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RĪGA STRADIŅŠ
UNIVERSITY

INSTITUTE OF ANATOMY
AND ANTHROPOLOGY

**XXIX Student International Conference of
MORPHOLOGY SCIENCES**

9 May 2024, Rīga

Abstracts Book



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Liver Caudate Lobe Variations, Sizes and Possible Cirrhosis Macro Signs

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Introduction. The human liver is the largest abdominal organ and gland in the human body. It is vital in blood filtering, vitamin storage and bile production (Sierosłowska, 2023). The liver is divided into four lobes; however, within the scope of this research, the most important will be the caudate lobe, also known as the Spigelian lobe (Murukami *et al.*, 2002), which in general is between the right and left lobes, but specifically it is located behind the *ligamentum venosum*, from the back, *v. cava inferior*, before the *porta hepatis* (Vernon *et al.*, 2022). It is crucial to study the caudate lobe since it has a blood supply and biliary drainage, making it independent from the right and left lobes. For instance, it can be used to find liver diseases such as cirrhosis by comparing the sizes of the right lobe (Sago *et al.*, 2018).

Aim. This study aims to measure caudate lobe transverse and longitudinal distance, detect and evaluate morphological variations, determine the right lobe longitudinal distance and Harbin's index, and compare it with other resources.

Materials and Methods. For measurements and identification of the forms, the Laboratory of Anatomy of the Department of Morphology of the Institute of Anatomy and Anthropology provided the cadaveric livers and the virtual dissecting table “*Anatamage*.” Four virtual livers and six cadaver livers were used. A digital Vernier caliper was used to measure the posterior transverse and longitudinal distances in millimeters on the livers. On the livers, three lines were intersected with sewing threads and pins. Line 1 was drawn straight by the portal vein. Line 2 was drawn parallel to Line 1, but Line 3 was perpendicular to Line 1. The maximum values of respective distances were taken (Bhavin *et al.*, 2019; Ibrahim, 2020). For each line, three measurements were taken. The caudate lobe morphological variations were determined. The program “*ImageJ*” was used to measure the right lobe transversal distance of the liver and used Harbin's index (caudate lobe transverse distance against right lobe transverse distance) to find out if any liver has cirrhosis (Jaikumar *et al.*, 2021). To be diagnosed with liver cirrhosis, the ratio must be equal to or greater than 0.65 because the right lobe shrinks and the caudate lobe enlarges.

Results. In the ten livers, 40 % had pyriform-shaped caudate lobes, 30 % were rectangular, 20 % were bicornuate, and only 10 % were globular-shaped, using the classification of *J. Abraham et al.* (2015). The right lobe transverse distance was from 53.33 mm to 134.59 mm, and the mean distance was 96.58 ± 26.1 mm. The caudate lobe transverse distance was 11.68 mm to 37.02 mm, and the mean distance was 27.78 ± 8.57 mm. The caudate lobe longitudinal distance was from 28.09 mm to 77.02 mm. The mean value was 48.48 ± 14.54 mm. Harbin's index mean ratio was 0.3 ± 0.12 . The first studied cadaveric liver had a ratio of 0.53. It was the maximum value of all ten livers and closest to 0.65. The minimum value was 0.12. Comparing the present study results with *Prasad et al.* (2021), the mean transverse distance was 90.87 ± 12.52 mm for the right lobe, and the value for this research was 5.71 mm wider. For the caudate lobe, the transverse distance was 30.05 ± 4.93 mm, and the obtained data was 2.27 mm narrower compared to *Prasad et al.* (2021). The longitudinal distance was 57.46 ± 5.26 mm. The data is close to *Prasad's* research and can be accepted as viable.

Conclusions.

1. In this study, the most common shape of the caudate lobe was pyriform.
2. According to Harbin's index, cirrhosis was not observed, but the portal vein diameter measurements and liver surface indication could be used in detailed future studies.
3. The measurements of the liver are essential to verify the shape of the caudate lobe because they reduce the risk of misdiagnosis and enlargement as a sign of cirrhosis.

Anatomical Aspects of the Conductive System of the Heart

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Introduction. Heart serves as a vital organ that is responsible for systematic delivery of oxygenated blood to all tissues in the body. This process hinges upon the orchestrated excitation of pacemaker cells, which form the conduction system of the heart comprising notably the sinuatrial and atrioventricular nodes. Arrhythmia is essentially a deviation from the normal firing heart rate or a rhythm that is not physiologically justified (*Okamoto et al., 2022*). Arrhythmias

can be caused by heart disease, electrolyte imbalances, medications, genetic disorders, stress and caffeine consumption. The main detected risk factors are number of diseased coronary vessels, smoking and alcohol consumption. According to the study performed on young patients, suffering of coronary syndrome, 55 % of the patients were detected with arrhythmia (Posch, 2020).

Aim. The research aims to analyse and review information regarding the conductive system of the heart and its various disturbances, particularly focusing on different types of arrhythmias, with a specific emphasis on atrial fibrillation. Additionally, the study involves examination of the heart topography through dissection, observation and identification of cardiac structures and coronary vessels. Furthermore, it explores the topography of *truncus pulmonalis* and *v. cava superior*.

Materials and Methods. The Laboratory of the Anatomy of the Department of Morphology at the Institute of Anatomy and Anthropology provided the human cadaver and instruments required for dissection. Theoretical research was performed by literature review.

Results. Analysis of the literature has shown that arrhythmia is a deviation from the normal firing heart rate that is not physiologically justified. It is characterised by irregular heart frequency. The value of arrhythmia is lower in younger patients (55 %) compared to the elderly patients (71.05 %) (Du-Guan Fu, 2017). One of the main variations of arrhythmia among young patients is atrial fibrillation (AF). Retrospective study of patients in Sweden, who had a clinically confirmed AF, was done in the time frame between 2005–2010. They associated 307,476 individuals with a diagnosis of atrial fibrillation, of these, 209,141 were still alive on the last day. The prevalence of clinically diagnosed AF in Sweden composed 2.9 % of the total adult (more than 20 years) population (Friberg et al., 2013). According to Shimotakahara and his colleagues (2014), the sinoatrial node gets blood supply from the right coronary artery in 184 branches (57.5 %) and in 136 branches (42.5 %) from the left coronary artery (circumflex artery). The pacemaker cells may malfunction, producing signals at the wrong time. Accurately diagnosing and treating arrhythmias requires careful evaluation by a healthcare provider. The dissection included the following activities: investigation of thoracic cavity after providing opening, dissection of the heart and coronary vessels, observation of the topography of *a. coronaria dextra* and *a. coronaria sinistra*, *truncus pulmonalis* and *v. cava superior*.

Conclusions.

1. Frequent arrhythmia is very rare in young people and more frequent in older individuals. The probability of arrhythmia increases among younger adults if there is an underlying disease in the patients, smoking, alcohol consumption, electrolyte imbalances.
2. Sinuatrial node gets blood supply from branches of *a. coronaria dextra* and *ramus circumflexus a. coronaria sinistra*. The main arrhythmia detected risk factors are number of diseased coronary vessels.
3. The study helped to detect the topographical aspects of coronary vessels. The knowledge about accurate topographical anatomy of coronary vessels, the topography of *truncus pulmonalis* and *v. cava superior* has clinical importance for diagnosis and treatment arrhythmias.

Cytokines in the Different Gestational Age Placentae

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Introduction. Pregnancy represents a distinctive immunological phase wherein the maternal immune system demonstrates tolerance towards the developing fetus. However, there has been a noticeable decline in successful pregnancies and births, prompting inquiries into potential factors contributing to this fact. The existing literature also exhibits a scarcity of information regarding the interplay between placental dynamics and successful gestation, raising questions about the impact of different tissue factors on placenta.

Aim. The aim of this study is to investigate the activity and interrelationships among various interleukins (ILs), including IL-1 α , IL-2, IL-4, IL-7, IL-8, IL-10 and IL-6, within placentas of various gestation ages.

Materials and Methods. A cross-sectional descriptive analysis was conducted on 15 placentae obtained from the three different gestational ages (28, 31 and 40 weeks) due to the pre-term and term labour; all placentae possessed placental distress syndrome. Material was obtained from the archive of the Institute of Anatomy and Anthropology, Riga Stradiņš University. The pregnancy was categorised into three groups as per World Health Organisation guidelines. Placental samples were routinely stained with haematoxylin and eosin.

Standard streptavidin and biotin immunohistochemistry (IMH) were used to reveal IL-1 α , IL-2, IL-4, IL-6, IL-7, IL-8 and IL-10. The semi-quantitative counting was employed to determine the relative number of positive structures. Descriptive statistics, including the Independent-Samples Kruskal-Wallis Test and Spearman's rank correlation, were employed to analyse nonparametric data.

Results. The number of IL-1 α positive structures was the highest and almost equal in all gestational ages; IL-7 showed the indistinct number of positive cells with an exception in the 31st week, where it has reached moderate numbers. IL-2 and IL-8 decreased constantly from the 28th to the 40th developmental weeks with more variations for IL-8 positive cells. Only occasional to few positive cells for IL-4 and IL-10 were detected in all gestational week placentae, while IL-6 showed a slightly higher number of positive cells, but mainly in the macrophages.

The statistically significant difference of studied cytokines was found between placentae of all three ages, as well as between all four different placental structures: between the IL-4 expression in the cytotrophoblast, endothelium and macrophages, as well as between the IL-2 expression in the cytotrophoblast, extraembryonic mesoderm, endothelium structures of the 40-weeks-old and 28-weeks-old placentae. The difference between IL-4 and IL-7 expression in the endothelium and extraembryonic mesoderm structures of the 40- and 31-weeks-old placentae was also marked as statistically significant. The statistically significant positive and negative correlations were found between both pro-inflammatory and anti-inflammatory interleukins: IL-4 and IL-2 expression in the cytotrophoblast.

Conclusions. The persistent dominance of inflammatory cytokine IL-1 α points the significant role of this cytokine in all distressed placental gestational time, strengthened also by IL-2 and IL-8 in specific compartments of placenta of early gestation. The indistinct appearance of IL-7, except 31 weeks moved out this cytokine from the regulators of placental function in early and late gestation. Just occasional positive numbers of anti-inflammatory cytokines IL-4 and IL-10 indicates their uselessness in sterile fetus development, while slight increase of the regulatory cytokine IL-6 in Hoffbauer cells proves its selective functioning in distressed placenta.

Development and Installation of Lateral-Inferior Orbital and Zygomatic Implant for Reconstruction of Facial Structures After Orbital Damage

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Introduction. Orbital fractures occur when one or more bones in the eye socket are broken, typically as a result of a facial trauma. The incidence of these fractures has increased due to the increased rate of traffic accidents, industrial accidents, sports-related injuries and physical assaults. Orbital fractures can be classified into three types: blowout, orbital rim or orbital floor fracture. However, not all orbital fractures require surgery. Demographically, most patients with orbital fractures are males, with motorcycle accidents being the most common cause of injury. Majority of patients are young and present with unilateral fractures (*Seen et al.*, 2021).

Aims. The study aims to: 1) review the literature on lateral-inferior orbital and zygomatic bone reconstruction and common complications; 2) develop an implant to reconstruct facial symmetry; 3) make a 3D scan of a skull with lateral-inferior orbital and zygomatic bone affected by osteoporosis; 4) model an implant using computer software; 5) print the implant; 6) implant the printed model into the skull.

Materials and Methods. A dry human skull sample was provided by the Laboratory of Anatomy of the Department of Morphology at the Institute of Anatomy and Anthropology, Rīga Stradiņš University. The sample was scanned using a portable 3D scanner “*SHINING 3D, EinScan-H*” on a scanning platform. The model was edited using software provided by the scanner manufacturer. The “*MeshLab*” software was used to simplify the scan, which made it easier to model the implant. The implant was printed using a stereolithography 3D printer “*Formlabs 3BL*” with material “*Model*” from the company “*Formlabs*”. Finally, the printed prosthesis underwent post-processing.

Results. The provided skull had broken right lateral-inferior orbital and zygomatic bone parts, whereby measuring with the digital caliper, the orbita lateral side was 22.04 ± 0.01 mm, inferior 24.63 ± 0.01 mm and zygomatic process 31.71 ± 0.01 mm. During the study, structured light technology was utilised to scan the skull because of its higher precision in comparison with the infrared light-based technology. Due to the choice of the scanning methodology, the scan has

been performed in the dark room to limit the surrounding light's interference with the scanners' sensor. To reconstruct the damaged area, a mirrored skull model was created using the "Meshmixer" mirroring feature, which was then cut to make it fit. However, since the other side of the skull did not have *processus temporalis ossis zygomatici*, the missing part was modelled using the "Meshmixer" brushes feature. After printing the implant out, it was post-processed by immersing it into the container filled with a detergent, followed by the curing process with UV light. The implant was designed to ensure that the most fragile part was removed from the skull with an electric saw during implantation stage. During post-process of creation for a stable surface in order to attach the implant to the skull, a "Moment epoxilin" was used as an alternative material to bone cement to fill the maxillary sinus of the right side. After that, the implant was also glued to the place with the same material. Additionally, the possibility of creating a standardised model of the *os zygomaticum* was explored during the project, requiring measurement of skulls.

Conclusions.

1. Due to each individual's unique facial proportions, creation of a standardised model for implanting the lateral-inferior orbital and zygomatic region is impossible.
2. To achieve optimal implant results, it is essential to consider the topography of each skull to minimise the risk of implant failure.
3. In clinical practice, it is possible to model an implant for a patient with broken facial bone features by using a CT scan.
4. The study should continue to find cheaper 3D printable material alternatives for lateral-inferior orbital and zygomatic implants.

Appearance of Defensin-2, Galectin-10, MMP-2, TIMP-2, PGP9.5 in Ocular Tissue Morphogenesis of Human and Rat Embryos

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Introduction. In the process of ocular development, the different tissue factors play a pivotal role in orchestrating the delicate morphogenesis. By exerting antimicrobial effects, Defensin-2 (HBD-2) helps to protect eyes from infections. Galectins (Gal) are involved in neural retina development, impacting cell differentiation and organisation. Matrix metalloproteinase-2 (MMP-2) is known for its role in degrading components of the extracellular matrix that plays role in tissue remodelling processes associated with development, wound healing, and normal physiological turnover of tissues. Tissue inhibitor of metalloproteinases 2 (TIMP-2) is primarily known for its ability to inhibit the activity of MMPs, including MMP-2. PGP9.5 is involved in neurogenesis, apoptosis, oxidative stress protection, and synaptic plasticity. Investigating the expression of the mentioned markers can provide additional understanding of ocular morphogenesis.

Aim. The aim of the study is to analyse expression and role of HBD-2, Gal-10, MMP-2, TIMP-2, PGP9.5 in morphogenesis of ocular tissues in rat and human embryo eyes at different developmental weeks.

Materials and Methods. Six samples of human eye and three samples of rat eye were obtained and examined routinely. The gestational age varied from 6th to 9th week in human eyes' specimens and 2nd to 3rd week in rat eyes' specimens. HBD-2, Gal-10, MMP-2, TIMP-2 and PGP9.5 were identified by immunohistochemistry. The quantification of positive structures was conducted semi-quantitatively.

Results. In human embryo eye, numerous HBD-2 cells were detected in the optic nerve, iris, cornea, retina, while appearance of it was moderate in the lens, ciliary body, sclera, choroid body, the retinal pigment epithelium and pupillary membrane. In rat, the common appearance of HBD-2 was lower in the lens. In human embryo eye, the common expression of Gal-10 was moderate in the lens, optic nerve, iris, cornea/corneal epithelium, choroid body, retina and pupillary membrane, while in rat eye Gal-10 was higher with numerous cells in the lens, neural retina, while moderate appearance was displayed in the optic nerve, cornea and sclera, choroid body, the retinal pigment epithelium and *m. orbicularis oculi*.

In human embryo, moderate MMP-2 cells were displayed in the lens, optic nerve, ciliary body, corneal epithelium, sclera, choroid body and *m. orbicularis*

oculi. In rat embryo, numerous MMP-2 cells were seen in the lens and iris, while moderate appearance was seen in pupillary membrane. In human embryo, numerous TIMP-2 structures were observed in the optic nerve, choroid body, retina, while moderate cells were displayed in all of the other structures except pupillary membrane. In rat, the common appearance of TIMP-2 was lower in the lens and optic nerve, and moderate in the ciliary body, iris, cornea, corneal epithelium, retina. In human embryo, eye numerous PGP9.5 structures were discovered in the optic nerve, choroid body, retina. Moderate expression of it was displayed in the lens, iris, cornea, corneal epithelium and choroid body, while the lowest was seen in sclera, *m. orbicularis oculi*, pupillary membrane. In rat embryo appearance of PGP9.5 was moderate in the corneal epithelium, retina, while it was the lowest in the lens, optic nerve, ciliary body, iris, cornea, sclera, choroid body, the retinal pigment epithelium and *m. orbicularis oculi*.

Conclusions. Commonly, the PGP9.5-containing structures are less distinct in rat embryo eyes indicating the significance of neuropeptide innervation in the development of human eyes neural crest originated structures of different time. Decrease of remodeling factors in rat embryo ciliary body, *m. pupillaris*, *m. orbicularis oculi*, sclera, choroid suggests the stable development of these structures in rat in comparison to the human. The selective decrease of defence factors in both species ciliary body, rat eye sclera, choroid body, pigment retina for HBD-2 and rat eyes corneal epithelium, *m. pupillaris*, and human *m. orbicularis oculi* for Gal-10 indicate not mandatory role of these factors in both species eye development.

Descriptive Investigation of the *Canalis Opticus* and *Sella Turcica* Anatomical Size Variations

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Introduction. The *canalis opticus* is a canal that passes through the lesser wing of the sphenoid bone and connects the middle cranial fossa to the orbit. The superior surface of the sphenoid bone also includes a *sulcus prechiasmaticus*. In the middle and on the intracranial surface of the body of the sphenoid bone locates a saddle-shaped structure or *sella turcica*. However, *canalis opticus* and *sella turcica* may have variations in their sizes. Knowledge of them is important

to evaluate the dimensions of these structures for clinical and pathological processes (Polat *et al.*, 2019). Several studies have observed the asymmetry of the *canalis opticus* in patients with asymmetrical degrees of glaucoma and papilloedema (Zhang *et al.*, 2019). Morphometry studies can provide new insights into the surgery of these structures, given the potential implication of sizes in pathology. The variations are essential in case of narrowing of the optic canal and an infection from a close sinus, which can cause optic neuritis and increase the risk of visual impairment. Moreover, linear dimensions of *sella turcica* can be used to predict pituitary gland size (Nerurkar *et al.*, 2022).

Aim. This study aims to investigate, analyze and describe anatomical size variations of the *canalis opticus* and *sella turcica*.

Material and Methods. 19 ossified adult and dry skull base sides were utilised for this observational study. All materials were provided by the Laboratory of Anatomy of the Department of Morphology of the Institute of Anatomy and Anthropology, Riga Stradiņš University. A digital Vernier caliper was used to make precise measurements (horizontal and vertical lengths of *canalis opticus*, anteroposterior and transverse distances of *sella turcica*) in the ossified bones. The data was used to calculate the mean values, min and max values, and standard deviation values for improved accuracy of the interpretation of the results.

Results. The average horizontal length of the left *canalis opticus* was 3.48 ± 1.00 mm, with a maximum value of 5.90 mm and a minimum value of 2.03 mm. The average vertical length of the left *canalis opticus* was 3.71 ± 0.47 mm, with a maximum value of 4.19 mm and a minimum value of 2.47 mm. The average horizontal length of the right *canalis opticus* was 3.92 ± 0.89 mm, with a maximum value of 5.49 mm and a minimum value of 2.06 mm. The average vertical length of the right *canalis opticus* was 4.18 ± 0.88 mm, with a maximum value of 6.24 mm and a minimum value of 3.26 mm.

Additionally, out of the 19 skulls that were examined, seven had at least one additional *canalis opticus*. One skull had a unilateral optic canal duplication on the right side and five had bilateral optic canal duplication on both sides. Duplicated optic canals were separated by a septum of variable thickness dividing the posterior part of the canal into a large canal in the usual position and a smaller canal inferior to it or a bar forming the caroticoclinoid canal. One skull had a bilateral optic canal triplication, with two optic canals on the left side and three on the right side. These canals were divided by thin septa.

The sizes of the *sella turcica* varied greatly. The average anteroposterior distance (from *sulcus prechiasmaticus* to *dorsum sellae*) of the groove was 20.53 ± 3.58 mm, with a maximum value of 28.41 mm and a minimum value of 15.04 mm.

The average transverse distance of the *sella turcica* was 23.72 ± 3.16 mm, with a maximum value of 32.46 mm and a minimum value of 19.59 mm.

Conclusions.

1. *Canalis opticus* had variable dimensions, and an increase in the number of it was found in a few skulls.
2. The right optic canals were usually more prominent in sizes than the canals on the left side.
3. Variable sizes of the *sella turcica* presented different dimensions and shapes of this area.
4. Other studies should aim to increase the sample size and include more visualisation variations to understand better pathologies related to the *canalis opticus* and *sella turcica*.
5. Identifying anomalies in these areas would provide valuable insights into managing related conditions in the future.

Effectiveness of Sedillot's Triangle as an Anatomical Landmark for Central Venous Catheterisation

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Introduction. Sedillot's triangle is one of the many anatomical landmarks for locating the internal jugular vein during central venous catheterisation (CVC). The borders of the triangle include the sternal head of the sternocleidomastoid muscle, which is most commonly attached to the lateral aspect of the sternal suprasternal notch and the clavicular head of the same muscle, which is connected to the clavicle bone. The third border of the triangle is the clavicle bone between the two heads of the sternocleidomastoid muscle (*Wang et al.*, 2024). Using visible and palpable landmarks for catheterisation reduces the need for ultrasound to locate blood vessels, lowering the time and resources, both human and financial, required for the procedure. Additional knowledge about possible variations of the sternocleidomastoid muscle heads and their points of attachment can aid in locating Sedillot's triangle. Any alteration to the triangle's borders can affect the triangle's positioning and, therefore, the effectiveness of using it as an anatomical landmark for central vein catheterisation (*Heo et al.*, 2020).

Aim. This study aims to measure the boundaries of Sedillot's triangle, which includes the attachment points of the muscle heads of sternocleidomastoid, clavicle bones, and the height of the triangle, to determine the presence of any variations. It also aims to evaluate effectiveness of the anatomical landmark method by performing a simulated CVC procedure on human cadavers.

Materials and Methods. The 6 cadavers and instruments of the Laboratory of Anatomy of the Department of Morphology of the Institute of Anatomy and Anthropology were used for dissection and simulating CVC. The method was performed on two cadavers while measurement was taken on both sides of five cadavers, and one cadaver was measured on only one side. Procedure of the catheterisation was performed through two approaches, central and posterior, by using a needle to puncture the internal jugular vein. The needle was guided by the apex of the triangle in the central catheterisation method and the posterior margin of the sternocleidomastoid muscle, inserting the needle at $\frac{1}{3}$ of the distance between the attachment point of the clavicular head of the muscle to the clavicle and the mastoid process, in the case of the posterior catheterisation method, which was used to compare to the central approach (Ayles *et al.*, 2023; Khare *et al.*, 2011).

Results. According to the literature review about the prevalence of Sedillot's triangle, in 12 % of cases, a gap between the two heads of the sternocleidomastoid muscle has not formed. Therefore, a triangle structure has not been developed and is not applicable for use as an anatomical landmark (Dunne *et al.*, 2023). The results of this cadaveric study show a larger prevalence of a missing Sedillot's triangle, as a gap between the heads of the muscle is absent in 33.33 % of cases on the right side and in all cases on the left side of the body. From the cases where the triangle is absent, on the right side, 50 %, and on the left side, 80 % have developed a tendon-like structure between the heads of the sternocleidomastoid muscle. The two heads have no distinguishable division in the remaining 50 % and 20 % of cases on the right and left sides, respectively. The data from the literature review suggests that Sedillot's triangle can successfully be used as an anatomical landmark in 71.4 % of cases on the right side (Dunne *et al.*, 2023). In this study, the anatomical landmark was successful in 50 % of the cases when simulating catheterisation on the right side.

Conclusions.

1. Knowledge about the variations of Sedillot's triangle can aid in reducing the time and resources needed for CVC in the internal jugular vein.
2. The practical findings showed a large prevalence of Sedillot's triangle absence on the left side and a smaller, however, significant, prevalence of an absent Sedillot's triangle on the right side of the body, which proves the left side to be a less effective site for CVC.

3. Deducing from our present results, when simulating catheterisation on the right side of a cadaver, using Sedillot's triangle as a landmark was successful in 50 % of cases, using a central and posterior approach to the internal jugular vein.

Anatomical Study of Variations of Facial Artery

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Introduction. The facial artery (FA) is the main artery of the face, where it moves superiorly along the corner of the mouth, ascends along the side of the nose in the nasolabial fold, and terminates as the angular artery. The FA gives rise to branches that supply various structures in the neck and face: ascending palatine, tonsillar, submental, glandular, lateral nasal, superior, and inferior labial arteries. Additional branches include the inferior and superior alar branches. The FA's localisation is significant in reconstructive surgery for lip defect reconstruction with the Abbe flap and other lip flap operations (*Loukas et al.*, 2006). Dermal filler injections pose a risk of necrosis and blindness (*Tansatit et al.*, 2021). Therefore, to avoid flap necrosis caused by avascularisation, it is vital to understand the course and variations of the artery, and individual anatomical variations in the FA patterns can benefit radiological anatomy professionals (*Siwetz et al.*, 2021).

Aim. The study aims to dissect, evaluate and compare variations of the FA on both sides of the face and review and analyse available literature on variations of the course of the artery and its clinical importance.

Materials and Methods. All the necessary materials for this study were provided by the Laboratory of Anatomy of the Department of Morphology at the Institute of Anatomy and Anthropology. Dissections of the FA were conducted on two formalin-fixed cadavers and four virtual cadavers that were accessible through the virtual dissection table "*Anatomage*." The study sample consisted of 12 FA. The variations were recorded on both sides of the face. Scientific databases such as *PubMed* and *ResearchGate* were used for the theoretical foundation. To avoid damaging the FA, the skin and subcutaneous fat were dissected laterally from the middle line of the face. The FA was uncovered at the lower edge of the mandible and cautiously dissected upwards. The distribution patterns

of the FA were detected and classified into the five types that were previously described by *Mitz et al.* (1973).

Results. All dissected FA emerged individually from the external carotid artery. The arteries' origin was symmetrical in four cases, with differences identified in two - near the angle of the mandible (73 %) and below the posterior belly of the digastric muscle in the carotid triangle (27 %). In four cases, the artery's course was symmetrical on both sides of the face. In two cases, the FA followed a different path on each side of the face. The angular artery (Type II) was found to be the termination point in 75 % of the cases. Variant termination as the superior labial artery (Type III) was observed in 16.67 % of dissected arteries. In one case, the FA was rudimentary (Type V). However, Type I (termination as the lateral nasal artery) and Type IV (termination as a double type) were not observed during this study. Each of the FA branches originated from a single facial arterial trunk. The superior and inferior labial arteries were absent in cases where the artery followed the classical course (Type II). In one case, the superior labial artery was present on both sides of the face, but the inferior labial artery only branched off on one side. Septal branches of the right and left superior labial arteries were identified in a single instance. The lateral nasal artery branched off from the FA in two specimens, with only one specimen displaying branching on a single side.

Conclusions.

1. Different kinds of facial arteries were observed in both real and digital samples.
2. In most cases, the facial artery terminated as the angular artery.
3. It is important to consider the various facial artery variations to prevent potential harm during cosmetic procedures.
4. Nonetheless, additional research is required to describe variations and clinical explanations of the gathered data.

Lower Leg Blood Vessels in the Clinical Aspect

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Introduction. Chronic venous and arterial diseases of lower extremities encompass a large spectrum of morphologic and functional pathologies of the circulatory system. These vascular changes are progressive and cause a wide range of clinical signs, varying from claudication and superficial vein dilatation to trophic disorders in the limb and gangrene. Vascular diseases can significantly affect a person's quality of life.

Aims. The aims of this study are: 1) to dissect and macroscopically study the course and topography of the blood vessels of the lower limb, compare the obtained results with literature data; 2) to investigate the importance of these blood vessels in a clinical aspect by conducting a literature review of the most common diseases of veins and arteries of the lower extremities, and 3) to create a macroscopic cadaver specimen.

Materials and Methods. In the study, a cadaver provided by the Laboratory of Anatomy of the Institute of Anatomy and Anthropology of the Rīga Stradiņš University was used. The study includes a review of the literature on chronic vascular diseases.

Results. In the course of the study, the lower leg arteries (*a. tibialis anterior et posterior*, *a. fibularis*), superficial veins (*v. saphena magna*, *v. saphena parva*) and deep veins (*vv. tibiales anteriores*, *vv. fibulares*, *vv. tibiales posteriores*) were dissected. During procedure, anatomical variations of these blood vessels were not found. According to the literature, the main risk factors for both arterial and venous diseases are smoking, metabolic diseases (e.g., diabetes, obesity), advancing age, infectious diseases, genetic predisposition and cardiovascular diseases (e.g., arterial hypertension). The pathogenesis of all these diseases is based on endothelium and intima damage with subsequent vascular stenosis and obstruction, which causes the corresponding clinical signs and symptoms.

Conclusions.

1. The created specimen can be used as a teaching tool in anatomy practical lessons.
2. The blood vessels of the lower leg correspond to the theoretical description in the literature and textbooks.
3. Vascular diseases of the lower leg can significantly affect the quality of a person's life, but it is important to emphasise that the development and progression of these diseases can be stopped by eliminating modifiable risk factors.

Morphological Evaluation and Defence Factors' Presence in Placental Tissue with Distress of Different Gestational Week

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Introduction. Proper placental development is crucial for healthy pregnancy, any disturbances can lead to many disorders of pregnancy. Studies have provided significance of defence factors' presence in placental tissue, although the role is not completely understood.

Aim. This study aims to evaluate morphological changes and assess expression of human β defensin 2, 3 and 4 (HBD-2,3,4), nuclear factor- κ B (NF- κ B), cathelicidin (LL-37), heat-shock protein 60 (HSP60), in-terleukin 10 (IL-10) in different gestational week placental tissue samples with distress and illustrate correlations between immunoreactive cells.

Materials and Methods. 15 human placental tissue samples were obtained from mothers with different gestational weeks. Five samples from weeks 28, five from weeks 31 and five from weeks 40. All samples come from pregnancies with distress. Routine staining and immunohistochemistry for samples were performed. Data was evaluated with semi quantitative methods and statistical analysis was done using Kruskal-Wallis test, correlations between factors were calculated using Spearman's rank correlation test.

Results. Morphological evaluation showed numerous accumulations of Hofbauer cells in almost all samples. NF- κ B, HBD-2,3,4, HSP60, IL-10 expression were found in every inspected placental tissue cell type in all gestational weeks. LL-37 expression was discovered only in Hofbauer cells. An increase of expression as higher the gestational week was noted in HBD-3 positive cytotrophoblasts ($p = 0.007$), endothelial cells ($p = 0.024$), extra-embryonic mesodermal cells ($p = 0.004$), LL-37 positive Hofbauer cells ($p = 0.03$) and HBD-4 positive endothelial cells ($p = 0.001$). Multiple statistically significant positive and negative correlations between defence factors were observed, notably a very strong positive correlation ($\rho = 0.854$; $p < 0.001$) between HBD-3 positive cytotrophoblast cells and HBD-3 positive extra embryonic mesodermal cells was found.

Conclusions. Persistence of Hofbauer cell accumulations underlines the growing significance of placental macrophages in placental protection. Positive defence factors' expression and an increase of expression in multiple factors (HBD-3, LL-37, HBD-4) in later gestational week may indicate these factors as

the most significant protectors of placenta in ontogenetic aspect. High number of statistically significant positive and negative correlations between factor positive cells show strong network to sustain distressed placental growth, therefore pregnancy.

Branching Variations of the *Arbor Vitae Cerebelli*

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Introduction. The cerebellum is increasingly recognised as a structure that regulates cognitive and emotional functioning and modulates motor activity. Its connection with other brain regions facilitates cerebellar modulation of implicit learning and executive functions, as well as regulation of emotional responses (Tyson *et al.*, 2014). Anatomically, the cerebellum has the following features: three surfaces, three fissures, two hemispheres and a single median *vermis*. Each hemisphere *vermis* divides into nine lobules separated by fissures: wing of lingula (*lingula branch*), wing of central lobule (central lobule branch), quadrangular lobule (*culmen tree*), simple lobule (*declive branch*), superior semilunar lobule (*folium branch*), inferior semilunar lobule (*tuber branch*), biventral lobule (pyramid branch), tonsil (*uvula branch*) and locculus (*nodulus branch*). In the vermal body, all branches connect (Gaillard *et al.*, 2008). Pathological variations in branches of the cerebellum can cause Arnold-Chiari malformation and relate to various neurological symptoms (Hidalgo *et al.*, 2023).

Aim. This study aims to describe pattern of the *arbor vitae cerebelli*, detect if there are any branching variations and classify further ramification.

Materials and Methods. Ten *arbor vitae cerebelli* were measured from the material provided by the Laboratory of Anatomy of the Department of Morphology of the Institute of Anatomy and Anthropology. A digital caliper and ruler were used to obtain the length of each branch five times and the branching count of the *arbor vitae* (midsagittal sections of cerebella were investigated). Measurements were made using the “ImageJ” application. Statistical data were analysed using *Excel*.

Results. While no two *arbor vitae* were entirely alike in all hemispheres, there was an apparent relationship between the *culmen tree*, the *uvula branch* and the connection of the *declive branch*, as well as the *folium branch* and the *tuber branch* to the vermal body. The *declive, folium*

and *tuber* branches were never directly connected to the vermal body via the medial branch. The average length of the medial branch was 9.92 ± 1.81 mm.

In 67.5 % of the samples, the *uvula* branch was divided into three white matter branches, while in 37.5 % of the samples, it split into four white matter branches. However, no direct relationship was found between the division of the *uvula* branch and its length before ramification.

The *culmen* tree was divided into two white matter branches in 40 % and three white matter branches in 60% of samples. The branching was directly related to its length before dividing. The size of the *culmen* tree was greater when it split into three branches, while it was lesser when it divided into two branches. It was noted that the average length of the *culmen* tree was 5.11 ± 2.22 mm when split into two branches and 9.42 ± 1.12 mm when bifurcated into three branches. There were no alternative splitting options available for these two branches.

The intermediate branch was the longest with an average length of 15.93 ± 3.65 mm, while the *uvula* branch was the shortest with an average length of 7.33 ± 2.65 mm. The average lengths of the remaining branches varied from 3.83 mm to 10.30 mm.

Conclusions.

1. Studying the branching patterns has enhanced the comprehension of the cross-sectional anatomy and *arbor vitae cerebelli*.
2. The architecture of *arbor vitae* determined structural complexity and exhibited significant individual variability.
3. Before delving into morphological classification and terminology, it would be beneficial to analyse more cerebellar white matter samples and compare them based on age and sex.

Anatomical Location, Course, Length and Width Variations of *Nervus Ischiadicus*

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Introduction. The ischiatic nerve is the largest and longest nerve in the human body. It is formed from the roots of the sacral plexus and passes through the infrapiriform foramen towards the lower extremities. Proximal to the popliteal fossa, it divides into two branches – the tibial and the common fibular nerve. Irritation of this nerve is commonly known as sciatica and is caused by a herniated disk,

lumbar spinal stenosis, spondylolisthesis, muscle hypertension or either spinal or paraspinal masses (Aguilar-Shea *et al.*, 2022). Ischiatic nerve injury is the most frequent and severe complication of intramuscular gluteal injection (Geyik *et al.*, 2017). Knowledge about the anatomical sizes and the different course variations of the ischiatic nerve is clinically essential in detecting and effectively treating patients with sciatica and reducing the chances of possible nerve injury during intramuscular injections.

Aim. The aim of this study is to examine and measure the various courses, lengths and widths of the ischiatic nerve. Additionally, the study aims to systematically review and analyse existing literature on the frequency of variations in the course of the ischiatic nerve and identify any correlation with the prevalence of sciatica in different variants.

Materials and Methods. The Laboratory of Anatomy, which is a part of the Department of Morphology at the Institute of Anatomy and Anthropology, provided human cadavers and dissection instruments, including the “*Anatmage*” virtual dissection table. The *Beaton* and *Anson* classification system was used to determine the type of ischiatic nerve course variation along the piriform muscle. The length of the nerve was measured from the distal side of the piriform muscle to the point where it splits near the popliteal fossa. The upper and lower widths were measured at the bottom of the piriform muscle and the splitting points near the popliteal fossa, respectively. Vernier caliper was used to measure the width on natural cadavers, while a virtual ruler was used on virtual cadavers.

Results. During dissection, cutaneous and subcutaneous tissue was removed from the gluteal and thigh regions to reveal the muscle tissue. Cuts were made on the proximal, distal and lateral sides of the gluteus maximus muscle, under which the ischiatic nerve was visible, passing through below the piriform muscle. The examined ischiatic nerves, both natural and virtual, had classic type 1 course along the piriform muscle, all passing inferiorly to the piriform muscle. The thigh muscles were separated to access the nerve’s course to the popliteal fossa. A total of seven ischiatic nerves were examined on the natural cadavers’ left and right sides. The results showed that the average length, upper width, and lower width of the nerves on the right side were 401.19 mm, 11.75 mm, and 9.73 mm, respectively. On the left side, the average length, upper width and lower width were 390.30 mm, 12.20 mm, and 9.66 mm, respectively. Besides, the ischiatic nerves of 2 cadavers’ right and left lower extremities were examined and measured on the “*Anatmage*” virtual dissection table. The mean values of the length, upper and lower widths were 373.68 mm, 9.36 mm and 6.82 mm for the left side. On the right side, these values were 361.75 mm, 9.18 mm and 7.15 mm.

Conclusions.

1. It is possible to observe the course of the ischiatic nerve on both virtual and natural cadavers.
2. The only distinguished course was Type 1, which runs below the piriform muscle.
3. The natural cadavers had a longer ischiatic nerve compared to the virtual ones.
4. There were no significant differences in width of the ischiatic nerve between the natural and virtual cadavers.

Anatomical and Topographical Aspects of *A. Femoralis* Damage

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Introduction. Trauma of the femoral region is widespread in military conflicts and dangerous due to high risk of massive bleeding and complications related to it, such as haemorrhagic shock (*Bekdache et al., 2019*), compartment syndrome (*Asmar et al., 2021*). The lifesaving activities in a case of damaged *a. femoris* are standard field haemorrhage control procedures – application of a tourniquet, pressure bandage or wound packing (*Bekdache et al., 2019*), if the wound location is closer to the groin application of other methods were recommended (*Baker et al., 2019*). Due to high vital imperil of *a. femoralis* trauma, casualty medical support and transportation is a challenge. It is important to evacuate such casualties to higher level of medical care facility by evacuation chain (*Kazmirchuk et al., 2022*).

Aim. The aims of the study are to review and analyse available literature about a variety of vascular damage in the femoral region, to dissect and examine *a. femoralis* topographical anatomy in the femoral region.

Materials and Methods. The human cadaver and all the necessary equipment for the dissection was provided by the Laboratory of Anatomy of the Department of Morphology of the Institute of Anatomy and Anthropology.

Results. Trauma in femoral region is primarily divided into three main types, which were analysed by *Topal A. E.* and co-authors (2010): gunshot wounds

(56.4 %), blunt trauma (30 %) and stab wounds (13.4 %). Lessons learned from analysis of 256 cases of battle casualties' combat trauma during operation Iraqi Freedom revealed that isolated lower extremity trauma composed 31 % of cases (Owens, *et al.*, 2008). In a case report performed by Rogovskiy V. M. and co-authors (2023), casualties with gunshot wounds and damage *a. femoralis* get immediate haemorrhage control by using combat application tourniquet (CAT), and after stabilising vital signs evacuated to the higher level of medical support, where primary surgical debridement and temporary arterial shunting was initiated. The next level of medical support included diagnostic procedures such as CT angiography, specialised surgery with vascular reconstruction, realised in hospital (Adibi *et al.*, 2014). The dissection work allowed to observe topographical aspects of *a. femoralis* and *v. femoralis*, their course in the inguinal region, passage through *lacuna vasorum* and *canalis vastoadductorius*. Additionally, topography, course and divisions of *n. femoralis* in *trigonum femorale*, the course of *n. saphenus*, *rami cutanei anteriores* and *rami musculares* of *n. femoralis*, that has clinical importance for lifesaving surgical procedures, performing in cases of injury in femoral region.

Conclusions.

1. Anatomical and topographical aspects are essential to realise life-saving activities in case of damaged *a. femoris*, which is associated with endangerment due to high risk of massive bleeding as well as related complications: haemorrhagic shock and compartment syndrome.
2. Analysis of literature revealed that vascular trauma of the femoral region in military conflicts is widespread. Damage of *a. femoralis* usually is not isolated, both hard and soft tissue injuries should be expected.

Morphometric and Topographical Analysis of *Foramen Infraorbitale*

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Introduction. *Foramen infraorbitale* (IOF) is located just beneath *margo infraorbitalis maxillae*. It is an opening at the end of *sulcus infraorbitalis* through which *vasa infraorbitalia* and *nervus infraorbitalis* (ION) pass. This is the terminal branch of the trigeminal nerve maxillary division (V2), providing sensory innervations to the upper lip, the lateral side of the nose, and the lower eyelid. Infraorbital

nerve blocks target the nerve roots originating from the skull. However, there is a risk of nerve damage during the procedure, leading to sensory deficits in the midface (Allen *et al.*, 2024). ION injury has also been observed during surgical interventions such as rhinoplasty, Caldwell-Luc surgical procedures, tumour surgery, orbital basis reduction, malar region fractures and Le Fort type-I osteotomy (Nanayakkara *et al.*, 2016). To prevent iatrogenic injuries, it is essential to accurately locate the nerve's most probable site of exit.

Aim. The study aims to evaluate the size, shape and bilateral symmetry of *foramen infraorbitale* (IOF) and its relation to the surrounding structural elements of the facial skeleton.

Materials and Methods. The morphological and topographic parameters of IOF were determined using 20 human skulls of unknown sex and age provided by the Laboratory of Anatomy of the Department of Morphology of the Institute of Anatomy and Anthropology, Rīga Stradiņš University. For each IOF (40), ten distinct metric measurements were obtained using a divider and a ruler (± 1 mm). These measurements included the maximum vertical and horizontal diameter of IOF and the distance between the centre of IOF and the following skull landmarks: *margo infraorbitale*, *nasion*, the midsagittal plane, opposite IOF, *apertura piriformis* at the level of *crista conchalis maxillae*, *spina nasalis anterior*, *margo alveolaris maxillae*, *sutura zygomaticomaxillaris*. The shape of IOF was estimated by direct visual inspection and described as having a circular, oval, triangular or semicircular outline.

Results. The study found that the shape of IOF was primarily oval on the left side of the skull and semicircular on the right, with 35 % of cases on both sides. The least common shape of IOF was triangular, with 15 % of cases on both sides. Out of the 20 samples, 12 had bilaterally matched IOF shapes. In comparison, the remaining 8 samples had asymmetrical IOF shapes, which were found to be associated with the presence of trabeculae close to the upper margin of IOF. Among these 8 samples, 2 had bilateral trabeculae, while 3 had unilateral trabeculae. Only 1 of the samples with symmetrical IOF morphology presented unilateral trabeculae. The mean vertical and horizontal diameters of IOF on the right side were 4.15 ± 0.93 mm and 3.55 ± 1.15 mm, respectively, while on the left side, they were 3.80 ± 1.06 mm and 3.95 ± 1.32 , with maximum measurements of 7.00 mm and minimum 2.00 mm on both sides.

Of the ten anatomical landmarks to which the distance from the IOF was measured, five are palpable clinically: *margo infraorbitale*, *nasion*, *apertura piriformis* at the level of *crista conchalis maxillae*, *spina nasalis anterior*, *margo alveolaris maxillae*. On the right side, the mean distances between IOF and the mentioned landmarks were 8.90 ± 1.59 mm, 46.65 ± 2.83 mm, 18.90 ± 1.83 mm, 35.20 ± 2.42 mm, and 29.40 ± 3.17 mm, respectively. On the left side, these values

were 9.00 ± 1.72 mm, 46.10 ± 2.81 mm, 19.10 ± 2.25 mm, 34.85 ± 2.52 mm, and 29.70 ± 3.53 mm, accordingly. The mean distance between the IOF and selected landmarks tended to be greater on the left side of the skull, except the distance to *spina nasalis anterior*, which was greater on the right side. Additionally, the range for measurement distribution was also greater on the left side of the skull, and this side was associated with almost all maximum and minimum values observed.

Conclusions.

1. The measurements showed a wide range of values, indicating significant variation in the localisation of the IOF among individuals.
2. Bilateral symmetry of the IOF shape was observed in 60 % of samples, while the remaining 40 % showed asymmetry associated with trabeculae.
3. The distances between IOF and adjacent skull landmarks showed no statistically significant difference when comparing IOF locations on both sides of the skull.
4. Surgeons and anaesthesiologists must locate the IOF accurately to prevent iatrogenic harm, which could cause extensive sensory deficits in the midface.

Local Defense Factors in Bilateral Cleft Lip Palate in Children Before and During Milk Dentition Age

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Introduction. Bilateral cleft lip is one of the most common and severe orofacial multifactorial birth defects that is caused by improper fusion of maxillary and medial nasal processes during the time period between 4th and 12th gestational week. Only 25 % of clefted defects affecting the lip are bilateral, and they are twice more prevalent in males than in females. The defect presents with various functional disturbances of the orofacial region, as well as presence of chronic inflammation. Local tissue defense factors modulate immune response, inflammation, and healing of the tissues; therefore, they are vital in the assessment of the immunological status of the patient and understanding of morphopathogenesis and characteristics of bilateral cleft lip.

Aim. The aim of this study is to assess distribution of Gal-10, CD-163, IL-4, IL-6, IL-10, HBD-2, HBD-3, and HBD-4 in tissue of bilateral cleft lip in children before and during milk dentition.

Materials and Methods. Tissue samples of lip were obtained from five patients during cheiloplasty surgeries - four boys and one girl, 4-17-months old. Five control samples without any craniofacial or inflammatory pathologies were used for comparison. Immunohistochemical staining, light microscopy, semi-quantitative evaluation (from 0 to +++) and non-parametric statistical analysis (Mann-Whitney U test, Spearman's rank correlation) were used to assess and compare the distribution of tissue factors in patient and control group, as well as evaluate the presence of statistically significant differences between the groups.

Results. A statistically significant increase of HBD-2, HBD-3 and HBD-4 positive structures was found in lip skin and mucosal epithelium, hair follicles and blood vessels of patient samples. Notable increase was also noted in IL-4, IL-6, and IL-10 in the mucosal epithelium and CD163 in blood vessels. The connective tissue of patient samples presented with statistically significant decrease of Gal-10, IL-10, and HBD-3. Spearman's rank correlation revealed multiple significant positive and negative correlations between all the local tissue defense factors observed in bilateral cleft lip palate tissues.

Conclusions. Increase of human beta defensins indicate the formation of line of defense to regain tissue homeostasis in chronically inflamed tissue. Upregulation of CD163 positive cells and increase of IL-4, IL-10 and decrease of Gal-10 points out the suppression of excessive damage from inflammatory reactions. Decrease of HBD-3, IL-10 in the connective tissue and increase of IL-6 suggests decreased tissue healing, excessive scarring, and impaired protection against pathogens. The presence of various mutual correlations between the factors indicates mutually linked effects, especially between HBD's and IL's, which function as important and synergistic mediators of immunological, inflammatory, and homeostatic processes observed in the tissues of bilateral cleft lip palate.

Muscle-Sparing Thoracotomy with Transcostal Sutures on Cadaver

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Introduction. Posterolateral thoracotomy is used for thoracic surgery. Although it provides excellent exposure of the thoracic organs, this approach requires dissection of muscles (*m. latissimus dorsi* and *m. serratus anterior*) that may be responsible for the occurrence of postoperative complications. To reduce the number of postoperative complications, muscle-sparing thoracotomy with transcostal sutures is used.

Aim. The aim of this study is to conduct the muscle-sparing thoracotomy.

Materials and Methods. One cadaver of the Laboratory of Anatomy of the Institute of Anatomy and Anthropology, Department of Morphology was dissected. A muscle-sparing posterolateral thoracotomy with rib resection and suturing with transcostal sutures were performed.

Results. Muscle-sparing thoracotomy – the cadaver lies on the side; the procedure is performed through a skin incision from the middle axillary line around the corner of the scapula to the paravertebral line. Next, the *m. latissimus dorsi* is identified and mobilised, retracted using special hook-holders. *M. serratus anterior* is preserved but shifted because an incision is made in the intercostal muscles of the 7th intercostal space (the authors of this study assume that the excision of a T3 lung carcinoma, which also affects the diaphragm area, should be performed) from the upper edge of the 8th rib. Transcostal sutures were used for suturing.

Conclusions.

1. The procedure was simulated for a T3 lung carcinoma in the 7th intercostal space by performing a muscle-sparing posterolateral thoracotomy, sparing the *m. serratus anterior* with rib resection and applying transcostal sutures.
2. The advantage of this method is the greater sparing of muscles and nerves by making an incision and suture, which would reduce post-operative complications and pain.

Morphopathogenic Features of Neonate Intra-Abdominal Adhesions: A Pilot Study

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Introduction. Newborns' intestinal adhesions have been reported in 4.7 % infants who underwent a laparotomy, but they can also appear idiopathically. The etiology and pathogenesis of adhesions is still to be determined, but some evidence shows relation to inflammation, formation of fibrin bands, hypoxia and tissue remodeling. Multiple candidate genes have been associated with adhesion development.

Aim. The aim of this study is to evaluate the appearance of Sonic Hedgehog (SHH), Indian Hedgehog (IHH), Forkhead-box F1 (FOXF1), caudal type homeobox 1 (CDX1), HCLS1-associated protein X-1 (HAX-1), GATA Binding Protein 4 (GATA4) and Granzyme-B (GZMB) proteins in neonatal adhesions and to describe the possible interfactorial correlations.

Materials and Methods. Adhesion affected tissue samples were collected from 14 patients under one year of age who underwent abdominal surgery to treat partial or complete intestinal obstruction. The control group consisted of six individuals that had surgical repairment of inguinal hernia. Routine staining and immunohistochemistry for SHH, FOXF1, CDX1, HAX-1, GATA4 and GZMB proteins were performed. Immunopositive fibroblasts, macrophages, endotheliocytes, smooth muscle myocytes of blood vessel wall and mesotheliocytes were investigated. The relative distribution of all factors was evaluated by the semi-quantitative counting method. Statistical analysis was done using non-parametric tests and correlations were calculated based on Spearman's correlation analysis.

Results. A statistically significant decrease was observed for SHH, IHH, FOXF1, GATA-4 and partially for GZMB gene proteins in the patient group. There were also decreased HAX-1 and CDX1 immunopositive structures in the patients, however, without any statistical significance. Moreover, a similar expression of all the factors in both patients' and control's mesothelium was detected. A strong positive correlation was seen between the number of FOXF1 and GATA4 positive endotheliocytes; between FOXF1 and GZMB/CDX1 positive cells in blood vessels; between SHH/IHH/GATA4/GZMB/CDX1 positive fibroblasts and macrophages; between SHH positive endotheliocytes and blood vessels; between GATA4 positive fibroblasts and HAX-1 macrophages; between GATA4 and CDX1 positive endotheliocytes; between the GATA4 positive endotheliocytes and blood vessels; between the number of GZMB and CDX1 positive endotheliocytes.

Conclusions. SHH, IHH, FOXF1, GATA-4 and GZMB gene proteins might have a role in neonatal adhesion development which could suggest a dysregulation of cellular events. Abundance of correlations between the gene protein appearances in different structures indicate the affected blood vessels, fibroblasts and macrophages; however, mesothelium seems not to be involved in the morphopathogenesis of neonatal adhesions.

Cuneal Point Angle, Length and Variations of Parieto-Occipital and Calcarine Sulci

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Introduction. Parieto-occipital (PoS) and Calcarine sulcus (CS) are in the medial part of the hemisphere, joining together posteriorly to the splenium, creating an acute angle, also called the Cuneal point (CP). There are various PoS types – a straight course without any ramifications, a Y-shape with two superolateral branches, and a sulcus with a T-shape form with the horizontal superolateral branch, the most identified course being a straight course without ramification. CS can be divided into four shape types – with a single apex (reverse V-shaped), with two apices (M-shaped), S-shaped (horizontal form) and a non-continuous pattern. A study on 40 cadaveric hemispheres reported an S-shape being the most common. Studies show varied results of PoS and CS lengths – the mean length of PoS being from 49.00 mm to 51.90 mm, but the mean length of CS being 73.00 mm to 104.60 mm (*Koutsarnakis et al.*, 2019; *Malikovoc et al.*, 2011). Mean length of proximal and distal part of CS being 27.30 ± 99.50 mm and 41.20 ± 14.40 mm (*Lopamudra et al.*, 2014). The CP angle was last mentioned in the literature in 1998 by *Gövsä*. Length and variations of PoS and CS are crucial for neurosurgeons as well as neuroradiologists to correctly assess and localize brain structures necessary for human functioning (*Huff et al.*, 2023).

Aim. The aim of this study is to analyse length and variations of the PoS and CS located on the medial part of the hemisphere, calculate the angle of the CP and compare the obtained data with existing literature.

Materials and Methods. This study utilised 13 separate cerebral hemispheres (8 right and 5 left sides) from cadavers preserved in formaldehyde. The specimens were provided by the Rīga Stradiņš University Laboratory of Anatomy of the Department of Morphology of the Institute of Anatomy and

Anthropology. Before this study, all hemispheres were dissected. Pictures of the hemispheres were taken on a white plastic base with a ruler placed next to them using a high-resolution camera. The length of the PoS and CS, as well as the acute angle of the cuneus, were measured in the digitalised images using the free image processing program “ImageJ” (Schneider *et al.*, 2012). PoS was measured in one consecutive measure, while CS was divided into two parts – proximal and distal – starting from the isthmus to the CP and from the CP to the occipital pole, respectively.

The gathered data were analysed using JASP software to obtain descriptive statistics such as mean, standard deviation, max and min.

Results. It was found that both PoS and CS were present in all hemispheres studied. The length of PoS ranged from 19.13 mm to 53.77 mm, with a mean of 37.26 ± 9.70 mm. The most common PoS had a straight course and no ramification, with 10 occurrences (7 in the right and 3 in the left hemispheres). Only 3 of 13 PoS were Y-shaped with two superolateral branches (2 in the left and 1 in the right hemispheres).

The proximal part of the CS had a length that varied from 4.40 mm to 33.50 mm, with a mean of 19.40 ± 8.72 mm. The distal part of the CS had a length that varied from 17.81 mm to 64.41 mm, with a mean of 36.23 ± 12.76 mm. The most common shapes found in hemispheres were the S-shape (6 occurrences; 5 in the right and 1 in the left hemisphere) and V-shape (5 occurrences; 3 in the right and 2 in the left hemisphere). M-shape (2 occurrences; in the left hemisphere) were less commonly found forms and no non-continuous patterns were found. The size of the acute angle obtained in cadaver hemispheres ranged from 14.23° to 109.21° , with a mean of $60.35^\circ \pm 24.25^\circ$.

Conclusions.

1. The data obtained indicates a wide range of CS and PoS lengths and various CP sizes.
2. In most cases, the PoS was straight without branching, while the CS was placed in the horizontal groove (S-shape) and in V-shape.
3. Accurate methods, such as CT/MRI scans, are recommended to eliminate errors and obtain a more precise measurement of the angle and length of the sulcus in the brain.
4. Developing a standardised measurement system for sulci to compare data more accurately is necessary.

Anatomical Snuffbox Approach for Radial Artery Cannulation

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Introduction. The distal radial artery runs through the radial fossa, known as the “anatomical snuffbox” (*Daralammouri et al., 2022*), named for its unique ability to cradle powdered tobacco for insufflation (Rajah et al., 2019). There are various structures, including the distal radial artery, a branch of the radial nerve and the cephalic vein (*Jae-Hyung Roh et al., 2018*). Distal radial artery has been suggested as an alternative anatomical region for radial artery cannulation in patients undergoing coronary angiogram or percutaneous coronary intervention (*Taylan et al., 2021*).

Aim. The study aims to assess the anatomical snuffbox as a potential alternative site for radial artery cannulation by examining the radial artery’s diameter and course variations.

Materials and Methods. In the dissection 5 cadavers were used that were provided by the Laboratory of Anatomy of the Department of Morphology of the Institute of Anatomy and Anthropology, Riga Stradiņš University. The dissection process involved using specialised tools such as a digital caliper, scalpels, and forceps. The literature review was performed using databases for medical studies (*PubMed, NCBI, IARS*). Six cadaver hands underwent analysis. Dissection involved anatomical snuffbox incision, and distal radial arteries were identified in all cadavers. Their localisation, course and diameters were compared. Subsequently, both arms’ distal radial arteries were measured in diameter and catheterised in one cadaver. A digital caliper was used to measure the diameter of the arteries. The selection of catheter sizes was predicated upon the measured diameters of the arteries.

Results. The course of the distal radial artery in the anatomy snuffbox is highly variable. In one case, it passes straight, without branches between the tendons of *m. extensor pollicis longus* and *m. extensor pollicis brevis*. In the second case, the artery is located closer to the tendon of *m. extensor pollicis brevis*, almost on the inner wall of the *digitus primus manus*, it goes straight and does not form branches. In the third case, the artery is located very close to the superficial surface of the hand, between the *m. extensor pollicis longus* and *m. extensor pollicis brevis* tendons. Still, it forms two branches (left arm). Artery in the other arm of the same cadaver is also located between the tendons of

m. extensor pollicis longus and *m. extensor pollicis brevis*, but it forms three branches (right arm). In the fourth case, the artery course is very close to the *m. extensor pollicis brevis tendon*, and its course is very wavy and does not form branches. In the fifth case, the artery runs closer to the *digitus secundus manus*, its course is straight and forms two branches. Both distal radial arteries in a cadaver were catheterised, with the right hand artery measuring 1.49 mm in diameter and the left hand artery measuring 1.79 mm. A catheter selection table was employed to choose an appropriate catheter size.

Three catheter sizes (18G, 20G, 22G) were considered for the right hand, but only a 22G catheter was successfully inserted. In the left hand, three sizes (18G, 20G, 22G) were also chosen, with successful insertions of both 20G and 22G catheters. Most angiographies are performed with 18G catheters (*Ojha et al., 2023*), but most percutaneous coronary interventions could be performed with a 14G catheter (*Sanmartin et al., 2003*). While the distal radial artery's diameter in the anatomical snuffbox aligns with the required size for cannulation, simulated arterial catheterisation revealed challenges with 18G and 20G catheters. The most successful cannulation occurred with a 22G catheter, but successful results were also achieved with a 20G catheter in the left arm.

Conclusions.

1. The distal radial artery has an inconsistent path within the anatomical snuffbox, although it is mostly situated between the tendons of *m. extensor pollicis longus* and *m. extensor pollicis brevis*, bifurcating into two or three branches or have no branches at all.
2. The most successful cannulation of the distal radial artery has been achieved using a 20G or 22G catheter.
3. Distal radial artery cannulation offers advantages over the conventional radial approach, and it simplifies hemostasis, limits venous congestion of the hand and preserves a greater length of the radial artery for potential coronary artery bypass surgery candidates.

Galectin-10 Characterisation in Cleft Lip Palate (CLP)

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Introduction. Failure in palatal shelf elevation, migration, or fusion because of biological or environmental factors can lead to cleft lip and palate formation. That is one of the most common craniofacial birth defects.

Aim. The aim of this study is to determine the expression and distribution of specific antimicrobial peptide Galectin-10 (Gal) in cleft affected soft lip and palate tissue.

Materials and Methods. The tissue material was obtained from children aged from 8 months to 12.7 years undergoing veloplasty or uranoplasty procedure. The inclusion criteria were mixed dentition, milk dentition, diagnosis of cleft lip or palate; however, the exclusion criteria consisted of genetic syndromes, chromosomal abnormalities and immunodeficiencies. Control groups for milk dentitions were five subjects without orofacial defects aged newborn to 24 weeks and three subjects with plastic of superior lip frenula aged from 7–14 years.

Immunohistochemistry was used to stain the tissue for Galectin-10, and slides were examined by light microscopy. The number of positive structures were evaluated semi-quantitatively. Statistical analysis was conducted using SPSS statistics, version 27.0 (IBM Company, Chicago, USA). Fisher Freeman test and Kruskal Wallis tests were used to calculate statistical differences between patients and controls. Spearman correlation test was used to reveal correlations between the indices of different groups.

Results. Few to moderate Gal positive cells were seen in palate epithelium in milk dentition patients, while controls showed only few positive cells. Connective tissue lacked the Gal in patients, but controls demonstrated few positive cells in milk dentition age. Moderate muscle fibres were positive for Gal, but mainly minor salivary glands excretory ducts showed the numerous Gal cells in both – patients and controls of milk dentition age.

Also mixed dentition patients revealed numerous to abundant positive cells in epithelium, while controls possessed only a few ones. Numerous to abundant number of Gal cells were seen in mixed dentition age patients and controls, and equal distribution of few positive Gal cells were seen also in palate muscles for both – patients and controls.

Statistically significant differences between patient and control samples were not observed for neither milk dentition with controls nor mixed dentition

and controls in epithelium and connective tissues. Fisher Freeman tests did not reveal any statistical differences. In the connective tissue in milk dentition and control groups statistical correlation was $p = 0.119$, epithelium revealed $p = 0.070$. In the connective tissue and epithelium in mixed dentition and control groups statistical correlation was $p = 0.357$, but in the muscle tissue $p = 1.00$.

Conclusions. The tendency of slight domination in number of Gal positive epithelial cells but decrease of them in connective tissue indicate the persistence for higher palatal epithelium ability to respond to the diseased process in milk dentition age with possible exhausting of connective tissue response in children with CLP on the continuing phone of an intensive Gal appearance in the excretory ducts of salivary glands and palatal muscles. Gal expression in palatal epithelium increases in mixed dentition of children with CLP, and connective tissue local immunity also intensifies the Gal defence mechanism here, but the protection via Gal is equal in the controls and patients for palatal muscles.

Size and Shape Variations of the Heart Auricles

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Introduction. The heart has two auricles - the right atrium auricle (RAA) and the left atrium auricle (LAA). The RAA is located in front of the ascending aorta on the heart's exterior. It functions as an addition to the atrium, relieving high atrial pressure and increasing the atrial capacity when needed, making them overflow vessels in times of stronger blood flow. The LAA forms a pouch that can also be found on the exterior part of the heart and is narrower than the RAA. It functions the same way the right auricle - aiding the left atrium. The left auricle has been found to be the primary source of intracardiac thrombi and a major site of origin for atrial fibrillation in patients undergoing ablation procedures. Since the LAA has many morphological variations, it contributes to the formation of thrombi (*Mantini et al.*, 2023).

Regarding the shapes of the auricles, the RAA is characterized as conical more frequently than triangular. However, the morphology of the LAA is much more diverse. According to *Stepanchuk* (2018), the length of the RAA ranges from 2.61 cm to 4.51 cm (average of 3.29 cm) and the width from 1.75 cm to 3.45 cm (average of 3.19 cm). For the LAA, these measurements are from 2.5 cm to

4.2 cm for length (average 3.34 cm) and from 1.09 cm to 2.81 cm for width (average 2.51 cm).

Aim. This study aims to measure length and width of both auricles (RAA, LAA), study their different shapes and compare their frequencies.

Materials and Methods. The length and width were measured for 28 auricles (14 RAA and 14 LAA) of the human hearts, provided by the Laboratory of Anatomy of the Department of Morphology of the Institute of Anatomy and Anthropology. A digital caliper was used to measure the structures, obtaining the length (measured from the base of the auricle to the furthest point) and width (measured at the widest part) of the auricles. The LAA shape morphology was determined using morphological classification by *Mantini et al.* (2023), and data was analysed using *Excel*.

Results. The right atrial auricle (RAA) had an average length of 3.33 ± 0.76 cm and an average width of 3.07 ± 0.74 cm. On the other hand, the left atrial auricle (LAA) had an average length of 3.62 ± 0.70 cm and an average width of 2.54 ± 0.60 cm. The largest RAA was noted at 4.31 cm in length and 3.86 cm in width, while the most extensive LAA was measured at 5.23 cm in length and 3.12 cm in width. The smallest RAA had a length of 1.31 cm and a width of 2.27 cm. The smallest LAA had a length of 2.36 cm and a width of 1.64 cm.

Most of the RAA was triangular, with one exception of an oval and one with an extremely short triangle. The triangles were classified into two groups – a triangle (6 out of 14 auricles analysed) and a triangle with upturned apex (6 out of 14). On the other hand, the morphology of the LAA differed more, with cauliflower – small in length, with complex internal structures and several small lobes (6 out of 14), chicken wing – characterised to have a prominent proximal or central fold of the main lobe (5 out of 14), cactus – with dominant central lobe as well as secondary lobes that branch off superiorly and inferiorly (3 out of 14) and none of the windsock shape – possessing a dominant lobe. However, this shape fills all the extensions of the auricle, which is characterised as the longest (would have the most extensive length).

Conclusions.

1. Different sizes of the length and width of both auricles were observed in this study.
2. The RAA's most prominent morphological shape was a triangle with an upturned apex, while the LAA's was a combination of cauliflower and chicken wing shapes.
3. Radiologists, cardiologists and surgeons must comprehensively understand the anatomy and functions of the heart's auricles.

Comparison of the Effectiveness of Supraclavicular and Infraclavicular Anatomical Landmark-Guided Subclavian Vein Catheterisation Methods

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Introduction. The subclavian vein is an essential site of central venous catheterisation (CVC) used in cases when the internal jugular vein is not accessible. This catheterisation method provides a short pathway to the superior vena cava. However, it is associated with severe risks such as pneumothorax (*Saeed et al.*, 2020) and puncturing of the lymphatic ducts (*Montoya et al.*, 2021). As this site is used for catheterisation in acute instances, such as trauma in the neck region, using anatomical landmarks as guidance for the procedure reduces the time and resources needed (*Kshirsagar et al.*, 2023). For these reasons, it is important to determine the reliability of landmark-guided subclavian catheterisation approaches.

Aim. This study aims to determine the effectiveness of two anatomical landmark-guided subclavian vein CVC methods by conducting a simulation of the procedure on cadavers. It also measures and documents the variations of the venous angle and its connecting structures, such as lymphatic ducts, and notes the position of the pulmonary apex concerning the subclavian vein.

Materials and methods. The Laboratory of Anatomy of the Department of Morphology of the Institute of Anatomy and Anthropology provided the instruments and seven cadavers for the dissection and measuring on both sides. Two of them were used for the imitation of the catheterisation procedure. On one of the cadavers, the procedure was performed unilaterally, resulting in three trials for each method. The CVC simulation was guided by the clavicular angle in the case of the infraclavicular approach (*Deere et al.*, 2023) and the clavisternomastoid angle for the supraclavicular approach (*Chen et al.*, 2020).

Results. Based on the literature review, the supraclavicular approach to subclavian vein catheterisation was shown to be more successful in terms of first attempt success rate and low malposition prevalence in comparison to the infraclavicular method (*Prasad et al.*, 2020). The prevalence of pneumothorax for both methods is equal (*Chen et al.*, 2020), with the universal incidence being 6.61 % (*Qamar et al.*, 2019). The conducted cadaveric study has shown an equal success rate for both approach methods and no cases of puncturing of the pulmonary apex or thoracic duct. According to the literature, the location of the main sites of possible

complications – the pulmonary apex and the thoracic duct vary significantly, with the prevalence of thoracic duct termination in the left subclavian vein being 27 % (*Tsouknidas et al.*, 2020). The cadaveric study showed the mean distance of the pulmonary apex to the subclavian vein posteriorly to be 27.12 mm on the left and 23.43 mm on the right side. However, the measurements vary significantly from 20.45 mm at minimum and 33.08 mm at maximum distance.

Conclusions.

1. Determining the safest anatomical landmark-guided CVC method reduces the risk associated with the procedure and the resources and time required.
2. This study showed that both approaches had an equal success rate and no malpositioning or complication risk, proving them to be an effective alternative to ultrasound-guided catheterisation.
3. The practical findings of the study showed the minimal risk of causing pneumothorax or lymphatic puncture when carrying out the supraclavicular or infraclavicular catheterisation methods, as the termination site of the thoracic duct was the venous angle in all subjects and the pulmonary apex placement notably varied between subjects, located at minimum 20.45 mm from the subclavian vein.

Determination of Auricular Shape of Sacral Bone and Potential Relations to the Sacroiliac Joint Pain Development

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Introduction. The sacroiliac (SI) joint is recognised as the largest joint in the body. Still, with relatively little mobility, the auricular surfaces of bones determine the volume of weight transfer to hip bones (*Mahato*, 2010). The auricular surfaces are the articulating surfaces of the SI, composed of a sacral side and a complementary iliac side (*Poilliot et al.*, 2019). Approximately 25 % of SI joints potentially cause low back pain (*Raj et al.*, 2023). Therefore, it is essential to determine and categorise variations and differences in the auricular surface shapes to understand the possible clinical relations to the SI joint pain.

Aim. The aim of the study is to determine the shape of the auricular surfaces of sacral bones and establish possible relations with the development of sacroiliac joint pain based on similar studies.

Materials and Methods. In this study, the auricular shapes of sacral bones were determined using the method by *M. K. Jesse et al.* (2017), where morphological type 1 has a wide posterior angle ($> 160^\circ$), type 3 a narrow posterior angle ($< 130^\circ$) and type 2 is in between ($130\text{--}160^\circ$). These three types provide a more objective definition of morphometry of the auricular surface. Data was accomplished with the virtual 3D dissection table “*Anatomage*” to visualise and measure sacral bones auricular *alpha* angles of 4 cadavers. Parallely, the 21 dry human sacral bones auricular surfaces were obtained. Determination was made on both sides (left and right) of the *facies auricularis ossis sacri*. The virtual dissection table “*Anatomage*” and dry human bones were provided by the Laboratory of Anatomy of the Department of Morphology of the Institute of Anatomy and Anthropology, Rīga Stradiņš University. All measurements were completed in the “*Inkscape*” program (v1.3.2.0). The calculations and statistical analysis were performed in Excel. The information from *Wiley Journal of Anatomy*, *PubMed*, *ScienceDirect* and *Journal of Neurosurgery* was used for detection of the auricular surface in possible relations to the SI joint pain.

Results. From the mean values of both sides of 4 cadavers in “*Anatomage*” and 21 dry human sacral bones together, the most common shape with 41 out of all 50 auricular surfaces was auricle-shaped or type 2 where the *alpha* angle was between 130° and 160° . Only in 4 of 50 cases of the auricular surface was detected crescent-shaped or type 3 with an *alpha* angle less than 130° degrees. Likewise, *Jesse et al.* (2017) study reported that among individuals without SI joint pain, the most frequently observed shape was type 2, a total of 290 from 412 auricular surfaces, but type 1 and 3 were represented equally. However, in the group experiencing SI joint pain, type 3 has been recorded with a higher percentage than other types. In the results of the research by *Cihan et al.* (2023), without given information about SI joint pain, the most prevalent shape of auricular surface among dry human sacral bones was type 3 on 93 out of 182, with type 2 being the second most common on 80 out of 182 surfaces. These findings suggest that type 3 may be implicated as a potential factor contributing to SI joint pain development, as another study by *Poilliot et al.* (2023) revealed that among SI joint pain free cases, type 2 was the dominant classification (51 out of 69). In contrast, type 3 had the lowest ratio (6 out of 69 surfaces).

In the four virtual sacrum samples, differences were detected among sexes, where the *alpha* angle of the auricular surface was lesser for females than males ($134.5^\circ \pm 2.4$ and $144.2^\circ \pm 5.4$, accordingly), both with the type 2 auricular shape.

That was noteworthy in the context of low back pain, as female auricular shape was associated with SI joint pain (but not male) in the study by *Jesse et al.* (2017).

Conclusions.

1. Distribution of the types was not equal between genders and bones on both sides of the sacrum.
2. Collecting and reviewing auricular surface data of the relevant iliac bone in future studies is recommended.
3. Detecting SI joint pain accurately using only characteristics of SI joint auricular sizes has been challenging, and further research and clinical studies are necessary to explore this issue.

Potential Key Genetic Factors in Right Auricle Tissue Cardiomyocytes in Case of Coronary Heart Disease and Aortic Valve Stenosis

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Objectives. Coronary heart disease (CHD) and aortic valve stenosis (AoS) are significant cardiovascular conditions leading to myocardial infarction, heart failure and death. Despite the pathophysiology of those diseases being mainly known, still the specific factors involved remains to be detected.

Aim. This study aims to identify the presence and distribution of DAD1, HAX-1 and GZMB genes and their proteins that were previously reported to be important apoptotic/anti-apoptotic markers in cardiomyocytes, and to compare the data with the controls.

Materials and methods. The tissue materials were fragments of the right atrial appendage taken from 15 patients with coronary heart disease and/or aortic valve stenosis during the open-heart surgeries. Control samples were collected from the identical location of five early-age operated individuals with congenital heart disease. For the routine light microscopy, haematoxylin and eosin method was used. The Tissue in Situ Hybridisation method (CISH) was used for detection of DAD-1, HAX-1 and GZMB gene signals. The immunohistochemistry for identification of HAX-1 and GZMB protein positive structures was also performed. The results were manually evaluated by finding positively stained structures

within the visual field. The Mann-Whitney U test and the Spearman's rank correlation coefficient methods were applied for statistical analysis.

Results. Statistically significant difference was found in case of HAX-1 gene signals and no DAD-1 or GZMB genes. The rich HAX-1 gene signals in fibroblasts within the sclerotic blood vessel of the study group was observed. The study group exhibited a moderate average number (++) of positive structures for HAX-1 and GZMB proteins, whereas the controls showed their abundancy (++++). The positive correlations between HAX-1 gene and its protein, HAX-1 gene/gene protein and the GZMB protein were found. The abundant GZMB proteins were found in atrial endocardial endothelial cells of the study group and in the blood vessel endothelium cells of the controls.

Conclusions. The significantly decreased number of HAX-1 and GZMB protein positive structures in a correlation between them shows importance of these proteins in apoptosis dysregulation in case of CHD and AoS. The decreased expression of HAX-1 gene with a correlation between the gene and the protein proves its significance as an anti-apoptotic factor.

Case Analysis of Differences Between the Right and Left Pulmonary Arteries Branching Patterns

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Introduction. Accurate diagnosis of vascular pathology and planning of interventional procedures require knowledge of normal and abnormal pulmonary artery anatomy on cross-sectional and/or angiographic images (*Kandathil et al.*, 2018). Diagnosis of chronic thromboembolic pulmonary hypertension (CTEPH) and its treatment – balloon pulmonary angioplasty (BPA) – requires precise identification and topographical locations of pulmonary segmental arteries. For patients with low cardiac output and/or significant thromboembolic occlusions, the segmental arteries in pulmonary angiography can be visualised poorly; in this two-dimensional imaging, segmental arteries overshadow each other, complicating the identification of arteries. There are differences in pulmonary segments between the right and left lungs, so the blood supply can also differ

vastly. Additional knowledge of arterial branching is required for safer, more structured, and more efficient diagnosis and treatment of CTEPH.

Aim. This study aims to determine and compare the pulmonary arteries' branching pattern and variant in both human lungs and to review the scientific literature about arterial supply differences in the right and left lungs.

Materials and Methods. The anatomical assessment was performed using one human embalmed cadaver provided by the Laboratory of Anatomy and the Department of Morphology of the Institute of Anatomy and Anthropology. Lung dissection was performed, removing parenchyma, nerves, veins, and bronchi while preserving arteries. A plastic protractor was used to measure arteries' branching angles. Data from scientific literature (*PubMed*, *Scopus*) were used and analysed to compare pulmonary artery branching patterns.

Results. The pulmonary arteries in the left and right lungs form two distinct patterns. The right pulmonary artery splits into *truncus anterior*, which supplies the upper lobe, and *a. interlobaris*, which provides circulation of the middle and lower lobes. In contrast, after giving separate branches to the upper lobe, the left pulmonary artery becomes *a. interlobaris*. From both *aa. interlobares* common trunks of the 4th and 5th segmental arteries branch opposite the origin of the 6th (superior) segmental artery. Interlobar arteries end in trifurcation in both lungs, but these three end branches supply different pulmonary segments in each lung. The branching angles of pulmonary arteries vary from 15° to 90°. In the branching of segmental and subsegmental levels, more narrow angles were observed (15° to 45°), while trunks and separate segmental arteries branching off the *a. interlobaris* form wider angles (70° to 90°).

Conclusions.

1. Despite similarities and identical names of some segments, the branching pattern of the pulmonary arteries differed between the two observed lungs.
2. Interventions in the pulmonary arteries can be challenging due to high degree of anatomical variability and segmental arteries varying in number, size and origin location.
3. Identifying pulmonary segmental arteries for diagnostic purposes can be considerably improved by having topographic recognition of the branching – knowing which branches supply which segments in each lung, especially in low-quality imaging or overlapping of the arteries.

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