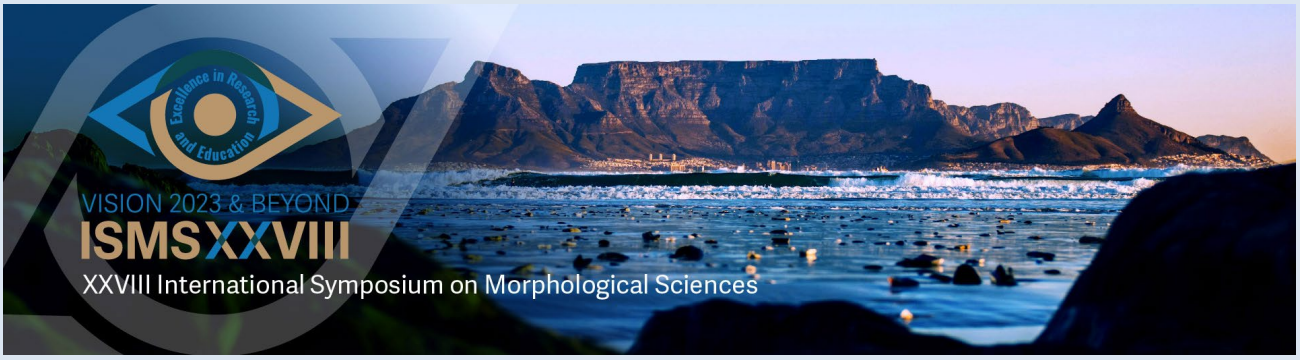
An assessment of electrical deaths in Cape Town Western Metropole from 2011 to 2020

Ms Ansuya Chetty[1], Mr Calvin Gerald Mole[1]
[1]University of Cape Town, Observatory, South Africa, [2]University of Cape Town, Observatory, South Africa

Electrical injury is a significant cause of morbidity and mortality worldwide. When an individual comes into contact with an electrical current, the resulting injury can range from minor burns to cardiac arrest and death. Electrical deaths are particularly concerning due to their sudden and unexpected nature. This study aimed to determine the prevalence and patterns of electrical death in the Western Metropole of the City of Cape Town. Post-mortem reports from Salt River Mortuary were retrospectively reviewed from 1st January, 2011 to 31st December, 2020. A total of 96 cases during the period were associated with electrical death. Of these cases, external electrical injury was seen in 97% of the cases (n = 93). A total of 282 burns were recorded in the cases reviewed. This is attributed to multiple burns being present on a single body in many cases. Electrical deaths were seen in males in 78% of these cases (n = 75). The majority of the fatalities (76%) were observed in people aged 35 years and below (n=73). Electrical injury was primarily seen in the extremities of the bodies and mostly seen in young males. Ultimately, a better understanding of electrical injury can help to improve prevention and management strategies, leading to better outcomes for those affected by this devastating type of injury.



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Anatomical variations of the anterior communicating artery complex in a South African sample

Ms Mbalentle Madolo[1], Dr Kentse Mpolokeng[1], Assoc Prof Geney Gunston[1]
[1]*University of Cape Town, Rondebosch, South Africa*

The anterior communicating artery complex (ACAC) consists of the A1 and A2 segments of the anterior cerebral artery (ACA) and the anterior communicating artery (ACoA). The ACAC is said to be the most frequent site of aneurysms and anterior cerebral circulation variations. Clear correlation between cerebral arterial circulation variations and aneurysm development has been reported. Cerebrovascular diseases play a significant role in the causes of morbidity in South Africa. South African data in this area is currently lacking and thus more knowledge is needed. This study aimed to report the prevalence of variations in the anterior communicating artery complex. A total of 29 (17 female and 12 male) formalin fixed brains were included in this study. These brains were from the bodies that were previously dissected in the Department of Human Biology, University of Cape Town by the medical undergraduate and honours post-graduate students. The occurrence of variations was significant, 10.3% to 13,8% of the brains presented with variations on either the left, right or both sides of the A1 and A2 segment of the ACA, respectively. Additionally, variations in the ACoA were the most frequent (44,8%). Of the 11 types of variations found, fenestration was the most common type of variation in the A1 and A2 segment of the ACA. For the ACoA, X-shaped and fenestration were the most common variations. Understanding ACAC anatomy and variations is vital to clinicians and neurosurgeons for the diagnosis of cerebral conditions and could advance the efficacy of interventional procedures.

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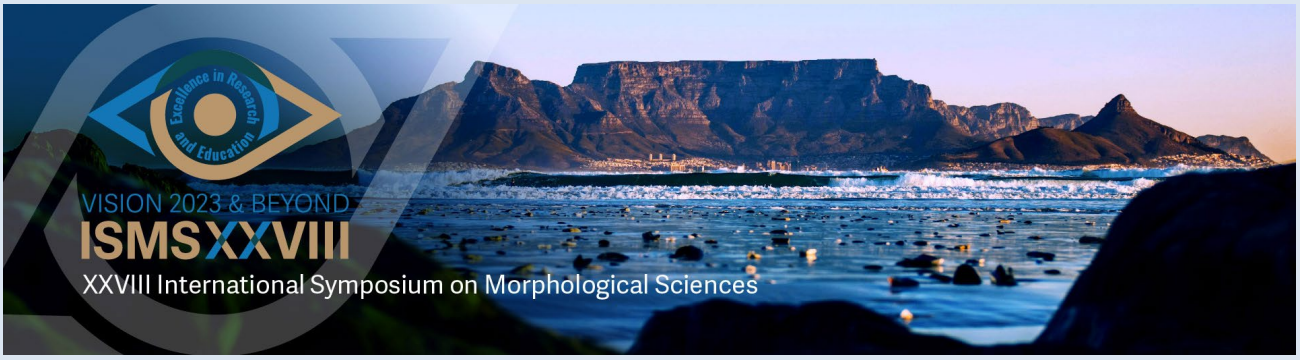

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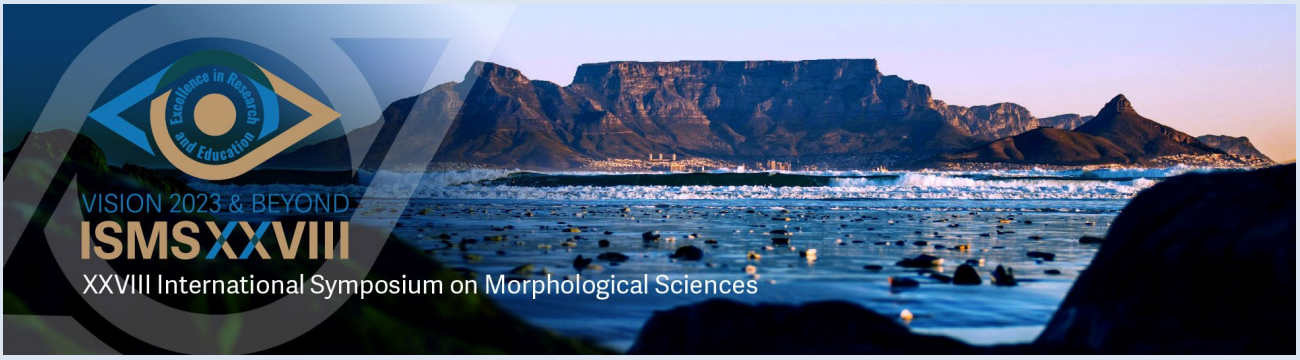
The use of structure-from-motion and mesh-to-mesh value comparison in dealing with commingled fragmentary remains

Ms Kamini Pillay[1], Mr Renier Hendrik van der Merwe[1], Dr Anja Meyer[1]
[1]*University of the Witwatersrand, Parktown, South Africa*

Pair-matching of osteological elements is one of the most common methods currently used to sort commingled human remains. However, this method tends to be subjective, relying on the experience of the Forensic Anthropologist. Thus, developing more objective and scientifically testable methods is necessary while expanding the field of Forensic Anthropology. This study tested the effectiveness of using three-dimensional surface renderings of bone, and the subsequent comparison of mesh-to-mesh values, as a more objective and repeatable method for pair-matching fragmented commingled human remains. Three-dimensional rendered models of paired fragmented humeri and femora were created and sliced using Agisoft Metashape. The fragments were tested against two different software, Viewbox 4.1 and Meshlab, and two different analytical methods, namely Lowest Common Value (LCV) mesh-to-mesh and Receiver Operating Characteristics (ROC) curve analysis.

For the results generated with Viewbox, the distal mesh fragment performed best for the femur and the humerus, with 100 % sensitivity for both analytical methods and greater than 95% specificity with the ROC curve analysis. For the results generated through Meshlab for the femur and the humerus, the shaft mesh fragment performed the best, with sensitivity levels greater than 79 % and specificity levels greater than 49 %. Meshlab generated considerably higher sensitivity and specificity values, which exhibited a larger threshold value compared to Viewbox. In general, the use of Structure-from-Motion and mesh-to-mesh comparison resulted in a high accuracy rate for pair-matching fragmented commingled remains, offering a more objective and repeatable method for pair-matching commingled remains.



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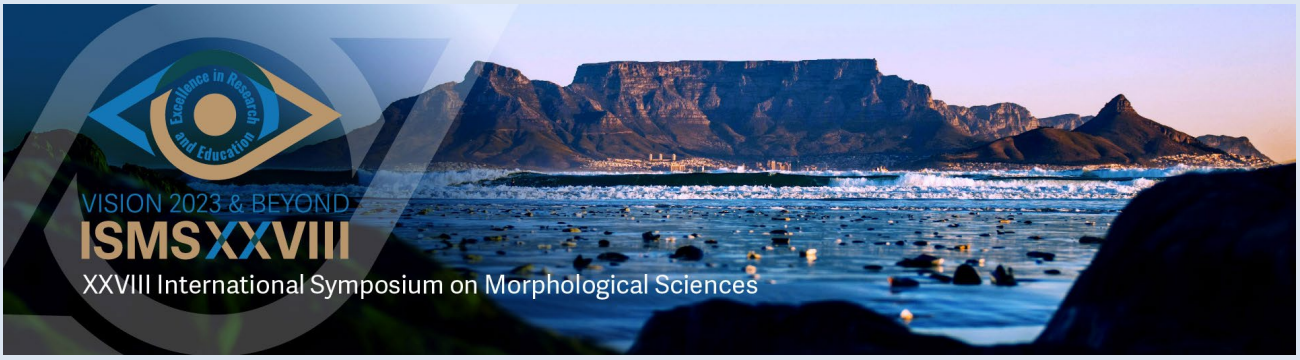
Exploring the application of three-dimensional scanning and printing of human juvenile skeletal remains for teaching

Ms Kamini Pillay[1], Prof Desire Brits[1], Dr Anja Meyer[1]
[1]*University of the Witwatersrand, Parktown, South Africa*

Training in human osteology requires a solid background in skeletal development which necessitates access to juvenile human osteology. Access to juvenile remains is not always possible given their scarcity in most skeletal collections. In addition, the continual use of fragile juvenile remains for teaching poses a threat to the remains. The aim of this study was to explore the effectiveness of three-dimensional (3D) surface scanning and printing of available juvenile remains, housed in the Raymond A Dart Collection of Modern Human Skeletons, University of the Witwatersrand as a potential teaching resource. The study forms part of a larger initiative looking at the use of 3D osteological prints in teaching. Here we report on the results of 3D surface renderings and prints of juvenile skeletons. Five juvenile individuals with ages ranging from 6 months to 12 years were scanned using an Artec Spider scanner and rendered using Artec Studio 11 software. The elements scanned were the long bones, crania, mandibles, and pelvic bones. Rendered scans were converted into stereolithography (stl.) formats and imported into Cura 5.2.2 software for printing with an Ultimaker S5 printer. The prints were created using PLA (Polylactic Acid) as the primary base model, with PVA (Polyvinyl Alcohol) and PLA as the support structures. Overall, this study's 3D surface scanning and printing of juvenile remains proved successful, with long bone lengths, osteological landmarks and epiphyseal fusion being clearly observable. The next step will be to assess the effectiveness of these prints in a teaching environment.



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Validation of the DSP2 software for sex estimation in South African populations

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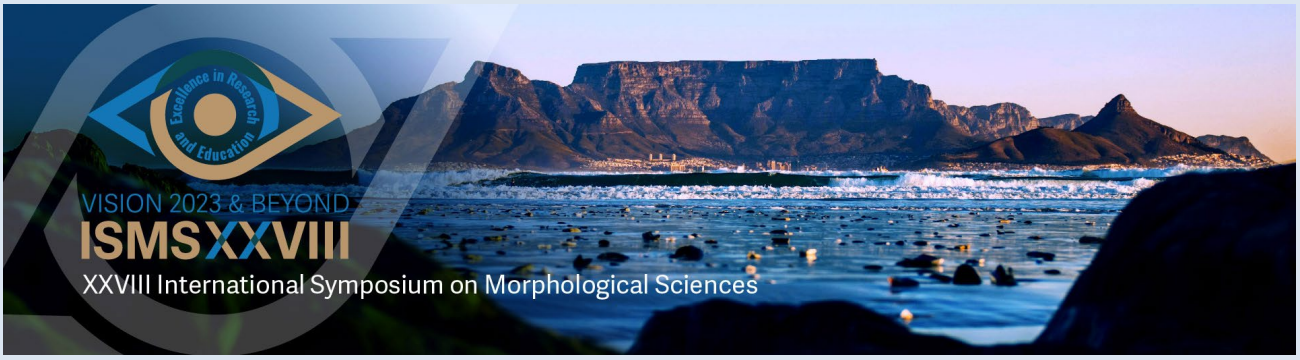
[1]*Human Variation and Identification Research Unit, School of Anatomical Sciences, Faculty of Health Sciences, University of the Witwatersrand, South Africa*

The Diagnose Sexuelle Probabiliste V.2 (DSP2) is a computer software programme used to estimate sex from the os coxae of skeletonised remains, with accuracies as high as 100% having been reported. This study was therefore aimed at assessing the accuracy of the programme when used in South African populations. The sample consisted of 120 left os coxae, housed in the Raymond A. Dart Collection of Modern Human Skeletons, University of the Witwatersrand and represented 60 Black and 60 White South African adults aged between 20-70 years, equally distributed for sex. The 10 measurements described in the DSP2 software programme were collected and tested for sex estimation accuracy and repeatability (Technical Error of Measurement). All measurements were repeatable apart from the cotylo-pubic breadth, depth of the greater sciatic notch, iliac breadth, and vertical acetabular diameter. The DSP2 programme was able to sex 87.5% of the os coxae with an accuracy of 96.2% with males (96.6%) being more accurately sexed than females (95.7%). Black South Africans (98.0%) were also slightly more accurately sexed than White South Africans (94.4%). Although the accuracies reported in this study are lower than those recorded by other studies, the results from this study showed sufficiently high classification accuracies which supports the use of the DSP2 software package for sex estimation in South African populations, once the repeatability of all measurements has been addressed.



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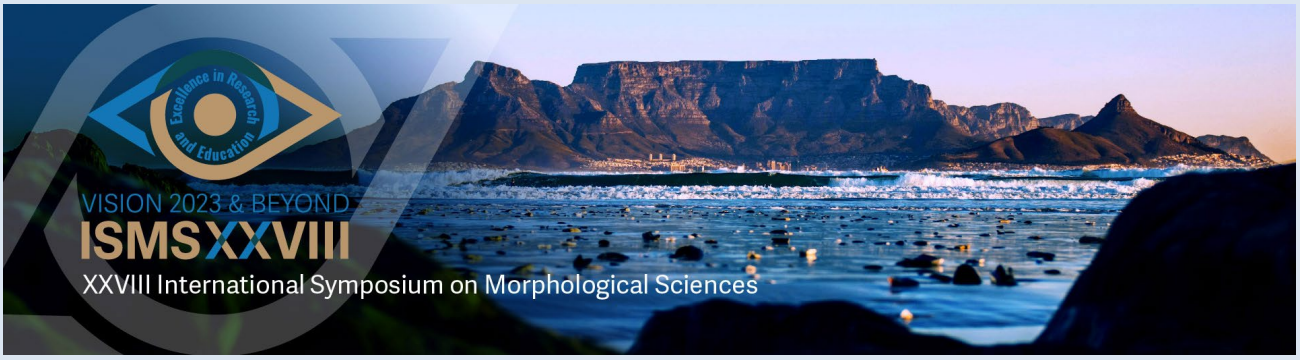
Proteomics profiling reveals network alterations following tumour cell-platelet interaction under hormone-therapy: hypercoagulation mediates survival

Prof Tanya Nadine Augustine[1], S. Buthelezi[2], K Pather[1], S Stoychev[2], Kutlwano Xulu[1]
[1]University of the Witwatersrand, [2]Council for Scientific and Industrial Research, Pretoria, South Africa

Tumour cell haematogenous dissemination is predicated on molecular changes that enhance their capacity for invasion, migration, immune evasion, and preparation of the pre-metastatic niche. It is increasingly evident that platelets play an essential role in this transformation. The systemic nature of the signalling molecules and the extravascular factors that participate in mediating platelet-tumour cell interactions led to the development of an in vitro co-culture model using whole blood and breast tumour cells. This allowed us to decipher the impact of hormone-therapy on breast tumour cells and associated changes in the plasma proteome (Ethical approval: M160826). Using qPCR and ddPCR we documented tumour changes in gene expression associated with EMT and survival. We reaffirmed hormone-therapy-induced platelet activation using SEM, corroborating previous work in which activation was defined with flow cytometry. Using proteomics, we determined tumour cell-mediation of dysregulated proteins in plasma that function in maintaining an invasive phenotype by harnessing the power of the coagulatory system and exploiting extracellular matrices. Results highlight the tumour cell adaptability to both treatment and whole blood resulting in a pro-tumorigenic response and a hypercoagulatory state. We illustrate that the breast cancer cell secretome can be altered by hormone-therapy, but that this is subject to the subphenotype of the cell line, notwithstanding the impact of platelet activation. More sophisticated co-culture systems are required to recapitulate these reciprocal interactions to better understand tumorigenesis. In addition, deeper plasma profiling, using abundant protein depleted and/or vesicle enriched strategies, will likely reveal additional secretory proteins related to tumour cell-platelet interactions.



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Research integrity in a South African health sciences institution

Prof Tanya Nadine Augustine[1], Prof Elena Libhaber[2], Ms Mapule Nhlapo[3], Prof Bjorn Hofmann[4], Prof Beverley Kramer[1]

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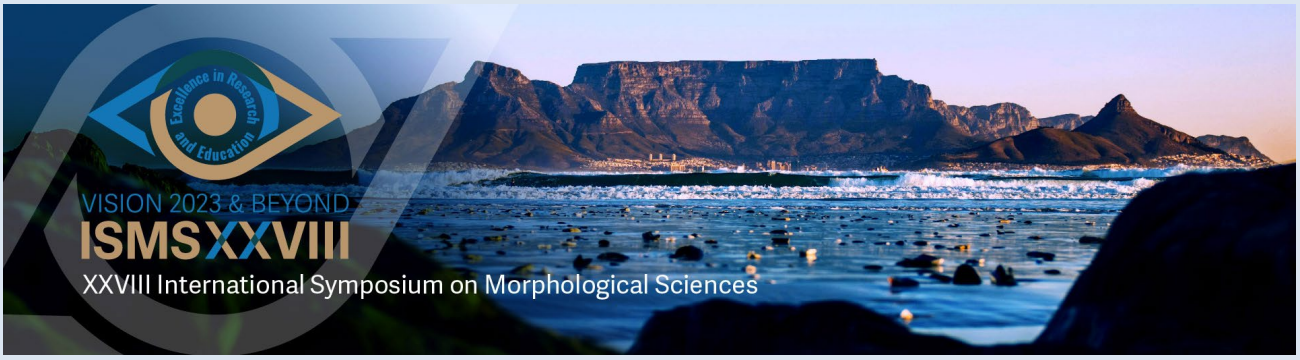
The impact of questionable research practices on societal perceptions of scientific research has been brought to the fore by popular media. Reported on more frequently by Health Science researchers in northern hemisphere countries, there is a need to unpack the experiences and attitudes of academic staff and postgraduate (Masters & PhD level) students to scientific misconduct in the southern hemisphere. An anonymous self-administered, structured questionnaire conducted online was addressed to academic staff and postgraduate students in the Faculty of Health Sciences, Wits University (Ethics number: M200202). Descriptive statistics were produced, and comparisons between postgraduate students and staff responses were made using Chi-square test or Fisher's exact test. Bonferroni correction was employed for multiple comparisons. While the response rate was low (11.4%), several concerns were identified. Self-reported cases of fabrication, falsification, plagiarism or presentation of results in a misleading way were low, but 9% of staff reported awareness of incidents where misleading results had been presented. Approximately 10% of all respondents witnessed misconduct. Authorship misconduct was red flagged, with 35.2% of staff and 8.8% of postgraduate students having experienced unethical pressure regarding inclusion or ordering of authors ($p<0.0001$). While low, the incidence of staff who self-reported data altering or who were uncertain about reporting scientific misconduct, was concerning. Institutions should ensure that adequate training in research integrity is provided if the standard and veracity of its science is to be upheld, and if scientific contributions to society are to be trusted.



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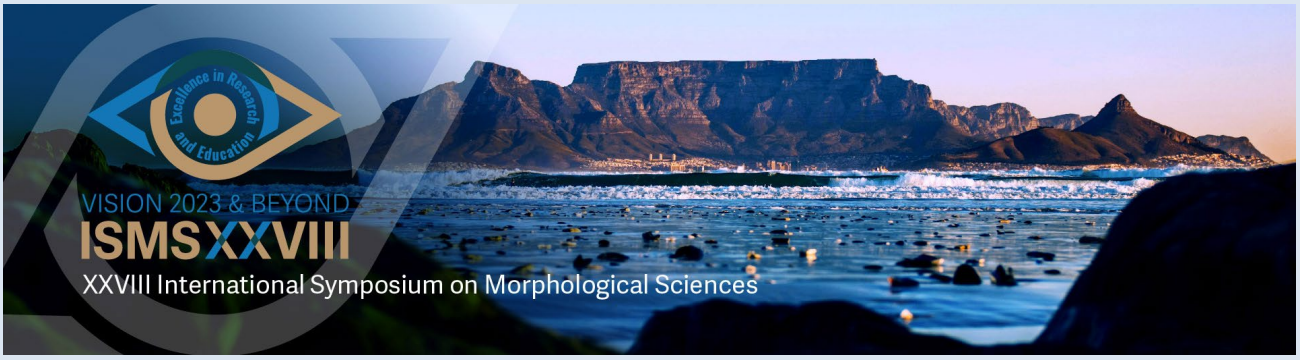
The bioarchaeology of human skeletal remains recovered from the Wellington Farm, Limpopo Province, South Africa

Dr Anja Meyer
University of the Witwatersrand, Parktown, South Africa

In 1957, human skeletal remains were inadvertently discovered during agricultural activities on the farm, Wellington, near the town of Settlers, in the current Limpopo Province, South Africa. These remains were sent to the then Department of Anatomy, University of the Witwatersrand, where they are still housed to this day in the Raymond. A Dart Archaeological Human Remains Collection. The remains have been studied previously, but these research projects focused primarily on typological classifications, typical of the period, with no attempt to reconstruct these individuals' lifeways or context within the archaeological landscape. The aim of this study was therefore to reconstruct the context of these individuals and add to our understanding of their lifeways and lived experiences. A bioarchaeological approach was employed to reconstruct aspects related to demographics and patterns of disease and physiological stress. These results were interpreted within the archaeological context of the Springbok Flats region. The results suggest that these individuals represent Sotho/Tswana men, women and children who lived during the Later Iron Age. Signs of disease and trauma could be observed in a large proportion of the individuals, attesting to some hardships endured. The results from this study contribute towards our understanding of 14th-century agro-pastoralist farmer lifeways and lived experiences.



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Alcohol aggravates skeletopathy in the diabetic male Sprague Dawley rat mandible

Dr Idemundia Eguavoen[1], Mr Vaughan Perry[2], Dr Diana Pillay[2], Prof Ejikeme Mbajiorgu[1], **Prof Robert Ndou[1]**
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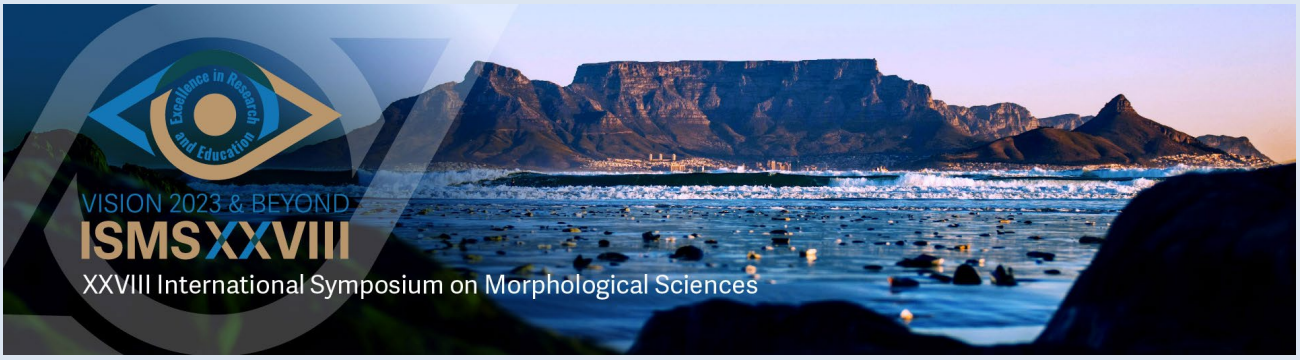
Type 2 diabetes mellitus prevalence is increasing globally. In South Africa, this is confounded with high alcohol consumption. Both diabetes and alcohol usage, independently, adversely affect bone health. Therefore, these combined effects were investigated on the rat mandible.
Twenty-four male Sprague-Dawley rats were equally allocated into Untreated, Alcohol (ALC), Diabetic (DBT) and Diabetic and Alcohol (DBT+ALC) groups. Diabetes was induced through a high fructose diet and streptozotocin, and confirmed through oral glucose tolerance tests, serum insulin levels, blood fasting glucose, and body mass measurements. Alcohol (ALC) and DBT+ALC groups received ethanol. The animals were terminated after 90 days. Bilateral hemi-mandibles were then harvested and fixed in 10% buffered formalin before conducting Micro CT for assessment of trabecular morphometric parameters and bone strength tests.
Bone to tissue volume (BV/TV), and trabecular thickness (Tb.Th) were smallest in the ALC than controls, DBT and DBT+ALC groups. While trabecular number (TbN) was similar among all study groups, the ALC and DBT+ALC groups had more spaced trabeculae (TbSp) than the DBT group. Cortical thickness (CtTh) was smaller among the ALC, DBT or DBT+ALC groups compared to controls. The break force (N), maximum displacement (mm) and maximum time (sec) were lowest in the DBT than control, ALC or DBT+ALC group. The latter two parameters were lower in DBT+ALC than the DBT group. The DBT+ALC had more stiffness (N/mm) than the DBT group.
These findings suggest an adverse impact of alcohol on mandibular diabetic skeletopathy. Therefore, monitoring of alcohol intake amongst diabetic patients may be clinically crucial.



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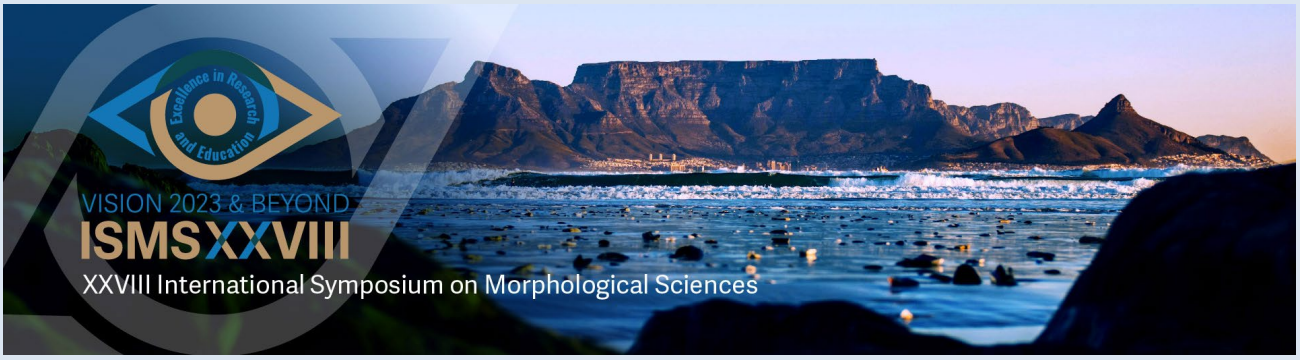
Establishing a 3D printing laboratory at a tertiary institution in Namibia: Experiences and challenges

Dr Adéle du Plessis[1], **Mr Hansbert Hamutenya[1]**, Ms Hilja Eelu[1], Mr Joseph Lakanemo[1]
[1]*University Of Namibia, Namibia*

This presentation focuses on the experiences of staff in establishing a 3D printing lab at the University of Namibia, School of Medicine, and the potential applications of 3D printing technology in academia, particularly in anatomy education. The decline of cadaver donation, due to the Covid-19 pandemic, demanded the development of 3D models to support teaching.
The 3D printing laboratory was co-funded through Dirisana, an Erasmus Plus project. The aim of the Dirisana grant is to promote health science education, through capacity development and improving teaching tools.
The main barriers to establishing a 3D-printing laboratory previously were a lack of funds, lack of technical staff, and the learning curve related to design thinking. Involvement in the Dirisana+ project provided the resources to overcome these barriers. Through collaboration and continuous support from partner institutions we were able to train five colleagues in 3D scanning, rendering and the maintenance of printers.
Sharing the experiences of staff can further provide transferable insights for other institutions. The possibilities for 3D virtual imaging, planning, and printing are almost endless and continues to develop at a precipitous pace. The skills building in 3D rendering software and 3D printing is critical, not only in our educational setting but also in the field of medical imaging, and surgical planning.



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The prevalence of the clinically implicated brachioradial arterial variant: a South African White cadaveric study

Ms Ozyl Marufu[1], Dr Joshua Davimes[1], Dr Nicholas Bacci[1], Dr Brendon Billings[1]
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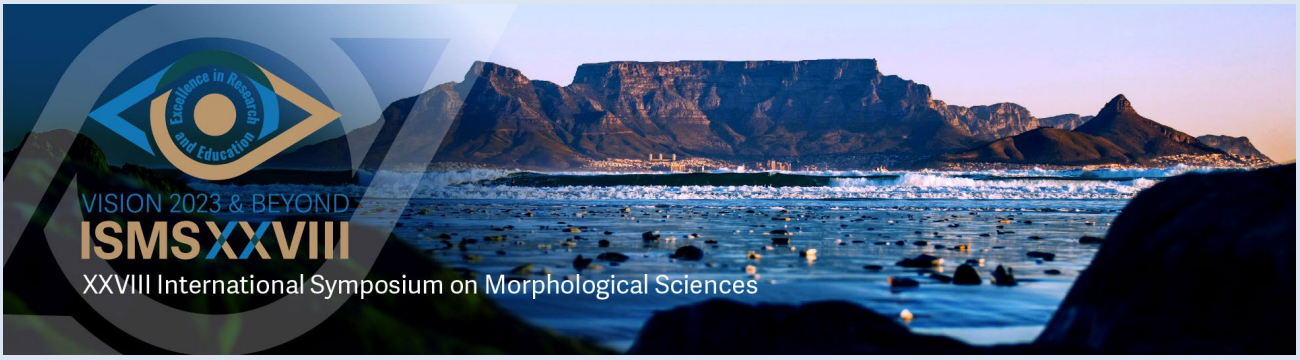
The brachioradial artery (BR) is one of the most common upper limb arterial variations of the radial artery. Important clinical procedures are conducted at the location where the variant commonly occurs. These procedures include cardiac surgeries such as cardiac catheterisation, coronary bypass and coronary angiography. The variant has been studied extensively and has been associated with deleterious complications involving the above-mentioned clinical interventions. The variant is highly prevalent globally (4.67% to 15.6%). However, there have not been any studies conducted on the BR in South Africa. Therefore, the aim of the current study was to investigate the prevalence of the BR variant in a South African White cadaveric population. Dissection was conducted to expose and identify BR variations on 90 cadavers (n= 178 upper limbs). Chi-squared tests were conducted to determine potential associations with sex, laterality and sidedness with BR prevalence ($p<0.05$). A qualitative interobserver error was conducted. The ethics waiver certificate number for the project was W-CBP-210401-01. The BR was seen in 18 limbs (10.10 % prevalence). No significant associations were found between sex, laterality, and sidedness with BR prevalence. The prevalence of the BR in a White South African sample falls within the global range. However, the study only revealed the prevalence in one population group. While surgical and diagnostic measures may be implemented for the White population due to the available data, there is a lack of information for other South African populations. Future studies should include other South African population groups to supplement the results of this study.



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A profile of skeletal lesions that are associated with tuberculosis in South Africa

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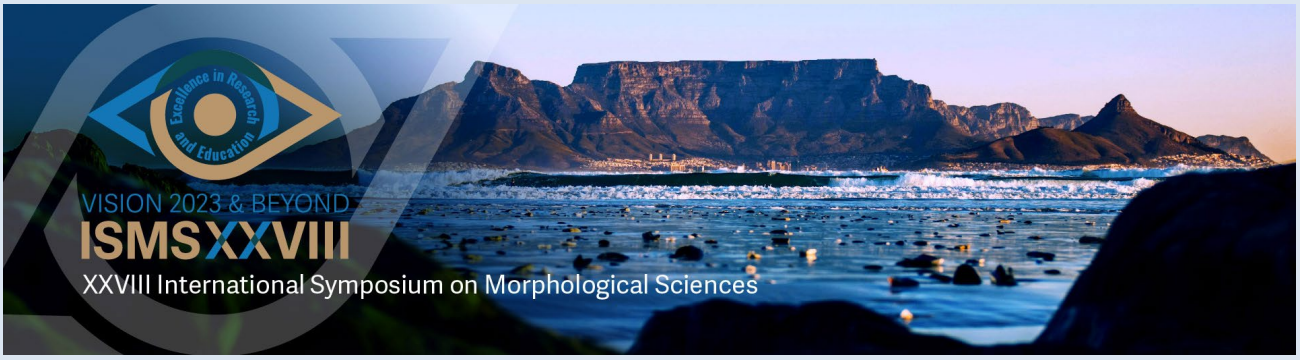
[1]*University of the Free State, Park West, South Africa,* [2]*University of the Witwatersrand, Parktown, South Africa*

Tuberculosis (TB) continues to be a leading cause of death in South Africa. Its skeletal manifestation is therefore significant in Forensic Anthropology. This was a successive study that aimed to assess the sensitivity and specificity of skeletal lesions to accurately diagnose TB in two post-antibiotic skeletal samples. Skeletal remains from a Gauteng sample and those from a Free State sample of individuals who died of TB and other non-related diseases were assessed. A list of twenty-one skeletal lesions associated with TB was compiled and used to score each set of remains. Sensitivities and specificities of individual skeletal lesions were calculated. These were compared to a previous South African study that used a pre-antibiotic sample. An association was found between TB and eleven out of the twenty-one lesions. Lesions found on the ribs, crania and pelvic bones were found to be increasingly sensitive to the presence of TB and also showed an increase in specificity in the post-antibiotic era. Vertebral lesions continue to have the highest sensitivity to TB although this has declined over time. The introduction of antibiotics has reduced the prevalence of severe TB in modern populations. This, however, has resulted in contrasting changes in the sensitivity of skeletal lesions associated with the disease. This may be due to the difference in the dissemination of TB to various regions of the body. Future studies can assess TB lesions according to their aetiology. Each of the individual skeletal lesions' profile is of diagnostic value and can be used in a differential diagnosis.



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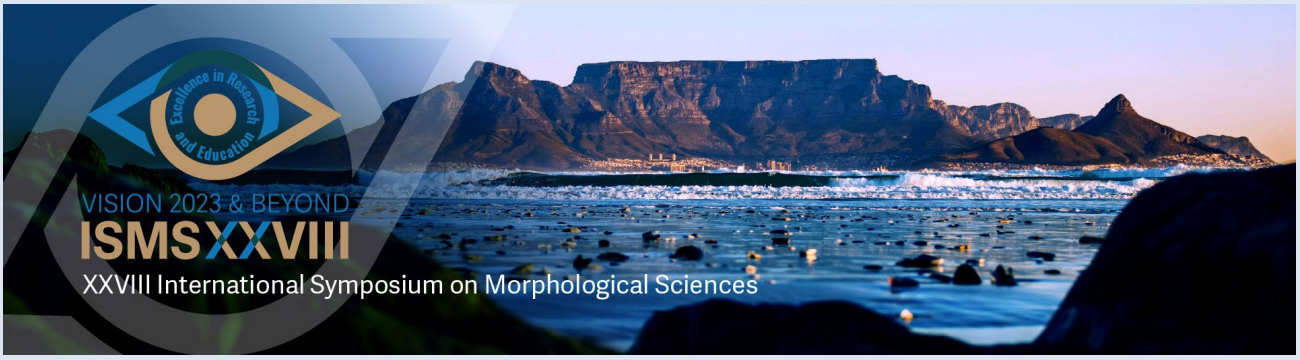
Morphological and histological analysis of vascular conduit options used for coronary artery bypass grafting

Mr Sandile Ntuli[1], Assoc Prof Geney Gunston[1], Ms Jeshika Luckrajh[1]
[1]*University of Cape Town, Observatory, South Africa*

Coronary artery bypass grafting (CABG) is a commonly used intervention for treating coronary artery disease. Surgeons must choose an appropriate conduit for the procedure. This study aimed to identify the conduit that closely resembles coronary arteries in terms of morphological and histological characteristics.
The study involved measuring the length, luminal diameter, and wall thickness of coronary arteries and various conduits including the saphenous vein (SV), right and left internal thoracic artery (RITA/LITA), inferior epigastric artery (IEA), right gastro-epiploic artery (RGEA), and radial artery (RA). The decision-making process of cardiothoracic surgeons before CABG surgery was also surveyed. Ethical approval was obtained in 2021 (HREC483/2021).
The results showed that the mean length and diameter of the right coronary artery were 11.39±3.1cm and 0.30±0.08cm in males, and 12.61±2.78cm and 0.26±0.07cm in females, respectively. The circumflex artery had a mean length and diameter of 8.64±2.18cm and 0.24±1.10cm in males, and 9.27 ±2.94cm and 0.21±0.07cm in females, respectively. The LITA was longer than the RITA in relation to four out of five coronary arteries. The SV had a mean wall thickness of 127.97±34.99µm. The survey indicated that the SV was preferred due to accessibility, while the LITA was favoured for exclusive use.
In conclusion, conduit diameter, wall thickness, and length are important factors for graft patency and surgical handling. The suitability of the RITA and RGEA conduits depends on the specific coronary artery being bypassed. The LITA and RA conduits closely resemble coronary arteries and are favoured choices. Surgeons prefer the SV due to its accessibility.



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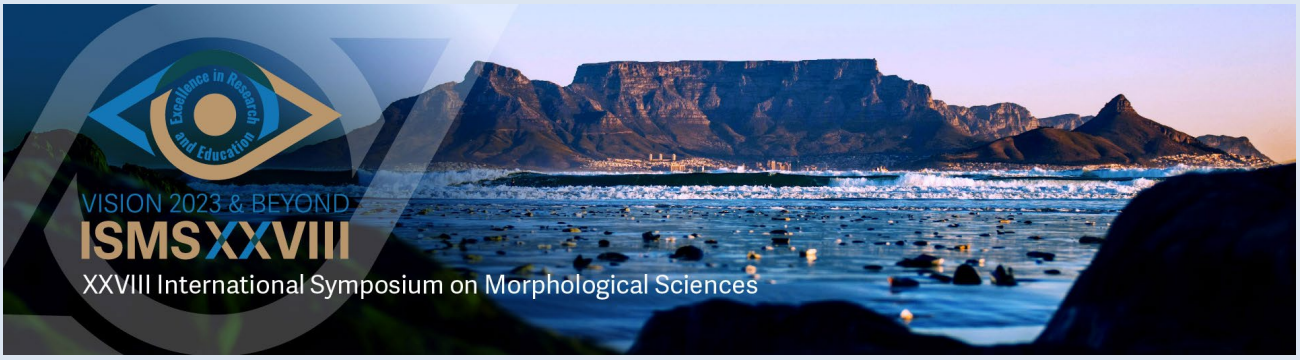
Assessing craniofacial symmetry in a Free State population

Ms Daniëlle Van Der Merwe[1], **Mr Ezra Earl Anirudh[1]**, Dr Petra Maass[1]
[1]*University of the Free State, Universitas, South Africa*

Craniofacial asymmetry is defined as 'dissimilarity in the size, shape and arrangement' of facial features on opposite sides of the skull. Deviations from symmetry can be classified either as directional, fluctuating or anti-symmetrical, and are influenced by different intrinsic factors [including aneuploidy, point mutations and homozygosity] and extrinsic factors [nutritional deficiencies, infectious disease, and parasitic load]. Understanding and quantifying craniofacial asymmetry is vital, therefore, to ensure accurate reconstructions and aesthetic corrections. This study aimed to evaluate whether a metric method [triangulation] could be used to assess craniofacial symmetry in a cadaveric skeletal population. A total of eight bilateral measurements of the skulls of thirty adult African males from the University of the Free State's research skeletal collection were used to compose three triangles in the orbital, maxillary, and nasal regions. It was observed that the right half of the skull was larger than the left in all measurements, except the nasion–alare (0.64%) distance; however, this half presented smaller angles than the left half. The largest and smallest asymmetrical differences were noted between the alare–nasospinale distance (2.15%) and the mid-supraorbital–mid-infraorbital distances (0.03%), respectively. Statistical tests revealed that significant statistical differences between the two halves were only noted between the nasion–zygion, nasion–zygomaxillare and zygomatic angle. This study finds that triangulation may detect relative asymmetries, but whether they are significant needs simple statistical assessment. Therefore, it is considered an appropriate and reliable method to assess craniofacial symmetry in this regionally relevant cadaveric sample.

Ethics number: UFS-HSD2017/1129-0003/3108



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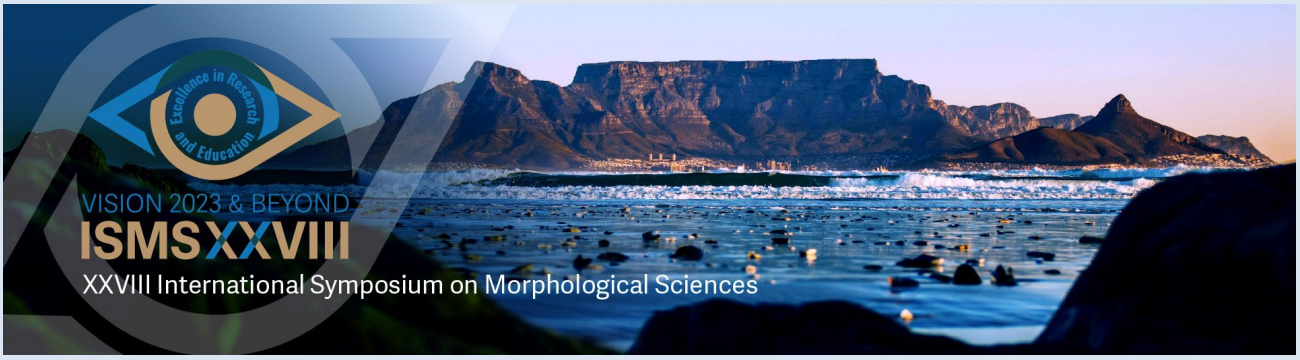
Radiological anatomy of the cadaveric African lion (Panthera leo) thoracic cavity

Ms Carmen Alicia Marais[1], **Prof Martina Rachel Crole[1]**

[1]Department of Anatomy and Physiology, Faculty of Veterinary Science, University of Pretoria, Onderstepoort, South Africa

The African lion (Panthera leo) is an iconic wildlife species in South Africa. Despite their importance in certain zoonotic diseases and their significance in veterinary procedures, the lungs have not been described in detail. Radiographic images of cadaveric lions may assist in establishing some reference points in describing normal radiographic anatomy. Two sub-adult male lions were culled on a private game farm in South Africa. They were embalmed onsite. At the Onderstepoort Veterinary Academic Hospital a size 18 endotracheal tube was inserted into the trachea, the cuff inflated and air forced into the lungs using an ambubag. The radiographic images were obtained with exposure factors 125 kV and 12.5 mAs to obtain a left lateral recumbent view. The bronchial tree is clearly visible in the cranial, middle and caudal lung fields. The heart shadow is between ribs 4-6. The dome of the diaphragm is visible as are the effects of a full stomach on expansion space for the caudal lung lobe. The radiographic images are an example of an air bronchogram due to the collapsed alveoli. Since this is a descriptive study these radiographic images may still be used to show the topography of the heart and lungs with special reference to the bronchial tree of the lungs. In living specimens structures such as the cranial and caudal vena cava, pulmonary vessels and aorta will most likely be visible which were not visible on the radiographs produced in this study as border effacement of the vessels played a major role.



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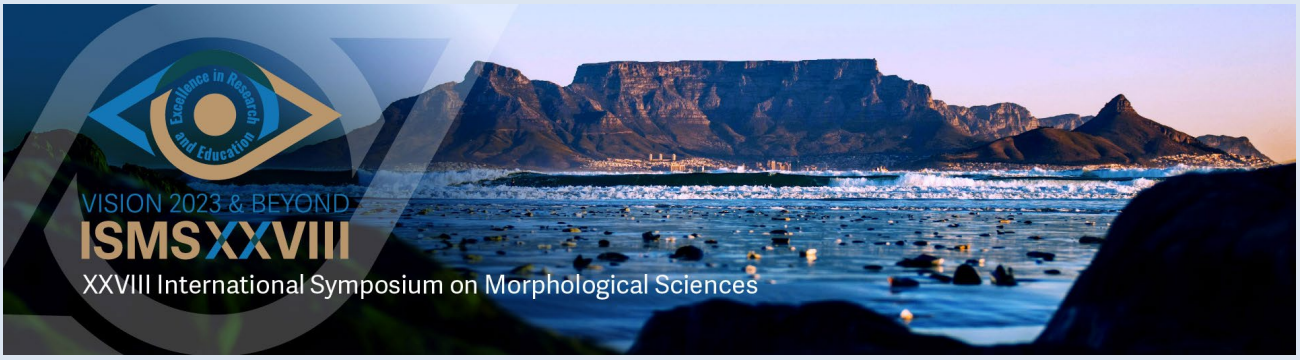
Impairment of the ultrastructure of mammalian oocytes under different in vitro culture conditions

Prof Maria Grazia Palmerini[1], Marta Gatti[2], Mariacarla De Rubeis[2], Dott. Manuel Belli[3], Ilaria Antenisca Mascitti[1], Prof Stefania Annarita Nottola[2], Prof Guido Macchiarelli[1]

[1]University of L'Aquila, Dept. of Life, Health and Environmental Sciences, Italy, [2]University of Rome La Sapienza, Dept. of Anatomy, Histology, Forensic Medicine and Orthopaedics, Italy, [3]IRCCS San Raffaele Roma, MEBIC Consortium, Italy

In vitro culture systems of cumulus-oocyte-complexes (COCs) allow for the precise control of environmental factors and provide a valuable tool for studying the ultrastructure of oocytes under various experimental culture conditions. Endocrine disruptors (EDs) can interfere with the normal functioning of the endocrine system, also affecting reproduction. We previously demonstrated a dose-dependent detrimental effect exerted by EDs, such as the dithiocarbamate Mancozeb and the organochlorine Lindane, on the ultrastructure of granulosa cells cultured in vitro. Since exposure to EDs can hamper crucial processes for the success of fertilisation and embryonic development, in this study we aimed to assess the effect of Mancozeb and Lindane on the ultrastructure of mouse MII-stage oocytes retrieved by COCs cultured in vitro with or without increasing concentrations of Mancozeb (0.001-1 µg/ml) and Lindane (1-100 µM). TransMsion electron microscopy was used to investigate the effects of the selected EDs. The results showed a preserved ultrastructure at the lowest doses, with an ooplasm rich in clusters of round-to-ovoid mitochondria, cytoplasmic lattice, elements of the smooth endoplasmic reticulum and electron-dense round cortical granules. Lipid droplets, multivesicular aggregates and lamellar bodies were numerous. The ooplasm was continuous and contained thin microvilli. A narrow perivitelline space was delimited by an intact zona pellucida. The highest concentrations of EDs affected organelle density, with a reduction of mitochondria, also appearing moderately vacuolated, cortical granules and microvilli. The latter were short and less abundant. These results contribute to understanding the mechanisms by which EDs can impair oocyte development and maturation, and to the identification of potential strategies for minimising their impact on reproductive health.



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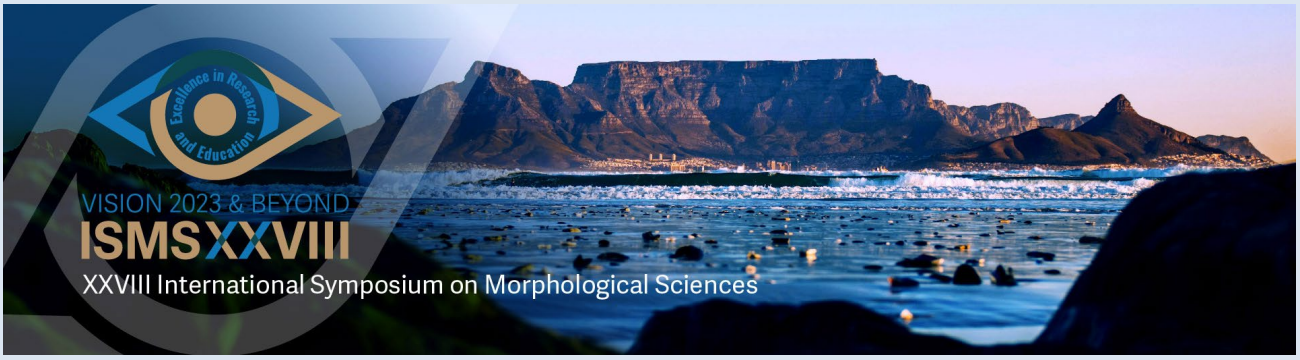
Progression of the histopathological changes in the urinary tract during Uropathogenic E. coli infection

Ms Ziphozethu Ndlazi[1], Dr Nontobeko Mvubu[2], Dr Brenda De Gama[1]
[1]*University of KwaZulu-Natal, Westville, South Africa,* [2]*University of KwaZulu-Natal, Umbilo, South Africa*

Urinary tract infections are among the most common bacterial infections across the globe indicated by significant bacterial growth anywhere along the urinary tract. Urinary tract infections are associated with a variety of microbes but the predominant causative agent implicated is uropathogenic Escherichia coli. The purpose of this study was to track the progression of the uropathogenic E. coli-induced infection, over a period of fourteen days and to compare the histopathological changes within the kidneys and bladders isolated at various time points. A total of fifteen adult female Sprague Dawley rats were randomly allocated into 5 groups, according to the days (days 1,3, 7,10 and 14) they were euthanised to determine the impact of the infection as it progressed. Three animals were dedicated to each group; one animal received saline transurethral inoculation while the remaining two received E.coli. Harvested bladder and kidney tissues were prepared and screened via light microscopy. Ethical clearance (AREC/008/020D) was obtained. Samples from the animals inoculated with saline showed a clear lumen, an intact normal-sized urothelial layer, and the lamina propria and detrusor muscle layers also portrayed normal anatomy within the bladders. The Bowman's capsules were intact and normal-sized tubules were observed within their kidneys. Infected animals displayed bacterial communities within the lumen, increased thickness of the lamina propria layer and muscle segmentation within the detrusor muscle layer. The infected kidneys displayed dilated tubules filled with eosinic cells, a disrupted Bowman's capsule and enlarged Bowman's space. Interestingly, a decline in tissue disruption was noted from day 7 onward.



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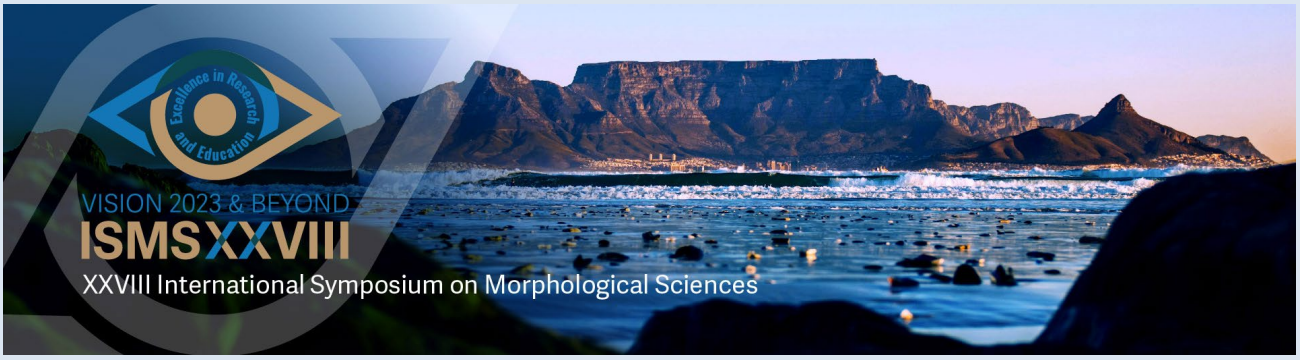
Cytotoxicity of chemotherapy drugs and characterising tumour heterogeneity in cervical cancer cell line

Dr Kutlwano Xulu[1], L Marakalla, T. N. Augustine
[1]*University of the Witwatersrand, South Africa*

Tumours are characterised by heterogenous cell populations which impacts the response to treatment, development of treatment resistance and tumour recurrence. Cervical cancer is among the commonly diagnosed tumours in females in South Africa. The aim of this study was to establish the in vitro cytotoxicity of doxorubicin and paclitaxel on a cervical cancer cell line, Hep2C and to characterise tumour heterogeneity in this cell line. Following standard cell culture of the Hep2C cells, they were treated with a range of concentrations for doxorubicin (0.5 µM, 1 µM and 2 µM) and paclitaxel (1 nM, 5nM and 10 nM) for 24, 48 and 72 hours. Thereafter a neutral red cell viability and a scratch assay to assess cell migration was conducted. Tumour heterogeneity was characterised using magnetic cell sorting to isolate subpopulations based on stem cell markers; CD44; a protein involved in maintain multipotency and CD133; a protein involved in metabolic process associated with metastasis, stemness and drug-resistance. Four subpopulations were derived CD44+CD133+; CD44-CD133+; CD44+CD133- and CD44-CD133- and subsequently cultured in Essential 8 media to prevent differentiation. Together with parent populations, these cells were tracked in cell culture for 14 days and imaged using and Olympus ix50 phase contrast microscope and changes in cell morphology and growth patterns were noted. Concentration and time dependent changes were observed in cytotoxicity as changes in cell viability and migration rate were noted. These findings are key in establishing optimal drug concentration and treatment duration to be used to further investigate tumour heterogeneity.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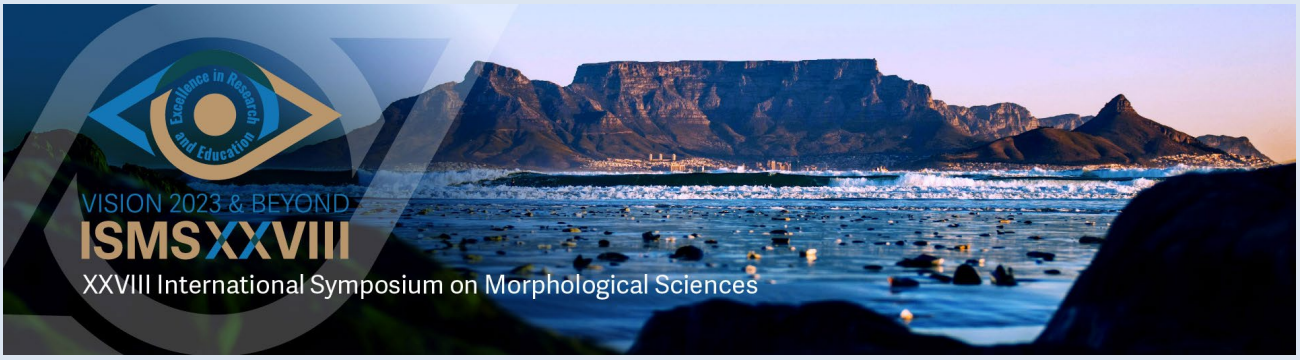

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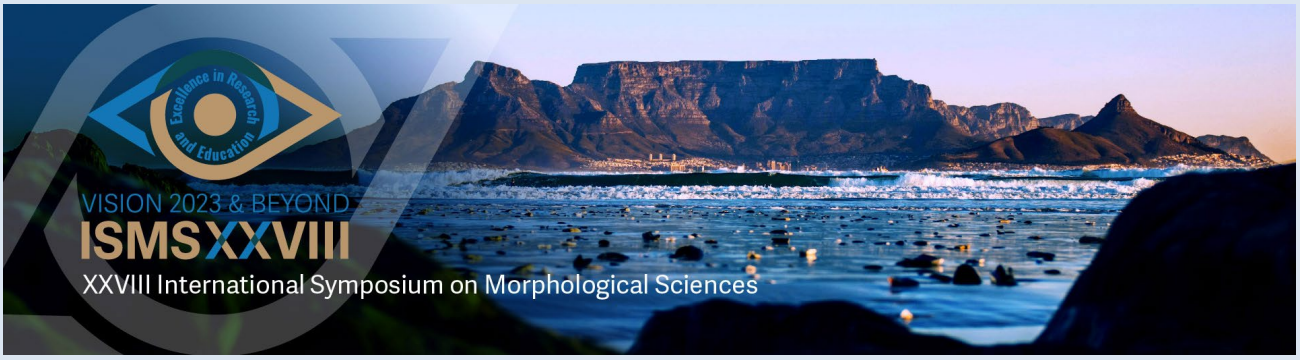
Students' perceptions of Anatomy teaching strategies and external factors affecting their learning of Anatomy

Ms Soné Van Der Walt[1], Dr Lané Prigge, Ms Konanani G Phaswana[1]
[1]*Sefako Makgatho Health Sciences University, Ga-Rankuwa, South Africa,* [2]*University of Pretoria, Pretoria, South Africa*

Anatomy is a core module included in all Health science degrees and various teaching methodologies are used to teach Anatomy. This study explored students' perceptions on the different teaching strategies employed in the Anatomy Department of a South African University, and the external factors that affected student learning. The sample comprised of: Medical, physiotherapy and nursing science students registered for Anatomy during the 2018 and 2019 academic year. An online distributed survey, with qualitative (open ended) and quantitative (multiple choice and Likert scale) questions were circulated. It consisted of three sections including demographics and consent, the perceptions of students on the strategies used in the teaching of Anatomy and finally, external factors that affected the learning of Anatomy as perceived by students. A 13.4% response rate was achieved. Practical lectures (114/122; 95%CI [87.5- 97.1]) and cadaver dissections (96/106; CI [83.3- 95.4]) were perceived as the most effective teaching and learning strategies whereas visiting the Anatomy museum (41/122; CI [2.53- 42.7]) was indicated as the least successful strategy. Student protests were identified as the most disruptive factor (83/122; CI [59- 76.2]). The study concluded that Anatomy departments should consider conducting more practical lectures than didactic lectures, since students deemed it most effective in their learning process. An anatomical museum adds great value; however, this valuable study resource should be emphasised more. External factors, such as student protests are not in the control of any department, but anatomy students should be encouraged to utilise this time productively.



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The prevalence of arterial variations in upper limbs of the South African population

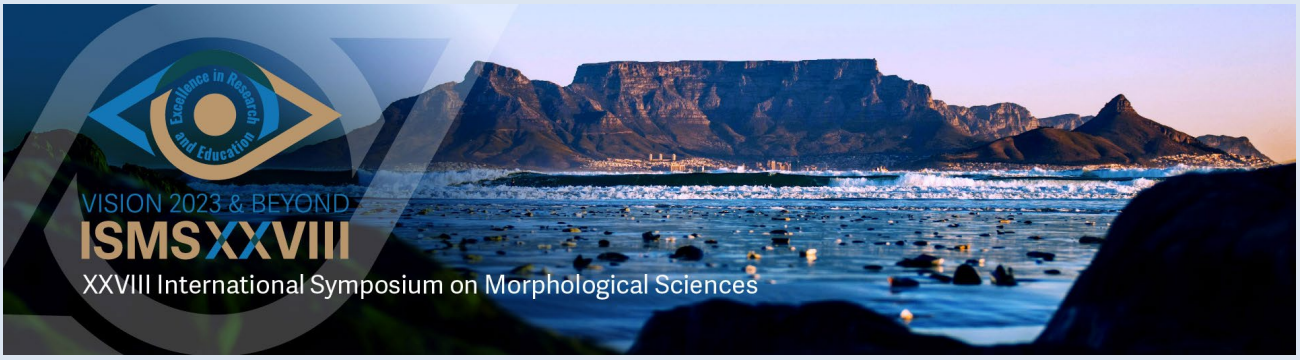
Ms Patria Hartman[1], Mr Nkosi Xhakaza[1]
[1]*Sefako Makgatho Health Sciences University, Garankuwa, South Africa*

Knowledge of upper limb arterial variation is important during surgical procedures to prevent iatrogenic injuries. The incidence of variant branching patterns has been reported to reach up to 25%. Tortuosity is another factor that plays a role in arterial disease. Population differences have been recorded in arterial variant patterns. However, there are not enough reports on the upper limb arteries variations in the South African population.

The current study aimed to record the incidence of tortuosity and variations of upper limb arteries in the South African population. In this study, 146 limbs of 73 SA cadavers were dissected (Ethics number: SMUREC/M/193/2022: PG). The normal and variant branching patterns and tortuosity of the axillary, brachial, radial and ulnar arteries were identified and recorded. The histological changes in tortuous vessels were also analysed using Masson's trichrome and haemoxylin and eosin stains.

The axillary artery showed the highest incidence of variations with 28.1% cases having a superficial subscapular artery, followed by 13.7% of cases with a common trunk for anterior and posterior circumflex humeral arteries. Tortuosity was more frequent in the radial artery (15.1%), followed by the brachial artery (8.2%). Histological analyses showed that tortuosity has a significant association with the thickening of the tunica intima (p=0.007).

The results of the current study suggest a high prevalence of arterial variations in the South African Population (66.4%). The tortuosity of the upper limb arteries was also high (23.3%) compared to other studies (1.3%). The results of this study will play a role in the planning of endovascular procedures that involve upper limb arteries.



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The quality of multiple-choice based anatomy tests at a tertiary institution in South Africa

Ms Patria Hartman[1], Prof Anna Oettle[1]
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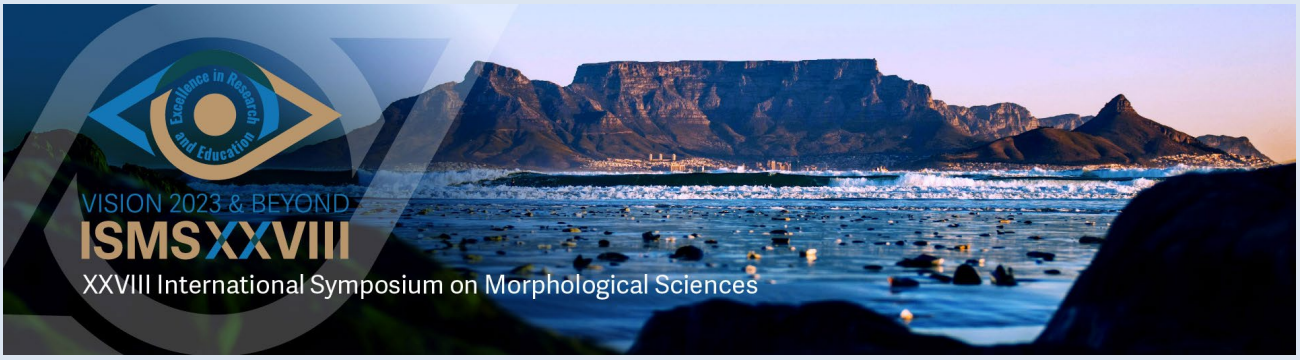
Emergency remote teaching has left us not only with many multiple-choice based anatomy tests but also the means to analyse the results on the popular learning management system augmented by Riddel, an offline learning and assessment system. There is also an opportunity to retain quality questions in a question bank. However, the possible effects of cheating on the results should be considered. The aim of this study is to evaluate the quality of tests and questions from 2020 to 2022 comprising multiple-choice questions towards the development of a question bank that takes possible cheating into account. Analyses were performed on 24 Anatomy tests for second-year medical students from 2020 to 2022. The average number of students who took a test was 258. Assessments where possible cheating took place could be identified by performing normality tests. An item analysis of all questions was made for difficulty and discrimination indices. Normal distribution in test scores was noted only in the 2022 year (4/8 tests) when invigilation took place. All tests using a proctoring system performed from home during 2020 and 2021 presented non-normal curves suggestive of cheating. However, the discriminatory ability of tests did not change with invigilation. Despite the possibility of cheating, questions with medium difficulty and good discrimination often involved questions based on diagrams and images, and therefore might be ideal to retain in a question bank.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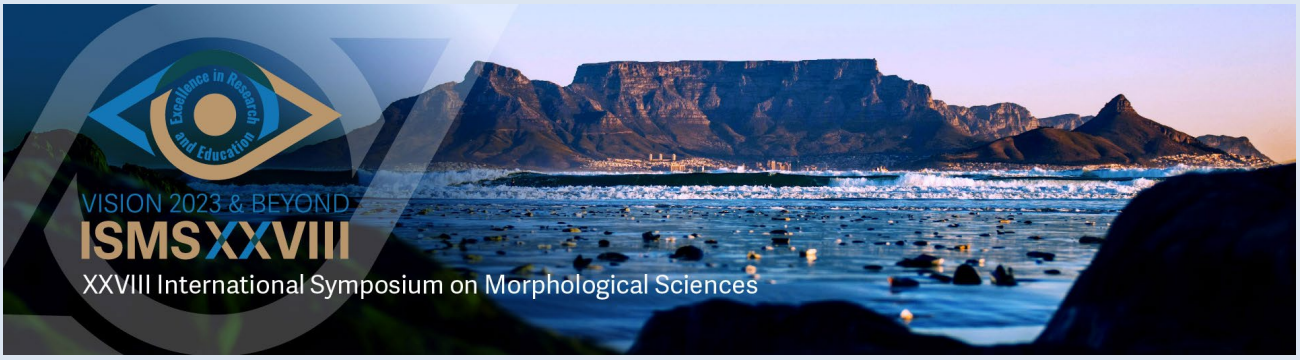

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Anatomical, cellular and molecular features of life-long tooth replacement in reptiles

Dr Joy Richman
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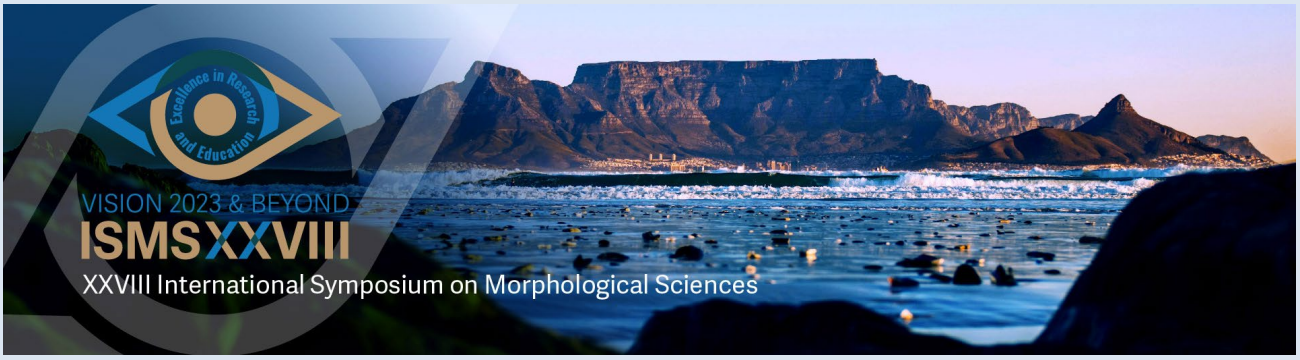
The dentition is one of the best preserved organs in the fossil and anthropological records. Teeth contain a record the life history of the animal such as the diet, stresses encountered, the life span and evolution of the hard tissues. In our laboratory we are fascinated by the ability of some amniotes to replace their teeth indefinitely while others, specifically mammals, have a much reduced replacement capacity. In the larger context, there are few examples of complete regeneration of organs in amniotes. Lizards, snakes and crocodilians have teeth along the jaw margins. Each tooth family consists of the functional tooth and 2-3 replacement teeth in various stages of development. In this talk I will describe our journey through tooth replacement from studies in embryonic snakes and lizards to adult geckos. We have developed the leopard gecko as an unusual, emerging model organism. Tooth replacement occurs every 4-5 weeks in waves that pass along the jaw from posterior to anterior. The gecko retains an ancient ability to restore the dental lamina, a key source of stem cells, allowing teeth to initiate from surrounding competent dental epithelium and mesenchyme. The gecko also uses a series of cytokine signals to attract odontoclasts to resorb functional teeth. I will show how the timing of tooth shedding is directly linked to timing of tooth initiation using a series of in vivo experiments carried out on adult geckos. Our experiments demonstrate the tremendous resilience in maintaining the reptile dentition which is important for survival in the wild.

This work is funded by the Natural Sciences and Engineering Research Council of Canada grant to JMR.



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Body Donation: Ethical concerns, best practice & guidelines before and during COVID19

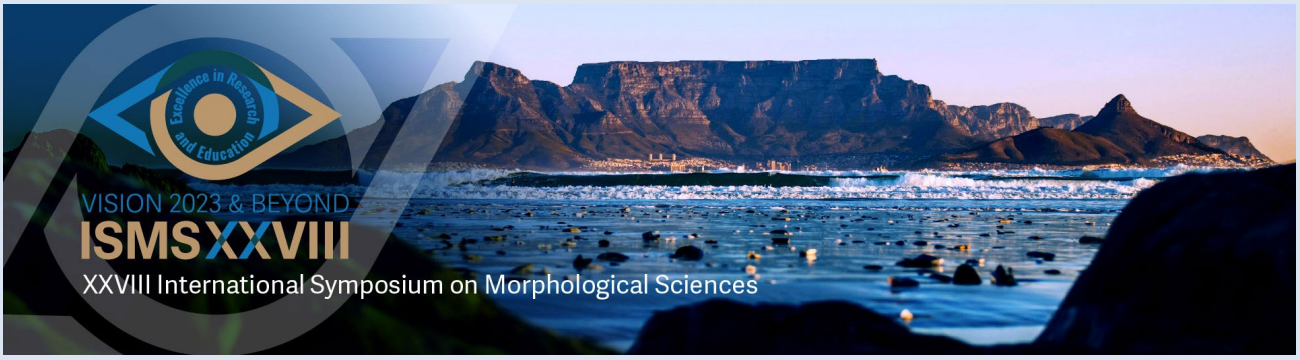
Dr Pamela Pillay[1]

[1]*University Of KwaZulu-Natal, South Africa*

As echoed in the literature, body donation is essential for Anatomy teaching and learning. However, critical shortages have impacted the delivery of anatomical teaching and research in South Africa. Some of the ethical considerations related to the use of donated bodies are informed consent, human dignity, voluntary decision-making and human rights. In order for institutions and donors to be legally "protected", it was suggested that the consent should be simple and transparent.

In 2020, South Africa underwent a lockdown due to the COVID-19 pandemic, which shifted the academic programme at the University of Kwazulu-Natal (UKZN) to a virtual platform. At this time, anatomists in the department had concerns regarding the impact of COVID-19 on the already strained body donation programme. This study highlights the recommended standard operating procedures related to body donation at UKZN during and after the COVID-19 pandemic.

Since the body donor programme was under stress, an Institutional Procedures Oversight Committee had been established at UKZN comprising academic and technical advisors. There were uncertainties related to donation and consent, however, the principles of consent and the legal framework remained as modus operandi. The COVID-19 health and safety considerations, together with recommendations from IFAA, were incorporated into the programme, taking into account factors such as staff well-being, viral incubation period and viability of the virus within the blood and /or specific organs. Body donor awareness campaigns were conducted virtually as webinars and UKZN aligned its body donation protocol to incorporate ethical considerations, screening protocols (ie. diagnostic assays), and various safety measures for handling and embalming cadavers.



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A quantitative approach to imaging seated anatomy of the buttocks and thighs using ultrasound

Dr Nkhensani Mogale[1,2], Dr Justin Scott[3], Mr Daniel Schantz[2], Mr Viktor Ilyasov[2], Prof Tamara Bush[3], Prof Albert van Schoor[1], Prof Jill Slade[2]

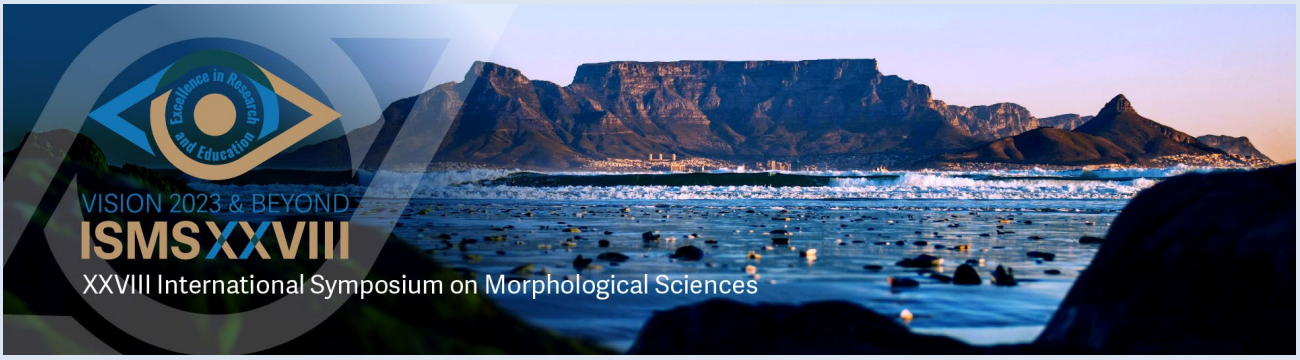
[1]University of Pretoria, Faculty of Health Sciences, School of Medicine, Department of Anatomy, Gezina, South Africa, [2]College of Osteopathic Medicine, Department of Radiology, Michigan State University, East Lansing, USA, [3]Department of Mechanical Engineering, Michigan State University, East Lansing, USA

Individuals with spinal cord injuries are plagued by pressure ulcers due to prolonged sitting and limited mobility. Novel approaches to imaging soft tissue of the buttocks and thigh were investigated in an unloaded and loaded condition using ultrasound (US) and magnetic resonance imaging (MRI).

Twenty-two able-bodied participants were recruited for this study. Two visits using US were required, as well as one MRI visit to evaluate soft tissue thickness and composition. The unloaded condition was a lateral decubitus position. For loaded conditions, US was done in the seated upright position and MRI was done in the lateral decubitus position and loading was applied to the buttocks.

The results demonstrated that tissue thickness reliability was excellent, ICC = 0.934-0.992. US and MRI measures of tissue thickness were significantly correlated (r = 0.725 and 0.816 for total tissue and muscle + tendon, respectively). US underestimated unloaded tissue thicknesses with a mean bias of 0.56 and 0.39 cm for total tissue and muscle + tendon thickness. When the buttocks were loaded, total tissue thickness was reduced by 48±14%, with the muscle + tendon thickness reduction noted as greater than skin + fat reduction ($p<0.001$).

In conclusion, US assessment of soft tissue thicknesses was reliable in both positions. Tissue thickness played a role in how the soft tissue of the buttocks responded to loading. These data provide support for an ultrasound and MRI approach to determining soft tissue of the buttocks and the response of soft tissue to sitting and loading in a seated position.



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Using Mentimeter as an interactive tool to facilitate student participation in in-person lectures on anatomy

Dr Kentse Mpolokeng[1]

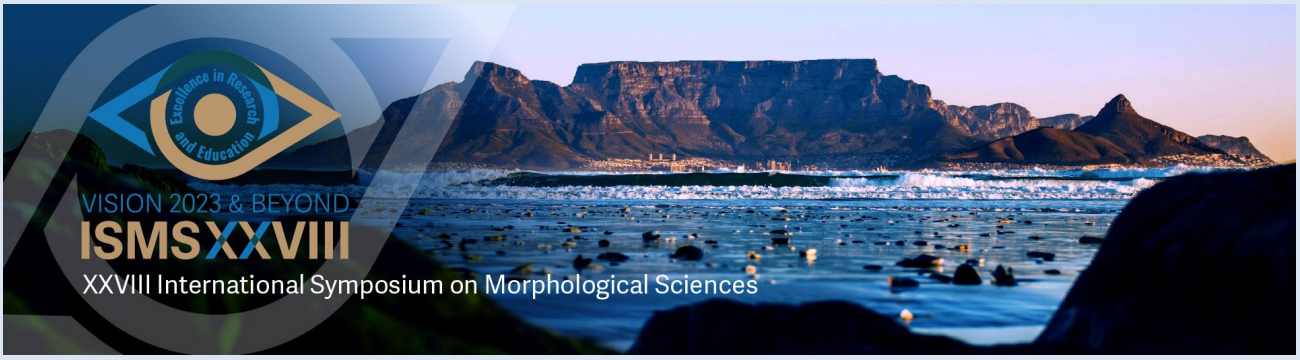
[1]*University Of Cape Town, Observatory, South Africa*

The transition from online learning to in-person teaching following COVID-19 restrictions has presented challenges in promoting classroom interaction among students and with the lecturer. The use of Mentimeter, has been proposed as a tool for promoting student engagement and interaction. This study aimed to assess the effectiveness of using Mentimeter in promoting interaction during in-person reproductive anatomy lectures for 2nd year BSc students.

An experimental study was conducted across five reproductive anatomy lectures. Mentimeter questions were integrated into the PowerPoint presentations, with additional questions at the end of the teaching week. A total of 48 students in a class of 82 participated in the activity.

Overall, the use of Mentimeter was positively received by students, as reflected on the course evaluations. The students appreciated the opportunity to actively participate in the lectures, which facilitated better engagement and understanding of the course content. The Mentimeter questions also allowed the lecturer to gauge how well the class was following the topic, enabling them to adjust their teaching as needed. At the end of the week, a separate set of questions was used to assess the students' understanding of the material covered. Feedback received from these questions allowed the lecturer to better prepare for the practical sessions.

The findings suggest that Mentimeter is an effective tool for promoting student engagement and interaction during in-person anatomy lectures. Further research is needed to determine how best to incorporate Mentimeter into Anatomy Education and to assess its impact on learning outcomes.



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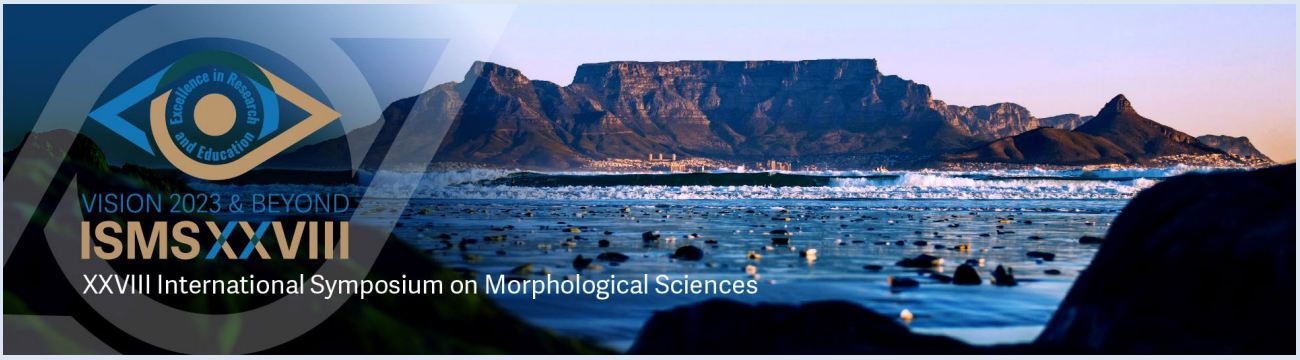
A theoretical framework and pedagogical analysis of visual language within the Health Sciences

Dr Natashia Muna[1]

[1]*University Of Cape Town, South Africa*

The arguments for understanding language as multimodal, contextually situated, socially negotiated, and central to meaning-making are well established by work across the social sciences, and provide various lenses through which to view specialised disciplinary 'languages', and how these languages are used. Within the health sciences, 'visual language' is central as both a source of knowledge and a mode through which knowledge is produced, with implications for teaching and learning. While there has been some engagement in health sciences education literature, what has been absent is a broader appreciation of the multiple factors that are simultaneously at work. This presentation addresses this contextual gap by drawing from foundational literature to construct a conceptual and theoretical framework that explains how meaning, and the language modes through which we communicate meaning, are situated and develop within and by Discoursal communities. And in relation, how through the functional roles of shared language, modes can become powerful and highly valued for the affordances they offer. From this perspective we can achieve a deeper understanding of the challenging and transformative experiencing of acquiring and mastering disciplinary language and the roles educators can play in enabling this process for students. This offering adds value by providing a pedagogical analysis of these theories, perspectives, tools, and strategies, alongside considerations for how to apply this knowledge in teaching and learning contexts to expose the tacit socio-cultural and political ways in which language operates, and through this to equip educators with the means to support students' acquisition of disciplinary language.



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A morphological study of age-related changes during the intra-puparial period of the blowfly, Chrysomya chloropyga

Ms Wilmari Uys[1], Mr Calvin Mole[1], Dr Marise Heyns[2]
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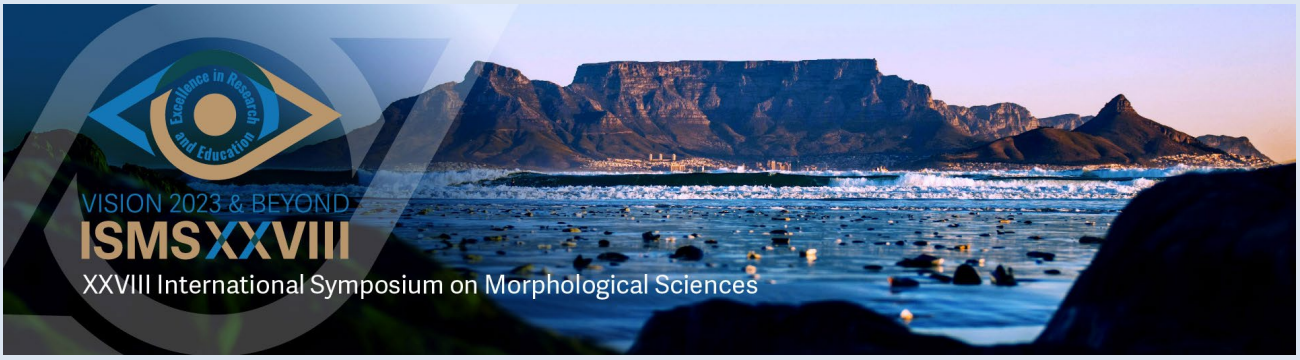
Blowflies are frequently used in medico-legal investigations to estimate the minimum postmortem interval (minPMI). This requires determining the age of specimens collected from the corpse using morphological features. Larval morphological development has been extensively investigated; however, limited research has examined age-related morphological changes of pupae. This study aimed to identify key morphological changes of Chrysomya chloropyga pupae, for age determination and utilisation in minPMI estimation. C. chloropyga were reared under controlled conditions at 25°C, 65% relative humidity and a 14:10 photoperiod. Once pre-pupation occurred, pre-pupae were collected, and morphological changes observed every 6 hours for the first 2 days and then every 12 hours until adult emergence. Micro-CT was employed to identify age-related changes to internal morphology and assess volumetric changes in prominent organ systems, while age-related changes to external morphology were identified using stereomicroscopy. Pupal age was presented in hours post-pupation and accumulated degree hours. Cephalic features, such as the mouthparts i.e. the labellum, labrum, and antennae, showed the most prominent changes in morphology which could be linked to pupal age. Similarly, changes in leg and wing morphology were associated with certain pupal ages. Transformations in wing muscle, the alimentary canal and rectal pouch morphology and volume were clear at different pupal ages. This study provides valuable data on key morphological features associated ancestry in a South African population.



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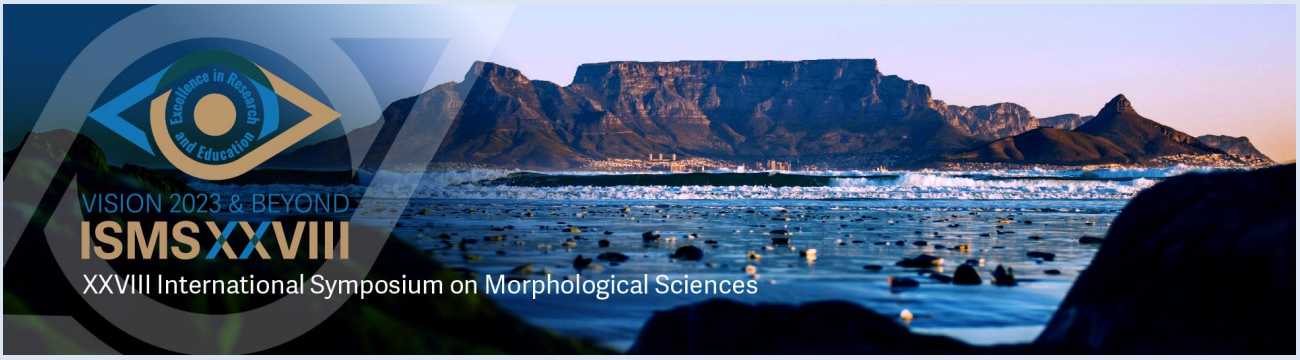
Lumbosacral transitional vertebrae: prevalence, morphology and ancestry in a South African population

Dr Glen Paton[1], Prof Scott Williams[2], Prof Shahed Nalla[3], Prof Graham Louw[4]
[1]University of Johannesburg, Doornfontein, South Africa, [2]New York University, United States of America, [3]University of Johannesburg, Doornfontein, South Africa, [4]University of Cape Town, Rondebosch, South Africa

This study sought to establish the prevalence and morphological characteristics of lumbosacral transitional vertebrae (LSTV) in the South African population and its correlation with population ancestry.
The methodology was a retrospective review which was performed of 3096 consecutive thoraco-abdomino-pelvic radiographs at two large public hospitals in South Africa. Categorisation of LSTV was classified into type II, III, IV based on Castellvi et al. (1984) classification with unilateral (A) or bilateral (B) subtypes present. Comparisons were made to prevalence of the three largest population groups (participant self-identified), namely African-, Mixed- and European-ancestries.
The results were as follows: The overall prevalence of LSTV was 10% (308 out of 3096). Prevalence by Type was 67.9%, 27.6% and 4.5% for II, III, IV, respectively. The most prevalent subtype was Type IIA (41.9%), Type IIB (26%), Type IIIB (21.8%), and Type IV (5.8%), respectively. Prevalence by frequency of side was bilateral (47.7%), left (26.6%), right (21.1%), and other (4.5%: no side recognised). The sex distribution was 53.9% female and 46.1% male. Prevalence by population ancestry were 10.5%, 9.3% and 9.9% for the African-, Mixed- and European-ancestries, respectively. The African and Mixed-ancestry populations demonstrated two statistically significant results: greater affinity for the prevalence of sacralisation ($p=0.008$), and affinity for sacralisation amongst their males ($p=0.010$).
In conclusion, this study was the first dedicated study of LSTV prevalence in a South African population. There was no significant difference in the prevalence of LSTV between the three largest population groups. Statistically, sacralisation was observed in greater proportions in the African- and Mixed-ancestries, particularly among males.



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Brain clearance: The glymphatic system and beyond

Dr Iben Lundgaard
Lund University, Lund, Sweden

The brain has a distinct system for the clearance of metabolites, named the glia-lymphatic (glymphatic) system. The glymphatic system uses perivascular pathways as a site of exchange of cerebrospinal fluid (CSF) and interstitial fluid and is able to clear amyloid beta (Aß), a pathological peptide in Alzheimer's disease. First, we set up lightsheet microscopy to study CSF circulation and found that the glymphatic system was evolutionarily enhanced in pigs compared to mice. The lightsheet imaging was then expanded to pinpoint CSF tracers along efflux pathways in mice and revealed efflux to the nasal turbinates, spinal nerve roots, and cervical lymph nodes. Finally, we investigated the fate of Aß peptide and non-amyloid proteins once in the CSF, in mice and pigs. Interestingly, Aß did not re-circulate into the brain from the CSF but was instead sequestered proximally in arterioles and moved towards the blood-brain barrier, most clearly observed in pigs with larger arterioles. This work sheds new light on the glymphatic system in large mammals and the efflux pathways of CSF. Finally, it suggests that Aß is sequestered by extracellular matrix molecules that lead it towards the endothelial cells for disposal across the blood-brain barrier.