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Content

Morphometric Evaluation of Internal Acoustic Porus and Its Relation to Three Grooves of Venous Sinuses

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Introduction. The internal acoustic porus (PAI) is a small bony opening on the temporal bone petrous part, and it continues into the internal acoustic meatus. Seventh and eighth cranial nerves, labyrinthine vessels, and the internal auditory branch of the anterior inferior cerebellar artery pass through both of these structures. The upper border of the pyramid is occupied by a groove, *sulcus petrosus superior*, opening behind into the *sulcus sinus sigmoideus*. On the inner side of the posterior border of the pyramid there is a groove, *sulcus petrosus inferior*. Normal size and local anatomy of the PAI are necessary for evaluation of temporal bone trauma, course of the nerves, variations and congenital anomalies, and some procedures that are related to neurootologic surgery (*Polat et al.,* 2019; *Şekerci et al.,* 2021).

Aims. The aims of this study were to detect some measurements of the PAI on the right (R) and on the left (L) side of the skull and compare them between each other and to characterise relation of the PAI to three grooves of the venous sinuses of the temporal bone.

Materials and Methods. Materials were provided by the Laboratory of Anatomy of the Department of Morphology of the Institute of Anatomy and Anthropology, Rīga Stradiņš University. Twenty human temporal bones obtained from different skulls were studied. Specimens consisted of 10 left and 10 right temporal bones. Five measurements were performed bilaterally, using a ruler and a digital calliper with an accuracy of 0.01 mm. The estimations were expressed as millimetres. Height and width of PAI were measured on the posterior surface of the petrous pyramid of the temporal bone, and by method of *Şekerci et al.* (2021) – three distances, including the shortest distance from the highest point of the PAI to the sulcus for superior petrosal sinus (PAI-SPSS), from the lateral midpoint of the sulcus for the sigmoid sinus to the superolateral edge of the PAI (PAI-SSS) and the midpoint of the highest point of the sulcus for inferior petrosal sinus to the inferior margin of the PAI (SIPS-PAI). The ratio (width / height) of the PAI was calculated on both sides.

Results. The overall means of the measurements were: the width of the PAI 8.29 mm (R) and 8.06 mm (L); the height of the PAI 4.70 mm (R) and 4.62 mm (L). The width of the porus ranged from 6.51 mm to 10.24 mm (R), and from 6.09 mm to 10.0 mm (L). The height of the porus ranged from 3.05 mm to 6.0 mm (R), and from 3.06 mm to 6.0 mm (L). The ratio of the PAI width to height was 1.76 on the right side and 1.74 on the left.

Distance of PAI-SSS had a great variability for both sides, ranging from 13.6 mm up to 23.58 mm. The average of the distance of PAI-SSS was 19.22 mm (R) and 20.22 mm (L). On the right side, the data showed slightly larger values regarding measured longest distance (23.58 mm) and shortest distance (13.96 mm). Distance of PAI-SPSS was larger on the left side, with a minimum value 4.06 mm and a maximum value 5.98 mm. The average of the distance of PAI-SPSS was 4.57 mm (R) and 5.08 mm (L). The values of the distance of SIPS-PAI were larger on the left side, with a minimum value 6.59 mm and a maximum value 12.98 mm. The average of the distance of SIPS-PAI was 7.49 mm (R) and 8.11 mm (L).

Conclusions.

1. This study helped to determine the size and relation of the PAI to the three grooves of the venous sinuses.
2. Dimensions of the PAI and distances to three grooves varied greatly, even between right and left side of the skull.
3. The obtained data include baseline information that can be used for anatomy studies of the temporal bone, detection of congenital anomalies and evaluation of the PAI in facial and otolaryngological surgeries.

Morphometric Evaluation of Apertura Piriformis and Differences of Its Shapes

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Introduction. Piriform aperture (PA) contributes to the formation of the nose and it limits nasal skeleton anteriorly. Its boundaries are superiorly the inferior edge of both nasal bones, laterally the nasal (ascending) processes of the maxilla, and inferiorly the horizontal processes of the maxillary bones (*Fleming,* 2020). Fractures and damages of the facial skeleton involving PA are very frequent clinical findings. The size and shape of it varies between genders, different races and ethnic groups. Knowledge about anatomy and differences of PA are important and necessary for areas of anthropology, otolaryngology, forensic medicine and surgery. Preoperative evaluation of PA will predict type of nose, soft tissue as well as skeletal changes which will further improve surgical outcome (*Kabacki et al.*, 2020).

Aims. The aims of this study were to evaluate two morphometric measurements of PA, detect differences of its shapes on skulls and compare the data obtained with those reported in other studies.

Materials and Methods. Twenty two adult dry skulls of unknown age and sex were provided by the Laboratory of Anatomy of Department of Morphology of the Institute of Anatomy and Anthropology of Rīga Stradiņš University. The measurements were made with a digital Vernier caliper. Two parameters were analysed: the height of PA (PAH), where maximal height of PA was measured from the *rhinion* to the anterior nasal spine, and the width of PA (PAW), where maximal width of PA was measured as the widest between the left and right bone margin on transverse plane. The ratio of PAH to PAW was defined as golden ratio (*Meyvaci et al.*, 2019). The shape of PA was also analysed and classified, according to *Yüzbasioglu et al.* (2014). All data collected were thoroughly screened and entered into MS Excel spread sheets, and analysis was carried out. The mean values, standard deviations, maximum and minimum values, and percentages were determined for descriptive analyses.

Results. In present study, PAH varied from 2.4 cm to 5.7 cm. The most common values ranged from 4.5 cm (inclusive) to 5.0 cm (excluding), for a total of 10 measurements, with 4.8 cm (n = 3) and 4.6 cm (n = 3) being the most common. However, the most common value was 4.1 cm (n = 4). The average PAH value was 4.5 cm. The obtained measurements of PAW varied from 2.3 cm to 3.5 cm. The most common values ranged from 3.0 cm (inclusive) to 3.5 cm (inclusive), for a total of

12 measurements, with the most common value being 3.1 cm (n = 4). The average PAW value was 2.9 cm. The average golden ratio was found as 1.6.

The following results were obtained according to the shape: pear, type I (n = 11); oval, type V (n = 6); diamond, type III (n = 3), inverted heart shape, type II (n = 2). According to the literature, pear, type I was also the most common form in other populations (*De-Araujo et al.*, 2018).

Results of some other studies showed gender differences in PAH and PAW values, where higher values were detected in men (*De-Araujo et al.*, 2018).

Conclusions.
1. Results of this study showed differences in all measured parameters and shape of PA; the data may provide an important reference value for medical and surgical practices.
2. As the skeletal structure of human face is influenced by several factors, specific standards of assessment must be drawn and applied to particular population.
3. In future studies, it is necessary to create a data bank of PA in human skulls.

Predetermining Scapular Glenoid Cavity Dimensions Using Osteometric Measurements of Scapular Body

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Introduction. Scapula makes up the shoulder girdle in the appendicular skeleton and connects the upper limb to the axial skeleton. Variations of morphology of the glenoid cavity have been previously reported. These influence the surgical reconstruction or arthroplasty of the shoulder (*Chaijaroonkhanarak et al.*, 2019). This study presents the possibility to preoperatively determine the size and shape of bone graft for glenoid reconstruction surgery or prosthesis size for shoulder arthroplasty with the aim of performing necessary surgery with lower risk of postoperative complications.

Aim. The aim of the study was to evaluate the osteometric dimensions of scapula, such as scapular length, scapular width, glenoid superoinferior distance

and glenoid anteroposterior distance and calculate predictive linear regression equations to predetermine scapular glenoid cavity dimensions.

Materials and Methods. Fifty dry scapula samples were evaluated from the materials that were provided by the Laboratory of Anatomy of the Department of Morphology of the Institute of Anatomy and Anthropology, Rīga Stradiņš University. Scapular length, scapular width, glenoid superoinferior distance and glenoid anteroposterior distance were measured. Statistical analysis was conducted on the obtained data. The univariate and multivariate linear regressions were calculated to formulate the predictive equations for glenoid dimensions using IBM SPSS Statistics 21.0.

Results. The mean values ± SD of scapular length, scapular width, glenoid superoinferior distance and glenoid anteroposterior distance were: 15.27 ± 1.61, 10.57 ± 0.97, 3.67 ± 0.47 and 2.63 ± 0.31 cm, respectively. Univariate linear regression analysis found that scapular length and width were the factors that were significantly associated with glenoid superoinferior distance: $F_{(1,48)} = 24.942$, $p < 0.001$, and $F_{(1,48)} = 27.207$, $p < 0.001$, respectively. Scapular length and width were significantly associated also with the glenoid anteroposterior distance: $F_{(1,48)} = 16.916$, $p < 0.001$, and $F_{(1,48)} = 10.329$, $p < 0.002$, respectively. R-squared values ranged from 0.18 to 0.36. Multivariate linear regression analysis based on both scapular length and width found significant regression equations in terms of both glenoid superoinferior distance and glenoid anteroposterior distance: $F_{(2,47)} = 14.75$, $p < 0.001$, R square = 0.36 and $F_{(2,47)} = 8.28$, $p < 0.001$, R square = 0.23, respectively. The equations to predict scapular glenoid cavity dimensions appeared to be as follows: glenoid superoinferior distance = 0.52 + 0.08 (scapular length) + 0.19 (scapular width) cm; glenoid anteroposterior distance = 1.12 + 0.10 (scapular length) − 0,002 (scapular width) cm.

Conclusions.
1. Scapular glenoid cavity dimensions are major components that influence both shoulder arthroplasty and glenoid reconstruction surgery planning.
2. Results show that scapular length and scapular width have statistically significant association with both glenoid superoinferior and anteroposterior distances and can be used as predictive factors when predetermining mentioned glenoid cavity dimensions prior to the necessary shoulder surgery.
3. Further research is needed in order to find the most appropriate linear regression model that can predetermine glenoid cavity dimensions with highest accuracy, based on osteometric measurement of the scapular body, with the aim of decreasing postoperative complication risk for patients undergoing shoulder reconstruction or arthroplasty surgeries.

Variable Morphology of Suprascapular Notch and Its Clinical Importance in Suprascapular Nerve Entrapment Syndrome

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Introduction. The suprascapular notch (SSN) is a small depression on the superior border of the scapula, and it forms a tunnel with the superior transverse scapular ligament. The suprascapular nerve and vein run under the superior transverse ligament. The suprascapular notch is the most common site where the suprascapular nerve is compressed, thus causing nerve injury and entrapment. This syndrome is characterised by vague pain on the posterolateral aspect of the shoulder joint with atrophy of the supraspinatus and infraspinatus muscles (*Bagoji et al.*, 2020). Knowledge about the variable morphology of suprascapular notch as well as superior transverse scapular ligament ossification is very important in understanding the risk of suprascapular nerve entrapment syndrome in patients with shoulder pain.

Aim. The aim of the study was to evaluate and classify the suprascapular notch (SSN) type of 50 dry scapula samples as well as to investigate its clinical importance in development of suprascapular nerve entrapment syndrome described in literature.

Materials and Methods. Suprascapular notch (SSN) type was evaluated and classified based on *Adewale et al.* (2020) proposed classification on 50 dry scapula samples from the materials that were provided by the Laboratory of Anatomy of the Department of Morphology of the Institute of Anatomy and Anthropology, Rīga Stradiņš University. The descriptive statistical analysis was conducted on the obtained data and presented as frequency and percentage.

Results. Fifty scapular samples (25 left and 25 right) were evaluated. Gross observation showed that, based on *Adewale et al.* (2020), there were 5 different suprascapular notch types detected: absence of SSN, small depressions SSN, U-shaped SSN, V-shaped SSN and completely ossified SSN. The most common type among studied samples appeared to be U-shaped SSN type with frequency of 26 samples or 52 % of all studied samples. Less common were absence of SSN with 13 samples (26 %), completely ossified SSN type with 6 samples (12 %), V-shaped SSN type with 4 samples (8 %), and the least common type was small depression SSN with frequency of 1 sample or 2 % of all studied samples. According

to the results described in literature, main morphologic pathogenetic factors in development of suprascapular nerve entrapment syndrome appeared to be lesser width of SSN as well as the ossification of superior transverse scapular ligament. V-shaped notches have lesser width than other shapes of the scapular notch, which is common causative factor for the suprascapular entrapment syndrome (*Bagoji et al.*, 2020). As well as when the transverse scapular ligament is ossified, this morphotype can compress the suprascapular nerve and increase the risk of entrapment (*Bozzi et al.*, 2020).

Conclusions.

1. Suprascapular notch as well as ossification of superior transverse scapular ligament have an important role in pathogenesis of suprascapular nerve entrapment syndrome.
2. The most common SSN type among studied samples was U-shaped SSN, which has less potential risk on suprascapular nerve entrapment syndrome development but the least common SSN type observed in this study was small depression SSN.
3. Further research is needed to identify suprascapular notch types that have statistically significant correlation with clinically diagnosed suprascapular nerve entrapment syndrome, as well as selecting the most appropriate radiographic diagnostic methods for evaluation of SSN type.

Illustration of Anatomical Variation of Distal Femur in Relation to Endoprosthetic Reconstruction

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Introduction. Distal femur is the most common site for primary malignant bone tumour, and endoprosthetic replacement is a method of reconstruction after resection of it (*Myers et al.*, 2007). Modular megaprostheses are the most common methods of oncologic reconstruction after segmental resection of long bones. Despite the advances in material and implants designs, the procedure has an incidence of complication and failures higher than conventional arthroplasty implants (*Pala et al.*, 2017). Aseptic loosening remains a major problem after

prosthetic replacement of large bone defect where the incidence is between 4.9 % and 9.6 % in the distal femur (*Unwin et al.*, 1996). Different shapes of the articular surfaces are an important factor in the choice of prosthetic since more anatomically curved femoral stems are reported to achieve a satisfactory long press-fit stem anchorage and therefore a better long-term outcome for the patient (*Gosheger et al.*, 2006).

Aim. The aim of the study was to analyse the differences in the anatomical variations of the distal femur and to correlate this to the higher risk of aseptic loosening due to the morphological differences between the prosthesis and the structure itself.

Materials and Methods. Materials provided by the Laboratory of Anatomy of the Department of Morphology at the Institute of Anatomy and Anthropology, Rīga Stradiņš University, were used, and total of 25 femurs were measured using a precision digital caliper (mm). In the distal part, following measurements were performed for each femur: TEA (transepicondylar axis length), APH (anteroposterior height), MAP (medial anteroposterior height), LAP (lateral anteroposterior height), AML (anterior mediolateral length) and PML (posterior mediolateral length). Using the mentioned measurements, three normalised ratios of the femoral shape were calculated: TEA/APH, AML/PML and MAP/LAP. According to these ratios, shapes of the femurs were classified into six different macroscopic categories (*Mahlfouz et al.*, 2012): type I, II regarding TEA/APH, type III and IV based on AML/PML, and type V and VI based on MAP/LAP.

Results. The range of the TEA/APH was 1.29–1.62, where the mean of it was 1.41 ± 0.08. The mean AML/PML was 0.73 ± 0.05 in range 0.65–0.85, and the mean MAP/LAP was 1.00 ± 0.027 in range 0.94–1.05. In Type I femurs were defined as more square in shapes with higher TEA/APH, whereas in Type II femurs had a higher ratio and were more rectangular. In Type III femurs were more trapezoidal with smaller AML/PML ratio, whereas in Type IV femurs were more rectangular. A smaller MAP/LAP ratio implied a lesser angle between the anterior and posterior condylar axes, indicating type V, whereas the anterior and posterior condylar axes were more parallel to one another in type VI.

Mentioned ratios and the consequent classification by *Mahfouz et al.* (2012) detected the complex variations in femur morphology and suggested that there was an overly simplification to categorise femur as being "wide / rectangular" or "narrow / square". This was the current methodology used in the choice of implants. The ratio of AML/LAP had a particularly important value, because most of the distal femur components appeared to be excessively rectangular (*Bonnin et al.*, 2016).

Conclusions.

1. Morphometric and macroscopic analysis of the distal femur has shown a greater degree of variability, and it was possible to differentiate morphological variations of the distal femur in six different categories.
2. AML/PML ratio had a particular significance in the mechanical associated complication (aseptic loosening) due to excessive rectangular shape of the distal component.
3. Future research is recommended to analyse geographical, ethnical and gender differences in the mentioned structures to provide and implement the currently used prosthesis model for patients.

Alcohol-induced Damage on Cytoskeletal Protein-Immunoreactive Astrocytes in Adult Cerebral Cortex

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Introduction. Astrocytes represent the largest group of glial cells in central nervous system. In the grey matter (GM), protoplasmic astrocytes contact and enwrap synaptic elements and control synaptic transmission. Fibrous astrocytes can positively enhance myelination in the white matter (WM). Astrocytes constitute an important part of the blood-brain barrier. Based on their functions and subpopulations, astrocytes can be localised perivascularly or diffusely. Alcohol serves as a neurotoxic substance to the human brain. This persistent stimulus might initiate inflammatory responses that cause an increase of astrocyte numbers in the human brain. However, little is known about changes in the numbers of astrocytes expressing cytoskeletal protein and cell localisation dependent on alcohol consumption.

Aim. The study was undertaken to examine the expression of glial fibrillary acidic protein (GFAP) in cortical and subcortical astrocytes in cases of alcohol consumption.

Materials and Methods. The study included 25 autopsies from prefrontal GM and WM areas collected in the Latvian State Centre for Forensic Medical Examination from 2007 to 2012. Tissues embedded in paraffin blocks were divided into three groups – control group, age-matched young alcohol users and chronic

alcohol users. Obtained sections of brain tissues were immunostained by anti-GFAP antibody for detection of GFAP positive astrocytes and further analysis of their location (perivascular and/or diffuse). In each of the slides, 10 visual fields in GM and WM regions were selected, and quantitative counting of all positive cells was one.

Results. In all groups, a statistically significant ($p < 0.05$) higher amount of GFAP positive cells were found in the WM compared to GM. Significantly greater ($p < 0.001$) numbers of GFAP positive astrocytes were localised diffuse in the WM in comparison to perivascular location. In addition, most of them were detected in chronic alcohol users' group. It was found that in comparison with the control group, in chronic alcohol users' group diffusely localised astrocytes were more present in both GM ($p = 0.031$) and WM ($p = 0.016$). Similar results were observed when comparing the chronic alcoholics' group with the age-matched alcohol users' group. The perivascular GFAP cells ($p = 0.016$) and diffuse GFAP cells ($p < 0.001$) were increased in GM, but in WM only diffuse GFAP positive cells were increased ($p = 0.010$). A significant correlation between perivascular and diffuse location of astrocytes was found in age-matched alcohol user's group ($p = 0.002$; $r = 0.682$).

Conclusions. The most significant increase of GFAP positive cells was found in the WM in comparison with GM in all study groups. Significantly greater numbers of diffuse located GFAP positive cells in chronic alcohol users' group could suggest on cytoskeletal protein changes in response to ethanol-induced damage in the *cortex cerebri*.

Histopathological Changes of Joint Cartilage in Osteoarthritis

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Introduction. Cartilage is a dense and flexible type of connective tissue that provides protection to the joints. Articular cartilage consists of cells, chondroblasts and chondrocytes, and an extracellular matrix (ECM). The ECM, produced by chondroblasts, is primarily composed of type II collagen and proteoglycans. Cartilage is an avascular and aneural structure with a defined ability to regenerate. Osteoarthritis (OA) is a chronic, degenerative arthropathy of the joint,

the most prevalent form of arthritis worldwide. In OA, the primary damage is done to the cartilage and the subchondral bone. In the "wear and tear" phenomenon, mechanical overload of the joint impacts chondrocyte count and activity, and can lead to disproportional synthesis and degradation of the ECM.

Aim. The aim of the present study was to analyse changes in joint cartilage composition in OA.

Materials and Methods. 23 cartilage samples out of the 62 OA surgery materials were collected, by dissecting the obtained tissues. The collected tissue samples were embedded in paraffin blocks, sectioned, and stained by 1) hematoxylin and eosin to confirm appropriate cartilage tissue, 2) toluidine blue to evaluate proteoglycans and 3) Picro Sirius red to assess collagen fibres. Quantitative evaluation of single cells, cluster groups, and cell count in cluster groups was done using a bright-field microscope in magnification × 400 in 5 randomly selected visual fields per sample. Additionally, a semiquantitative grading method was designed to evaluate ECM area size between cells / clusters (1 – narrow space between cells / clusters; 2 – medium space between cells / clusters; 3 – great space between cells / clusters), ECM proteoglycan staining (1 – low-intensity coloration; 2 – medium-intensity coloration; 3 – high-intensity coloration) and ECM collagen staining (1 – low-intensity coloration; 2 – medium intensity coloration; 3 – high-intensity coloration). SPSS 28.0 programme was used for statistical data analysis. Data were presented as medians with an interquartile range (IQR (25 %; 75 %)).

Results. A greater number of single cells was found in comparison with cell clusters (43.00 (26.00; 61.00) and 3.00 (0.00; 9.00), respectively). Numbers of single cells and cluster groups in OA samples showed a statistically significant correlation ($r = -0.452$, $p < 0.001$). A correlation was found between a number of cells in cluster groups and both cluster groups ($r = 0.715$, $p < 0.001$) and single cells ($r = -0.253$, $p = 0.006$). A negative correlation was observed between a number of single cells and ECM area size between cells / clusters ($r = -0.490$, $p < 0.001$). A statistically significant negative correlation between ECM proteoglycan and collagen quantity was found ($r = -0.682$, $p < 0.001$).

Conclusions. A negative correlation between the quantity of collagen fibres and proteoglycans can point to severe changes in the ECM. A greater number of single cells and the less ECM space was found indicating imbalance in cell functions thus leading to degenerative diseases.

Glycosaminoglycan, Antimicrobial Defence Molecule and Cytokine Appearance Variations in Tracheal Hyaline Cartilage of Healthy Humans

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Introduction. Trachea is an essential part of the respiratory system, yet it is commonly associated with trauma and iatrogenic injuries that in severe cases require tracheal replacement with hyaline cartilage being one of the most important structures. However, very little is known about tracheal hyaline cartilage structure, protective tissue factors and variations in healthy humans, thus making it difficult to understand pathologies and organ replacement options, due to the lack of molecular targets for investigation.

Aim. The aim of the study is to research the appearance of glycosaminoglycans, specific antimicrobial defence molecules and cytokines in healthy tracheal hyaline cartilage tissues.

Materials and Methods. The tissue material was obtained from first three tracheal rings of 10 cadavers of the Rīga Stradiņš University Institute of Anatomy and Anthropology archive. The inclusion criteria were male gender, age from 30 to 60 years and that the obtained tissue sample contains the whole tracheal wall. Exclusion criterion were findings of any pathology in the material. Tissues were stained with Bismarck brown and Periodic acid-Schiff (PAS) for glycosaminoglycans and immunohistochemical staining was performed for HBD-2, HBD-3, HBD-4, IL-10 and LL-37. The slides were inspected by light microscopy and Spearman's rank correlation coefficient was used to evaluate correlations between the studied factors.

Results. Extracellular matrix of hyaline cartilage was positive throughout the entire hyaline cartilage for PAS staining, while Bismarck Brown marked positive proliferation and growth zones. Moreover, PAS and Bismarck Brown positive cells were found in large quantities in each of the hyaline cartilage zones. All of the anti-microbial defense molecules and cytokines were found in moderate number of cells, except in the mature cell zone with around few positive cells for these factors. Commonly, there were slight variations in positive cell numbers of tracheal hyaline cartilage. Spearman's rank correlation coefficient revealed strong positive correlations between HBD-3 and IL-10 and HBD-4 and LL-37. Moderate positive correlations were observed between HBD-3 and HBD-4, HBD-3 and LL-37, as well as IL-10 and LL-37, whilst moderate negative correlation was noted between PAS and LL-37.

Conclusions. Tracheal hyaline cartilage is an important tracheal defence structure that contains moderate number of antimicrobial defence protein and cytokine immunoreactive cells in normophysiological conditions. Extracellular matrix which is composed of both neutral and acidic glycosaminoglycans, which are also found in numerous positive cells across all of the cartilage zones, provides structural scaffolding of trachea as well as supports cell signalling throughout the hyaline cartilage. Correlations between the studied factors (HBD-2, HBD-3, HBD-4, IL-10, LL-37 and PAS) confirm synergistic and also antagonistic activity of them to support the baseline immunity and protect the organ from possible pathogens.

Anatomical Study of Simple Landmarks of the Mastoid Process in Relation to Its Fractures

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Introduction. Temporal bone is one of the most affected bones involved in head traumas: approximately 90 % of temporal bone fractures are seen together with concurrent intracranial injuries (*Sun et al.*, 2011). Most fractures are longitudinal and involve the mastoid process. It is a cone-shaped bone projection that belongs to *pars petrosa* of temporal bone, and it is located posterior and inferior to the ear canal and lateral to the styloid process. It is made of *cellulae mastoideae* that protect the sensitive vestibular part of the inner ear and play a role in the regulation of ear pressure. On its medial surface a pit is formed, *incisura mastoidea*, and on the medial aspect of this the *sulcus arteriae occipitalis* can be seen. Complications of the fractures at the mastoid process level might involve intracranial haemmorrhage, cerebral contusions, CSF leakage and meningitis, facial paralysis and damages to middle and inner ear structures, which could lead to conductive, sensorineural or mixed hearing loss (*March*, 2021).

Aims. The aims of this study were to study some simple analysis landmarks of the mastoid process and provide an overview of the most common fractures related to these landmarks from anatomical and clinical points of view.

Materials and Methods. Forty *processus mastoideus* from 23 different skulls were measured and analysed. Materials were provided by the Laboratory of Anatomy of the Department of Morphology of the Institute of Anatomy and

Anthropology, Rīga Stradiņš University. The measurements were performed using a digital caliper by measuring the width and length of the processes of right and left side. The length was measured between the outermost point of the bone projection until *spina suprameatica* and the width was measured from *fissura tympanomastoidea* to *incisura mastoidea.* Traditional classification was used for description of the lines of the fractures (*Kösling et al.*, 2015): longitudinal, transverse, oblique or mixed.

Results. The average length of mastoid process was 27.07 ± 3.09 mm, with a minimum of 23.37 mm and a maximum of 37.32 mm. The average width was 21.03 ± 2.92 mm, with a minimum of 16.23 mm and a maximum of 28.66 mm. On the right side, the average length of the mastoid process was 26.83 ± 3.11 mm, with a minimum of 23.37 mm and a maximum of 37.32 mm. On the left side, the average length of the mastoid process was 27.32 ± 3.07 mm, where minimal value was 23.52 mm and a maximal value was 35.50 mm. The average width of the mastoid process was 20.45 ± 2.49 mm on the right side and 21.61 ± 3.18 mm on the left side. The minimal value of the width was 16.23 mm on the right side and 17.11 mm on the left one. The maximal values were 27.02 mm and 28.66 mm, respectively.

Longitudinal fractures can be parallel to the long axis of the petrous bone and, depending on their location with respect to the labyrinthine structures, may be either anterior or posterior. Transverse fractures can be perpendicular to the long axis of the petrous bone and, depending on their location with respect to the arcuate eminence, may be either lateral or medial. The oblique or mixed category can be because many fractures can include both components. Battle's sign is a typical result of head traumas that involve the mastoid process and fractures of middle cranial fossa. It presents as ecchymosis in the area behind the ear which may indicate internal injuries and may be associated with rhinorrhea, raccoon eyes, facial nerve injuries and, in worst cases, with a depressed Glasgow coma scale (*Becker et al.*, 2021).

Conclusions.
1. Measured and analysed mastoid processes vary in length and width on both sides.
2. Different sizes are important when it leads to traumas, and some of them could appear more susceptible to temporal bone injuries close to the mastoid process or through it.
3. Knowledge of the traditional classification of the fractures provides the information about the characteristics of them.
4. Fractures of the mastoid process can range from minor concussions to very severe and urgent situations with multifunctional deficits.

Assessing Hepatic Kupffer Cell Subtypes in Chronic Alcoholism Conditions

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Introduction. More than 90 % of consumed alcohol is metabolised by the liver. Chronic alcohol consumption can activate immune response related hepatic macrophages that are fundamental for maintaining tissue homeostasis. Resident macrophages in the liver display immense plasticity. Kupffer cells are a powerful component of both liver injury and repair – found at the luminal side of the sinusoidal endothelium, with a slightly higher density around the portal regions than in the central vein regions. These cells play a crucial role in providing prompt response to hepatic tissue injury and can show phagocytic properties.

Aim. The aim of the study was to analyse Kupffer cell subtypes and their distribution in different liver tissue areas in chronic alcoholism conditions.

Materials and Methods. Hepatic autopsy samples from the Latvian State Centre for Forensic Medical Examination were collected. CD68$^+$ and Iba-1$^+$ cells in the lobular, portal and central vein areas of the postmortem liver tissue of controls (n = 11), age-matched alcohol users (n = 15) and chronic alcohol users (n = 30) were investigated using immunohistochemistry and relevant antibodies. Immunohistochemical staining results were analysed quantitatively by a light microscope using × 400 magnification. The samples were evaluated by counting positively stained cells in five randomised visual fields per area. The SPSS 28.0 programme was used for statistical data analysis.

Results. Compared to controls, chronic alcohol users demonstrated a highly significant rise in both CD68$^+$ and Iba-1$^+$ cell count in all hepatic areas (p < 0.001, respectively). Compared to age-matched alcohol users, however, chronic alcohol user liver tissue expressed more Iba-1$^+$ cells in the central vein (p = 0.007), lobular (p < 0.001) and portal areas (p < 0.001). Overall, statistically significant correlations between Iba-1$^+$ and CD68$^+$ cells were found in the central vein and lobular areas of all groups (controls r = 0.272, p = 0.049 and r = 0.405, p = 0.003; age-matched alcohol users r = 0.268, p = 0.032 and r = 0.528, p < 0.001; chronic alcohol users r = 0.384, p < 0.001 and r = 0.399, p < 0.001, respectively). Correlations between Iba-1$^+$ and CD68$^+$ cells in portal region were only found in age-matched and chronic alcohol user groups (age-matched alcohol users r = 0.580, p < 0.001; chronic alcohol users r = 0.404, p < 0.001, respectively).

Conclusions. Increased numbers of Iba-1^{+} cells in the lobular, portal and central vein areas of liver tissue could be associated with earlier indication of active immune response, in chronic alcohol users' group. Overall, increased Iba-1^{+} and CD68^{+} cell expression in the portal region of age-matched and chronic alcohol users could be a considerable risk factor responsible for development of fibrosis.

Distribution and Appearance of HBD2, HBD3, HBD4, IL-10, LL-37 and CD163 in Congenital Cleft Palate Affected Tissue in Comparison with the Control Group

Ričards Kauliņš, Faculty of Medicine, 5th year
Supervisor – *Dr. habil. med.*, Professor Māra Pilmane

Introduction. Orofacial clefts, mainly cleft lip with or without cleft palate, are congenital anomalies formed due to craniofacial development failures. It is thought that both genetic and environmental factors play important role in the disease morphopathogenesis. Although the morphopathogenesis of cleft lip-palate (CLP) has been investigated for many years, the aspect on the significance of an innate immune system in CLP affected tissue has been viewed scarcely.

Aim. The aim of this study was to investigate distribution and appearance of various antimicrobial factors (Human beta defensins (HBD) 2, 3, 4 and LL37), Interleukin (IL) 10 and CD163 positive macrophages in CLP affected palate tissue in comparison with the control group.

Materials and Methods. The CLP patient soft palate material was obtained from 17 paediatric patients during plastic surgery of bilateral and unilateral clefts. The control soft palate material was obtained from 5 subjects during *postmortem* necropsies. The tissue material used in this study is property of the Institute for Anatomy and Anthropology of Rīga Stradiņš University. The samples were stained with hematoxylin and eosin for routine morphological evaluation, meanwhile standard biotin and streptavidin immunohistochemical method was used for detection of HBD2, HBD3, HBD4, IL-10, LL37 and CD163. To evaluate the immuno-reactivity in the sample tissue, a semi-quantitative counting method was used to evaluate the frequency of positively factor stained cells in the visual field. To determine the statistically significant differences between the CLP patient and

control groups, nonparametric Mann–Whitney U test was used. Spearman's rank correlation coefficient was calculated to detect correlations between the factors in the CLP patient and control sample groups. Non-parametric Kruskal–Wallis ANOVA with appropriate post hoc tests and Bonferroni correction were performed for inter-group comparison.

Results. Overall, the control group showed more stable appearance of HBD2, HBD3 and CD163 expression compared to the CLP patient group. HBD4 positive cells were barely detected in the CLP patient oral tissue, meanwhile the control group subjects showed low, but stable appearance of HBD4 expression in oral mucosa. A statistically significant increase in CLP patient group was found in IL-10 positive cells in the oral epithelium and in the oral connective tissue as well as HBD2 positive cells in the oral connective tissue. However, it was also noticed that the CLP patient group has a significant decrease of LL37 in the oral epithelium, HBD4 in the oral connective tissue, HBD3 and HBD4 in the oral inflammatory cells, HBD3 and HBD4 in the oral blood vessel smooth muscle myocytes, HBD3 and HBD4 in the endothelium. Spearman's rank correlation coefficient showed moderate (r_s = 0.4–0.6), strong (r_s = 0.6–0.8) and very strong (r_s = 0.8–1.0) correlation strength between immunoreactives in different tissue and structures. Kruskal–Wallis ANOVA post hoc analysis revealed statistically significant differences in the number of cells expressing IL-10, HBD2, HBD3 and HBD4 amongst different cell types in CLP affected oral mucosa.

Conclusions. An increased number of IL-10 positive cells with variable appearance of CD163 macrophages in the oral mucosa suggests of increased anti-inflammatory defence with individual participation of anti-inflammatory macrophages in CLP affected tissue. Absence of HBD4 in CLP patient group does not exclude the partial decompensation of anti-microbial defence in the CLP affected site due to persistent inflammation on the phone of increased common and specific antimicrobial proteins HBD2 and HBD3.

Distribution and Appearance of Myosin, Dystrophin, and Collagen IV in Strabismus-Affected Eyeball Muscles in Comparison with the Control Group

Vita Konopecka, Faculty of Medicine, 5th year
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Introduction. Strabismus is prevalent throughout the world. Although strabismus patients may have difficulties in their daily life due to possible binocular vision dysfunction and physical disturbance, the morphopathogenesis of the strabismus is still not fully understood. However, the changes in the eyeball muscles due to strabismus may reveal the morphopathogenesis of it.

Aim. The aim of the study was to investigate distribution and appearance of myosin, dystrophin, collagen IV in strabismus-affected human eyeball muscles compared to the control group.

Materials and Methods. Ten eyeball muscle samples from strabismus patients obtained during correction surgery, and five control eye muscle specimens obtained during a post-mortem autopsy were examined. The samples used for this study were the property of the Institute of Anatomy and Anthropology of Rīga Stradiņš University. The staining with haematoxylin and eosin along with Biotin-avidin immunohistochemistry (IMH) method was used to detect myosin, dystrophin, and collagen IV. A semi-quantitative grading method was used for evaluation of the immunoreactive cells' appearance and distribution. To perform data statistical analysis, nonparametric statistic like Mann–Whitney U-test, and Spearman's rank correlation coefficient were used.

Results. In the patient group, striated skeletal muscle fibres varied in size and diameter, and newly formed muscle fibres also appeared. Myosin marked moderate number of skeletal striated muscle fibres in control and patients as well. Dystrophin mainly dominated in control cases while showed a decrease in patients. Collagen IV was positive for moderate skeletal striated muscle fibres in controls with only occasional appearance in patients. Statistically significant data were found between the patient and the control group in myosin (Mann–Whitney U: 7.0; Z-score: −2.510: p-value: 0.028), dystrophin (Mann–Whitney U: 4.0; Z score: −2.761: p-value: 0.008), collagen IV (Mann–Whitney U: 0; Z-score: −3.494: p-value: 0.001). Two high positive correlations in the patient group between myosin and collagen IV (rs = 0.640; p = 0.010; n = 15) and between dystrophin and collagen IV (rs = 0.748; p = 0.001; n = 15) were revealed by Spearman's rank coefficient.

Conclusions. Commonly, strabismus-affected eyeball muscles are char-acterised by decreased qualitative structural changes in muscle fibres and the decrease of structural organisation filaments. The diminished myosin and dystrophin appearance indicate also the beginning of muscular dystrophy, but notable decrease of collagen IV – damage of basal membranes in muscle fibres, proved by statistically significant differences and intercorrelations between the factors.

Determinations and Measurements of Some Anatomical Structures in *Scapulae*

Alina Laukötter, Faculty of Medicine, 1st year
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Introduction. *Scapula*, also known as shoulder blade, is a flat and triangular bone situated in the posterolateral chest wall extending over the 2nd to the 7th ribs. In articulations with *clavicula* and *humerus*, being connected to specific muscles, the scapula plays an important role in enabling movements of the upper limbs (*Standring et al.*, 2015). As part of the glenohumeral articulation, the glenoid cavity is involved in dislocations of the shoulder joint which, alongside the rotator cuff disease are the most common out of several conditions involving the *scapula*. *Cavitas glenoidalis* shows a broad variety of sizes and forms which need to be accounted for during treatments of diseases or shoulder arthroplasties (*Chhabra et al.*, 2015; *Kibler*, 1998). The *processus coracoideus* originates from the superior margin of the *collum scapulae* and its body points anteriorly. Fractures related to the coracoid process are very rare and often associated with shoulder injuries such as dislocations. Additionally, such fractures can prove difficult to diagnose (*Galvin et al.,* 2020; *Standring et al.*, 2015).

Aim. The aim of this study was to analyse the *scapula, cavitas glenoidalis* and *processus coracoideus* by measuring their sizes. Comparing the findings and measurements of the different specimens, conclusions about the possible clinical significance could potentially be drawn.

Materials and Methods. For this investigation 42 *scapulae*, provided by the Laboratory of Anatomy of the Department of Morphology at the Institute of Anatomy and Anthropology, Rīga Stradiņš University, were studied. Measurements were carried out with 26 left side *scapulae* and 16 right side

scapulae. The following structures were measured: length and width of the scapula, point of longest length and width of the glenoid cavity, the glenoid cavity index. Besides, the glenoid cavity's shape was determined by *Chhabra et al.* (2015). On each coracoid process, the medi-lateral width, horizontal length as well as the horizontal and base thickness were measured. All measured values, except the length of *scapula* that was measured by means of a ruler, were detected with a digital caliper.

Results. The mean length of *scapula* between *angulus superior* and *angulus interior* was 154.76 mm, ranging from 117.00 to 187.00 mm. The mean width was 94.80 mm with values in the range from 68.10 mm to 122.08 mm. Regarding the measurements of *cavitas glenoidalis*, the mean height (SI) was 38.56 mm, ranging from 28.44 to 46.82 mm. The maximum breadth (AP-1) was measured in the lower third of the glenoid cavity. The mean width was 27.31 mm, varying between 19.45 and 33.76 mm. Glenoid cavity index (GCI) was calculated based on SI and AP-1, with mean of 70.93 mm and ranging between 58.41 and 82.18 mm. Additionally, the shape of *cavitas glenoidalis* varied: 16 round-oval, 11 pear-shaped and 15 inverted comma shaped specimens were recorded. Analysing the *processus coracoideus*, the mean media-lateral width is 14.09 mm, the values ranged from 10.30 to 22.75 mm. The mean horizontal length was 43.42 mm ranging from 34.46 to 53.84 mm. Thickness was measured at the base (mean: 9.87 mm; range from 6.91 to 13.60 mm) and horizontally (mean: 11.03 mm; range from 6.86 to 43.60 mm).

Conclusions.

1. *Scapulae* sizes of the structures showed a great variability across all measurements, but directly the height of *scapula* showed the largest variance from all.
2. Anatomical characteristics of *cavitas glenoidalis* and *processus coracoideus* are essential for understanding the causes of some conditions, such as dislocations and fractures, which occur commonly and improve the treatment.
3. The high divergence of the sizes and shapes, exposed by this analysis, have to be accounted during treatments of diseases, affecting the shoulder, and in arthroplasties.

Anatomical Variations of *Processus Condylaris Mandibulae* in the Context of Electric Scooter Related Fractures

Diana Fredrika Lidford, Faculty of Medicine, 5th year
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Introduction. The mandible is the most solid and strongest among the facial bones. Simultaneously, it is the most vulnerable to fracture, mostly because it protrudes more than any other facial bone. Mandible condyle fracture has been reported to constitute from 9–50 % of all mandibular fractures, depending on population and year. To ensure successful treatment results, anatomical reduction and proper fracture stability are necessary, which depends upon anatomical variations of the condyle (*Bielecki-Kowalski et al.*, 2020). Since the introduction of electric scooters worldwide, mandibular fracture has been documented to be one of most common type of cranio-facial traumas, and condyles were a frequent site of injury (*Lentzen et al.*, 2021).

Aims. The aims of this study were to analyse the anatomical variations of the mandible condyles, specifically focusing on the differences between right and left side and to review the medical literature, regarding the most common mechanism and type of trauma related to electric scooters.

Materials and Methods. Materials provided by the Laboratory of Anatomy of the Department of Morphology at the Institute of Anatomy and Anthropology, Rīga Stradiņš University, were used, and 22 mandibles were measured using a precision digital caliper (mm), triangle ruler and a half circle ruler. The reference line for measurement of condylar neck described by *Neff* were used (*Bielecki-Kowalski et al.*, 2020). For determination of condyle head anteroposterior and mediolateral, method by *Matsumoto & Bolognese* (1995) was used (*Ishwarkumar*, 2016). Both (right and left) condyles were measured and compared. The following measurements were performed: neck height *dx et sin*, neck medium base *dx et sin*, neck medium width *dx et sin*, subcondylar base *dx et sin*, subcondylar width *dx et sin*), condyle head anteroposterior AP *dx et sin* and condylar head mediolateral (ML *dx et sin*.

Results. Among all measurements, the height of the condyle neck was the anatomical part with the biggest range – 2 mm. Furthermore, the left condyle height had a larger range of variability compared to right side. Moreover, head AP *dx* was significantly larger than head AP *sin*. Head ML *dx* and *sin* were comparable in size. However, head ML *dx* had a variability of 16.16 mm, compared to head ML *sin* – 8.61 mm. The left was on average slightly larger than the right

side in neck medium base *dx et sin*, neck medium width *dx et sin*, subcondylar width *sin* and head ML *dx et sin*.

According to study by *Coelho et al.* (2021), involving 422 injuries, only 19.1 % wore helmets and the vast majority of mechanism of injury was due to fall, followed by collision and hit by a vehicle. In most of the cases, patients presented with more than one fracture of the mandibula (73 %). The most typical combination was symphysis or body fracture, and bilateral affected ramus and/or condyle (*Lentzen*, 2021). Relating this to the mechanism of injury, this damage will affect the condyle at a higher level (*Dhupar et al.*, 2021). Among the fractures that resulted in occlusion instability, intracapsular condyle fracture was the most common type (*Lee et al.*, 2021).

Conclusions.

1. There were differences between the condyles on the right and left sides, and it could be part of the reason why a bilateral condyle fracture is not always present.
2. On the right side, the size of condyle head and condyle head antero-posterior were significantly larger than the left side.
3. It would be interesting to investigate the temporomandibular joint, the muscles and the tendons that surround the condyles to assess what impact they have on the risk of developing a fracture due to a fall from an electric scooter.
4. To combat the increasing number of condyle fracture, it is necessary to underline the role of the helmet that could protect the mandibula from fracture.

Expression of MUC-2, MUC-6, NAPE-PLD, IL-6 and IL-13 in Healthy and Metaplastic Lung Epithelium

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Introduction. The normal tissue structure of respiratory system is necessary to provide adequate protection of the airways and lungs. Prolonged exposer to trigger factors can result in adaptive mechanism activation and lead to development of chronic pulmonary diseases or even dysplastic changes.

Aim. The aim of this study was to compare mucins, cytokines and enzyme expression in lungs with different bronchial epithelium.

Materials and Methods. The respiratory system material with pseudostratified ciliated epithelium was obtained from 12 patients (aged 16 to 95) and the material with stratified squamosa epithelium was obtained from 6 patients (aged 23 to 93). Routine staining and immunohistochemistry to MUC-2, MUC-6, NAPE-PLD, IL-6 and IL-13 was proceeded.

Results. Inflammation was absent in any of the cases. Expression of MUC-2, MUC-6 and NAPE-PLD in both groups with pseudostratified and stratified squamous epithelium was detected in glands, cartilage, alveolar epithelium and alveolar macrophages only of a few specimens. Expression of IL-6 and IL-13 was detected in all structures of the group with pseudostratified epithelium and varied from occasional to moderate number of positive cells.

In the group with pseudostratified epithelium, a very strong positive correlation was detected between NAPE-PLD in cartilage and NAPE-PLD in alveolar macrophages ($\rho = 0.983$, $p < 0.001$) and between IL-13 in alveolar epithelium and IL-13 in alveolar macrophages ($\rho = 0.981$, $p < 0.001$). Strong positive correlation of alveolar epithelium and alveolar macrophages was detected between IL-6 and IL-13 ($\rho = 0.863$, $p < 0.001$), IL-6 and IL-6 ($\rho = 0.787$, $p = 0.002$), NAPE-PLD and NAPR-PLD ($\rho = 0.796$, $p = 0.002$), IL-6 and IL-13 ($\rho = 0.704$, $p = 0.011$) in the group with pseudostratified epithelium. Also, in the group with pseudostratified epithelium, a strong positive correlation of alveolar macrophages was detected between MUC-2 and IL-13 ($\rho = 0.740$, $p = 0.006$), MUC-6 and IL-13 ($\rho = 0.740$, $p = 0.006$), MUC-2 and NAPE-PLD ($\rho = 0.732$, $p = 0.007$), MUC-6 and NAPE-PLD ($\rho = 0.732$, $p = 0.007$). There was detected a strong positive correlation of alveolar epithelium between IL-6 and IL-13 ($\rho = 0.894$, $p < 0.001$), NAPE-PLD and IL-6 ($\rho = 0.766$, $p = 0.004$), between IL-6 and IL-13 in cartilage ($\rho = 0.825$, $p = 0.001$), NAPE-PLD in cartilage and NAPE-PLD in alveolar epithelium ($\rho = 0.817$, $p = 0.001$), MUC-2 in alveolar macrophages and NAPE-PLD in cartilage ($\rho = 0.711$, $p = 0.009$), MUC-6 in alveolar macrophages and NAPE-PLD in cartilage ($\rho = 0.711$, $p = 0.009$).

Expression of IL-6 and IL-13 was detected almost in all structures of the group with stratified squamous epithelium and dominantly was expressed in moderate to numerous cells. A number of correlations was detected in the group with stratified squamous epithelium, but the most important was a very strong positive correlation between IL-13 in alveolar epithelium and IL-13 in alveolar macrophages ($\rho = 0.953$, $p = 0.003$) and a strong positive correlation between IL-6 in alveolar epithelium and IL-6 in alveolar macrophages ($\rho = 0.832$, $p = 0.04$). Also, there was detected a statistically significant difference between IL-6 in alveolar macrophages ($p = 0.024$) and the group with pseudostratified epithelium.

Conclusions.

The appearance of stratified squamous epithelium is local and not accompanied by any other dysplastic tissue changes. Increased secretion of IL-13 in the group with stratified squamous epithelium shows its involvement in metaplasia of bronchial epithelium. Secretion of tissue factors by hyaline cartilage demonstrates its plasticity and adaptability.

Obstetric Conjugate Measurement as Predictor of Successful Vaginal Birth

Kristiāna Maskava, Faculty of Medicine, 2nd year
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Introduction. In the last few decades the caesarean births have increased throughout the world, half of which is considered to be unjustified. When the unnecessary caesareans are performed, the risk of complications increases, both – for mother and child. Some of the negative effects include preterm birth and increased neonatal death (*Guzmán-López et al.*, 2016). Thus, it is important to determine the possibility for women to give birth vaginally successfully. One of the measurements of the female pelvis, which is important to determine, is the obstetric conjugate that is the distance between the centrum of the sacral promontorium and the posterior border of the symphysis pubis located few millimetres below the border (*Salk et al.*, 2016). The diameter of this conjugate can help to predict the possible childbirth outcomes.

Aims. The aims of this study were to measure the obstetric conjugate of the 10 female pelves samples and to predict the possibility for the successful vaginal birth.

Materials and Methods. The obstetric conjugate was measured on 10 female pelvis samples, provided by the Laboratory of Anatomy of the Department of Morphology of the Institute of Anatomy and Anthropology, Rīga Stradiņš University. The age and the height of the samples were unknown. Digital caliper and a ruler were used to determine the length of the obstetric conjugate. Digital analysis of the measurements was done and all data, including mean values and standard deviations (SD), were analysed by using Excel and IBM SPSS 27.0. Obtained information was compared to the literature data, which informed about the obstetric conjugate measurements as a predictor of a successful vaginal birth.

Results. The measurements of the obstetric conjugate showed that the mean value was 11.42 ± 0.99 cm. The maximum value and the minimums being 12.80 cm and 9.40 cm. Two of the samples had the obstetric conjugate less than 11.00 cm, accordingly 9.40 and 10.10 cm. The biggest obstetric conjugate was 12.80 cm. Some authors suggest that the cut off value for the successful vaginal birth, which does not need any other examinations, is 11.7 cm (*Stevenson et al.,* 1975, *Tanaka et al.,* 2021). Thus, only 6 of the 10 female pelves samples could be with the increased possibility to give successful vaginal birth. Furthermore, because the average baby weight at the term is about 3400 g, 11.70 cm is the minimum length of the obstetric conjugate necessary for the safe vaginal birth, but for the preterm labour at 38 weeks, when the baby weight would be around 3200 g, the minimums length of the 11.40 cm of the obstetric conjugate would be necessary (*Stevenson et al.,* 1973). Thus, the 6 pelvic samples would qualify for the term labour and 7 female pelvic samples for the preterm labour at the 38 weeks.

Conclusions.

1. The obstetric conjugate is helpful in predicting the mode of delivery.
2. The mean obstetric conjugate was 11.42 cm, which indicates that some women in case of pregnancy would need to undergo more extensive examinations to see if they could deliver vaginally successfully.
3. The probability of successful vaginal birth increases if the diameter of the obstetric conjugate increases.
4. Considering the results by *Stevenson et al.* (1975), *Tanaka et al.* (2021), in this study 40 % of the female pelves would qualify for the further investigation, to determine the possibility to give vaginal birth successfully.

Pelvic Shape Differentiation Using Turner and Thoms' Classification

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Introduction. Traditionally, to determinate the shape of pelvis, there is used classification of *Caldwell-Moloy* (1933). It includes 4 pelvic shapes – gynaecoid, anthropoid, android and platypelloid. Referred to the *Caldwell–Moloy's* classification, *Turner* and *Thoms* (1946) subdivided these pelvic shapes into four groups: dolichopellic type (anthropoid pelvis), mesatipellic type (gynecoid type), brachypellic type (android pelvis) and platypellic type (platypelloid pelvis). According to this division, it is possible differentiate the pelvic shapes by measuring the anteroposterior diameter and the transverse diameter of the pelvic inlet (*Delprete*, 2017).

Aims. The aims of this study were to measure 10 female pelves samples and determine the most common pelvic shape.

Materials and Methods. The pelvic measurements were taken from 10 female pelves samples, provided by the Laboratory of Anatomy of the Department of Morphology of the Institute of Anatomy and Anthropology, Rīga Stradiņš University. A ruler and digital caliper were used to obtain the different pelvic measurements. Digital analysis of the measurements was done and all date, including mean values and standard deviation (SD), were analysed by using Excel and IBM SPSS 27.0. Obtained information was compared to the literature data, which informed about different pelvic shapes among the women.

Results. The measurements of 10 female pelves samples and their subdivision, using the *Turner* and *Thoms'* (1946) classification, showed that there were: 6 android pelves, where transverse diameter (TD) was more than 10 mm and less than 30 mm longer than anteroposterior diameter (APD), 2 gynecoid pelves (APD was equal to the TD or the TD was no more than 10 mm longer than APD) and 2 platypelloid pelves (TD exceeded the APD by more than 30 mm). There were no samples of anthropoid pelves (APD longer than the TD).

The study by *Kuliukas et al.* (2015) showed 41.7 % gynecoid, 31.9 % anthropoid, 24.9 % android and 2.2 % platypelloid pelvic shape prevalence in the populations, although anthropoid pelvis was the most common among the men. The researchers underlined that there the most common type of female pelvic shape was android pelvis (60 %) and it was also confirmed in the study by *Delprete* (2017). Nevertheless, other studies suggested that the most common type of female pelvis shape was gynecoid (*Salk et al.*, 2016; *Hobel et al.*, 2016).

Conclusions.

1. Use of different classifications might give different results regarding the female pelvic shape.
2. In this study, 3 out of 4 female pelvic shapes were differentiated – android (60 %), gynecoid (20 %) and platypelloid (20 %).
3. Based on a comparison of the results in other studies, female pelvic morphology is extremely variable.
4. Further studies are recommended to obtain more information about the variations in female pelves and their shapes.

Analysis and Interpretation of Some Anthropometric Parameters for Detection of Sexual Dimorphism in the Human Mandibles

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Introduction. Gender estimation is the first step to analyse the human skeleton. It is essential to recognise the dimorphism between genders. When knowledge of the human dimorphism is applied, it can be possible to identify the gender, even when there are only few parts of the skeleton that can be used for analysis (*Mello-Gentil et al.*, 2021). The humans' mandible is dimorphic and can be used to determine the gender of an unknown mandible if other skeleton parts as the pelvis or skull is fractured or is not found.

Aims. The aims of the study were to understand theoretically and detect practically dimorphism in the humans' mandibles and to describe relationships between some parameters that would help distinguish the gender.

Materials and Methods. The mandibles and instruments where provided by the Laboratory of Anatomy of Department of Morphology at the Institute of Anatomy and Anthropology, Rīga Stradiņš University. Several parameters were chosen to detect the gender: length, maximal and minimal width of ramus (*dx*, *sin*), distance between bicondylar length, mandibular length, angle and index. Ramus maximal and minimal width, bicondylar length was measured using a digital caliper by placing the mandible against a support which was 90°, ramus length and mandibular length was taken by using millimetre paper, the mandibular index was calculated using a formula, the mandible angle was measured using

a protractor. The data and correlations were analysed by using Excel and IBM SPSS 27.0. All mandibles were divided in 3 groups, according to the gender: male (group 1; n = 33), female (group 2; n = 13) and unidentified (group 3; n = 6). The last group was excluded from analysis. The data was compared between the sides of mandible, genders and other studies.

Results. Six parameters were detected larger in group 1, where in group 2 only the angle of the mandible was confirmed to be larger. The mean values of ramus length (*dx*) were larger than ramus length (*sin*) in both groups: 61.74 mm (group 1), 50.89 mm (group 2) on the right side and 61.41 mm (group 1), 50.63 mm (group 2) on the left side. For both genders maximal and minimal ramus width also was larger on the right side. There were significant and positive correlations (p < 0.001) between the angle of mandible and ramus length (*dx*): 0.965 (group 1) and 0.977 (group 2). The lowest correlations were detected between bicondylar length and mandibular index (*dx*) 0.068 (group 1) and mandibular length (*sin*) 0.226 (group 2). In group 2, a strong correlation (p < 0.001) between ramus length (*dx*) with minimal ramus width (0.715) was detected, but in group 1 this correlation did not exist. In group 1 and group 2 there were no considerable significant correlations (on both sides of mandible) between mandibular length and bicondylar length, and the angle of mandible with maximal ramus width.

Comparing parameters to the golden standard, only the mandibular angle showed a significant difference for the group 2 where the mean value on both sides was 127.67° (*dx*) and 129.63° (*sin*), but the golden standard was 130.61° (*dx*) and 131.12° (*sin*). From 3 pairs of the significant parameters (both sides mandibular angle and ramus length, mandibular angle and mandibular length, mandibular length and ramus length), greater correlation coefficients were in group 2 in comparison with group 1.

Conclusions.

1. In this study, all used parameters can be helpful for determination of the gender.
2. Parameters of the male mandibles (group 1) were larger than in female mandibles (group 2).
3. There were more correlations between female mandibles than male mandibles, but male mandibles can be more challenging to detect due to the parameters not being as related.
4. As an indicator, to faster detect the gender, the angle of the mandible is most useful; based on the data from the chosen parameters, the angle was the only slightly larger in group 2 compared to group 1.
5. Sexual dimorphism was seen in correlation coefficients that were existent or inverse to one gender, but not to the other.

6. The human mandibles were asymmetrical, because, on the right side, parameters were commonly larger than on the left side in both genders; consequently, when detecting the gender of a mandible. it is necessary to take the asymmetry into consideration.

Morphological Peculiarities of the Rectum in Patients with Grade III and Grade IV Types of Haemorrhoids

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Introduction. Nowadays haemorrhoids are a very common anorectal condition in which a symptomatic enlargement and distal displacement of haemorrhoidal plexus veins and destructive changes in connective tissue are seen. The risk factors for this condition are as common as haemorrhoids themselves. These are – constipation, long sitting, pregnancy, obesity, straining, etc. Although haemorrhoids are a common problem, not everybody needs surgical treatment and can manage it with dietary and lifestyle modifications and topical treatments. Haemorrhoids are classified into 4 groups in Goliher's classification: first-degree haemorrhoids occur with occasional bleeding, but not prolapsing; in second-degree – prolapsing reduces spontaneously; only in the third and fourth-degree haemorrhoids prolapsing is constantly present, causing pain and other complications, and needs surgical treatment.

Aim. The aim of the study was to examine morphological disparities between grade III and grade IV types of haemorrhoids in men and women.

Materials and Methods. Surgical tissue samples obtained from 29 men and 31 women with grade III and grade IV haemorrhoids were examined in this study. The histopathological stainings performed included hematoxylin and eosin staining, and Van Gieson's and Picro Sirius red staining for the assessment of collagen. In each of the slides, a type of epithelium characteristic of the surface of the anal canal either above or below the pectinate line, the presence of inflammatory cells, and venous sinuses were assessed. The density of connective tissue fibres appearing in Van Gieson's and Picro Sirius red staining was graded semi-quantitatively from 0 to 4, where: 0 – loose, 1 – minimally dense, 2 – moderately dense, 3 – markedly dense, and 4 – very dense. SPSS Statistics v.23 was used to analyse the data.

Results. In 22 women and 24 men, haemorrhoids obtained from the anal canal region above the pectinate line were covered by simple columnar epithelium, whereas, in 8 women and 3 men, haemorrhoids obtained from the anal canal region below the pectinate line were covered by stratified squamous epithelium. In 1 case for women and 2 cases for men, lesioned tissue was obtained from the transitional zone. Inflammatory cells were observed in all slides except for 1 in men. Simultaneously, in women, inflammatory infiltrates were observed in 23 cases. Fewer cases had loose connective tissue than moderately and markedly dense connective tissue. Venous sinuses were found more often than compact veins.

Conclusions. Haemorrhoids develop more often above the pectinate line. As two staining methods were used, Picro Sirius red staining was distinguished as more suitable in the assessment of collagen appearance in the given tissue samples. In both men and women, lesioned connective tissue presents mostly with the increased density of collagen fibres, infiltration of inflammatory cells, and large venous sinuses which reflects to the clinical symptoms observed in subjects with grade III and grade IV types of haemorrhoids.

Anatomical Determination and Measurements of *Condyli Tibiae*

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Introduction. *Tibia* is a bone involved in *articulatio genu* also known as the knee joint which is known as the most complicated joint of the human body. Despite its complexity, it has little muscular support, over time often degenerates and could be affected by osteoarthritis. These structural changes are influenced by numerous aspects ranging from wrong foot posture, injuries of ligaments and menisci to traumatic incidents. Consequently, many patients face arthroscopic treatment or get artificial knee joints. Therefore, it is crucial to get a better insight into the proximal tibia (*Akaltun*, 2021). The plateau of proximal tibia consists of *condylus lateralis* and *condylus medialis*. Whereas *condylus medialis* is more shaped like an oval, *condylus lateralis* is more circular. Both articulation surfaces contain their own meniscus (*Paulsen et al.*, 2011). Between the two condyles *eminentia intercondylaris* is located.

Aims. The aims of this study were to analyse the proximal tibia with special focus on the diameters of the condyli and diameters of proximal tibia and to compare the measured values to other studies and available data in literature.

Materials and Methods. Twenty dried human *tibiae* were provided by the Laboratory of Anatomy of the Department of Morphology at the Institute of Anatomy and Anthropology of Rīga Stradiņš University. Ten left and ten right *tibiae* were measured and compared. Age and gender of the bones were unknown. Measurements were taken by the usage of a digital Vernier caliper. The length of the *tibiae* was measured by tape measure. Parameters that have been measured were: diameter of *condylus medialis* anteroposterior (MCAP), diameter of *condylus lateralis* anteroposterior (LCAP), *condylus medialis* transverse diameters (MCTD), *condylus lateralis* transverse diameter (LCTD), total diameter of *condylus tibiae* anteroposterior (TTC-AP) and total transverse diameter of *condyli tibiae* (TTC-TD). Collected data were entered into MS Excel, and analysis was carried out. The mean values, standard deviations, maximum and minimum values, and T-values were determined for descriptive analyses. All measured parameters were compared to study by *Bamne & Pandalai Gayathri* (2020).

Results. The mean diameter of MCAP was 43.16 mm, ranging from 32.70 to 53.42 mm, whereas the mean diameter of LCAP was 39.77 mm. It ranged from 24.44 to 52.97 mm. The average diameter of MCTD was 30.63 mm, ranging from 26.14 to 36.72 mm. The average diameter of LCTD was 31.10 mm and it ranged from 24.85 to 36.20 mm. The mean TTC-AP was 48.97 mm that ranged from 38.81 to 57.70 mm. The mean TTC-TD was 71.47 mm. It ranged from 61.52 to 79.80 mm. It was observed that measurements of right *tibiae* appeared to be mostly smaller than left *tibiae*. By statistical means, only MCAP and MCTD can be considered relevant in proving right side (41.87 and 29.20 mm) to be smaller than left side (44.46 and 32.07 mm). In comparison to results by *Bamne & Pandalai Gayathri* (2020), these investigated bones appeared to be greater in size than those of the bones of Indian specimen. Statistically all measured values can be taken into consideration to prove that in this study measurements of the condyles were bigger than Indian. In both of these studies only LCTD of the left side showed lesser values in comparison with differences between other measurements.

Conclusions.
1. The results of our study show that there exist a lot of anatomical variations of the tibia plateau and it should be considered carefully during the design process of the tibia prosthesis.
2. There is a great importance to obtain morphometric parameters of the *tibiae* individually and for populations because of the difference in sizes and sides of the bones.

Morphologic Study of Proximal and Distal Tibia Bone for Intraossear Application

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Introduction. The use of Intraossear application (IO) was first described in 1920 and it allows for a quick vascular access, especially for critical patients within 20 seconds (*Dornhofer & Kellar*, 2021). Situations can vary from cardiac arrest, septic shock to traumatic incidents. Studies found that IO success rates are twice as large as attempts for intravenous access in above mentioned situations. Although, success rates are high not only for adults but especially for children, IO is not as frequently used as it should be. This is caused by lack of knowledge, training and general insecurities. The proximal tibia is the most commonly used application location, recommended site is approximately two fingers below patella and 1–2 cm medial of tibial tuberosity. Placement on the distal tibia should be placed "2 cm proximal to the medial malleolus" (*Dornhofer & Kellar*, 2021).

Aim. The aim of the study was to examine medullary cavity and cortex of proximal and distal tibias, in order to draw conclusions about optimal application site in tibias and to compare findings with measurements of a study on Anatolian bones and draw conclusions on variations between ethnic groups (*Polat*, 2018).

Materials and Methods. Two dried human tibias of the right side were provided by the Laboratory of Anatomy of the Department of Morphology of the Institute of Anatomy and Anthropology of Rīga Stradiņš University. From the highest elevation of tibial tuberosity, tibias (PT) were sawn in horizontal plane in 1 cm steps until a distance of 5 cm. Distal tibias (DT) were sawn in 1 cm steps from articulation surface until a distance of 4 cm. Sawing was conducted via manual saw and jigsaw. Afterwards, several measurements were taken: width of cortex of anterior margin (CAM), width of cortex midline medial surface (CMS), width medullary cavity at anterior margin to posterior surface of medullary cavity (MCAM), width medullary cavity from midline medial surface to posterior surface of medullary cavity (MCMS), width anterior to medial margin (WAM), length of tibiae from *eminentia intercondylaris* to *facies articularis tibiae distalis* (LT). Measurements were taken by digital Vernier caliper, length was measured by measuring tape, sawing marks were created by usage of a ruler. Measurements of PT were compared with study on Anatolian bones (*Polat*, 2018) by performing a two samples t-test with a 95 % confidence interval using the software R studio.

Results. The mean distance of all CMS-PT measurements was 2.11 mm, ranging from 1.64 to 2.39 mm. In accordance to that, the mean MCMS-PT was 26.14 mm, ranging from 20.82 to 32.77 mm. CMS-PT is smallest at 2 cm below tibial tuberosity (1.91 mm), with sufficient MCMS (26.83 mm). The average distance of all CMS-DT measurements was 0.83 mm, ranging from 0.55 to 1.28 mm. Average MCMC-DT was 33.77 mm, ranging from 27.22 to 41.42 mm. CMS-DT is smallest at 1 cm proximal to medial malleolus (0.55 mm), with sufficient MCMS-DT (41.43 mm). Results are consistent with the study conducted on Anatolian bones. Compared to Anatolian bones, bones of this study appear to have a significantly thinner cortex and larger medullary cavity ($p < 0.05$). This finding is conclusive with previous studies showing northern populations have less cortical bone than populations living closer to the equator (*Virtama*, 1976). However, variation is not so large as to affect safeness of IO application.

Conclusions.

1. Recommended IO application sites can be confirmed by conducted measurements of cortex thickness and medullary cavity diameter, although optimal application site for distal IO may be even 1 cm closer to medial malleolus.
2. Significant differences exist between thickness of the cortex and diameter of the medullary cavity in different ethnic groups, however a larger sample is necessary to confirm this finding.
3. Further research should be conducted to substantiate optimal IO application sites, skin thickness and location of relevant other anatomical structures.

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