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RĪGA STRADIŅŠ UNIVERSITY
INSTITUTE OF ANATOMY AND ANTHROPOLOGY

XXX Student International Conference of

MORPHOLOGY SCIENCES

8 May 2025, Rīga

Abstracts Book

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Photogrammetry in Human Anatomy Education

Alens Silvestrs Aizupietis, **Tīna Krastiņa**, **Lilianna Cimziete**,
Rūdolfs Lepa, **Matīss Zicāns**, Faculty of Medicine, 3rd year
Supervisor – Acting Assistant Andris Čakstiņš

Introduction. Photogrammetry is a 3D modelling technique which relies on obtaining and merging a large amount of high resolution digital photographs. Application of photogrammetry in the anatomy study process improves factual and topographical knowledge, as well as raises satisfaction of the study process. Currently, multiple universities around the world are creating their personal photogrammetric 3D anatomy collections for educational purposes, while the universities of the Baltic states do not yet have such collections. Knowledge of necessary resources and applications of photogrammetry provides opportunities in making high quality anatomical 3D models, improving the anatomy learning process.

Aim of the study was to determine the optimal photograph count for a medium-sized photogrammetric 3D model intended for learning anatomy, using a smartphone's camera and its available software.

Materials and Methods. The Laboratory of Anatomy, which is a part of the Rīga Stradiņš University Department of Morphology at the Institute of Anatomy and Anthropology, provided a human *os femoris sinistrum* specimen for the use of the study. Multiple photogrammetric 3D models were constructed of the same specimen, which differed by the count of photographs used. The quality and usefulness of each 3D model for anatomy education was evaluated by surveying the lecturers of the Department of Morphology. By analysing the survey results and taking into consideration each 3D model's total creation time, conclusions were made on the optimal photograph count for creating a high quality photogrammetric 3D model.

Results. No significant differences in total creation time were determined between 3D models of 100, 200, and 300 photograph count, all taking approximately 20–25 minutes. Meanwhile, the 3D model of 400 photographs took almost 50 minutes. No significant differences were determined in vertice and triangle count, or memory size between any of the 3D models. The smallest count of artefacts were found in the 3D model of 200 photographs, however, the most artefacts were found in the 3D model of 100 photographs. Survey data further highlights

the 3D model of 200 photographs as having the highest quality and resolution, and marks the 3D model of 100 photographs as having the lowest. Additionally, survey data modes and medians present the 3D model of 200 photographs as the most useful for learning anatomy, while the 3D model of 100 photographs as the least useful.

Conclusion. The optimal photograph count for a medium-sized photogrammetric 3D model intended for learning anatomy, using a smartphone's camera and its available software, is 200.

Asymmetry of the Upper and Lower Body in Relation to Musculoskeletal Dysfunctions by Sex

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Introduction. Postural asymmetry is normal and expected during a postural examination, and one of the leading factors in asymmetry is idiopathic scoliosis (*da Rosa et al.*, 2022). However, excessive asymmetry can lead to dysfunctions. The slight curvature of the spine, as well as the symmetrical arrangement of selected bone points and joints such as shoulders, shoulder blades, knees, and feet concerning others, are essential factors in examining posture (*Twarowska-Grybalow & Truszczyńska-Baszak*, 2023). Good posture is a physical health indicator that presents individual well-being and body appearance (*Xing et al.*, 2023). Posture can be impacted by pain in body regions such as shoulders and back, physical inactivity, muscle weakness, ageing, degenerative bone changes, osteoarthritis, knee conditions and other conditions (*Cheung et al.*, 2021; *Öztürk et al.*, 2025).

Aims. This study aims to divide individuals by reported information in the musculoskeletal dysfunction (MSD) and unaffected groups; detect differences between the inferior angle of the scapula height (IASH), shoulder height (ShH) and leg length (LL) by group with and without MSD; examine the correlation between measurements; divide individuals by ShH groups according to *Kuklo et al.,* 2002.

Materials and Methods. In July and August of 2024, an anthropology expedition was conducted in Piebalga, Latvia. The study involved anthropometric measurements from 681 participants, comprised of 275 males (40.4 %) and 406 females (59.6 %), ranging in age from 1 to 99 years. The participants were

divided into two groups based on their reported experiences of musculoskeletal disorders (MSD) for both sexes. Measurements were taken with an anthropometer. The data was analyzed using IBM SPSS Statistics 29.0, the Mann-Whitney U test and the Spearman rank correlation for both sexes.

Results. MSD was reported by 26.6 % of individuals. Females complained about dysfunctions in 125 cases, while males complained in 56 cases. For males without MSD, the average difference of ShH was 0.87 ± 0.85 cm, compared to 0.95 ± 0.83 cm for those with MSD. Among females who did not report MSD, the average difference of ShH was 0.78 ± 0.82 cm, whereas it was 0.81 ± 0.72 cm for those with MSD. Between IASH and LL, significant correlations were observed for males (rho = 0.211; $p < 0.001$) and females (rho = 0.244; $p < 0.001$). The Mann-Whitney U test revealed that the distribution of differences in the LL was statistically significantly different between those with and without MSD for males, $p = 0.017$ and not statistically significant for females, $p = 0.219$. Slight asymmetry was found for 319 individuals; 19.2 % had balanced shoulders, and 25.7 % had minimal imbalance in ShH differences. Moderate imbalance was found for 6.8 %, while only 1.5 % of individuals had significant imbalance (> 3 cm) (*Kuklo et al.*, 2002).

Conclusions.

1. Females more frequently reported MSD; however, males had a more prominent asymmetry in all distances.
2. Compared to unaffected individuals, individuals with MSD had more prominent asymmetry, although females had a lower distance of IASH in the group without MSD.
3. Significant correlations were observed for IASH with LL and ShH with IASH – both for males and females.
4. This study suggests that the observed differences necessitate attention to postural stability in the future to reduce undesirable postural changes and improve quality of life.

Osseous Metaplasia in a Patient with Chronic Periodontitis: A Case Report

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Introduction. Osseous metaplasia is the abnormal formation of bone tissue within soft tissues. It is often a reaction to trauma or inflammation. In periodontitis – a chronic inflammatory disease characterized by the destruction of tooth-supporting structures – osseous metaplasia can develop as a pathological response to chronic inflammation in tissues such as the periodontal ligament or gingiva. Although the precise molecular mechanisms underlying the development of osseous metaplasia in periodontitis are not fully understood, they are thought to be related to an unregulated inflammatory response and aberrant osteogenic differentiation.

Aim. The study aimed to document and describe a rare case of osseous metaplasia in a patient with chronic periodontitis.

Materials and Methods. A 42-year-old man has presented with chronic periodontitis treated at RSU Stomatology Institute of Periodontology Department. The patient had not reduced the depth of periodontal pockets after conservative periodontal treatment and required surgical treatment to reduce them.

Results and/or Discussion. After surgical treatment, the periodontal pocket tissues were examined and abnormal bone-like formations were observed in the connective tissue, particularly in areas of persistent inflammation. Microscopic examination confirmed the presence of inflammatory cells and osseous metaplasia – mature lamellar bone formation in the gingival connective tissue. The patient anamnesis *morbi* didn't demonstrated any other systemic conditions that could explain the osseous metaplasia, suggesting that the chronic inflammatory environment of periodontitis could be the primary contributing factor.

Conclusions. Osseous metaplasia is a rare case in a patient with chronic periodontitis. A prolonged inflammatory process in the gingival connective tissue due to chronic periodontitis may lead to abnormal osteogenic differentiation, which causes heterotopic bone formation in the gingival connective tissue. Although the precise molecular mechanisms of bone metaplasia remain unclear, this case supports the theory that chronic inflammation plays an important role in the development of bone metaplasia.

Anatomical Aspects of Carpal Tunnel Syndrome

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Introduction. Carpal tunnel syndrome (CTS) is defined as pain, weakness or numbing and tingling on the palmar surface and on the dorsal surface of the wrist, as well the thenar eminence, that caused by a pressure on the median nerve within the carpal canal. Carpal canal is a highly congested area and thus prone to neural compression making up 90% of cases with a general population prevalence of 1–5%, with higher rates in individuals aged 45–60 years (*Sevy,* 2023). The risk factors of CTS include repetitive motions at work, prolonged subjectification to vibration or tension, trauma in the wrist joint area.

Aim. The aim of the study was to dissect and analyze anatomical aspects of the carpal tunnel and the *n. medianus* the topographical anatomy, and investigate Carpal Tunnel Syndrome (CTS) and its clinical presentation and treatment.

Materials and Methods. The Laboratory of Anatomy of the Department of Morphology at the Institute of Anatomy and Anthropology provided the human cadaver and the instruments used for this dissection, while the theoretical research was conducted relying on papers and other sources online (*National Institute of Arthritis and Musculoskeletal and Skin, Mayo Clinic, Dellon Institute, American Association of Neurological Surgeons, National Health Service*).

Results. CTS affects women and men in a 3 : 1 ratio, respectively, due to various factors like earlier onset due to estrogen level decrease after menopause, predisposed CTS due to genetic variation, etc. (*Rodríguez,* 2022). Credible article studies (*NHS,* 2024) point to CTS as pain or weakness of the wrist, as well as "pins and needles" and weakness of the fingers. Perhaps due to the vague clinical presentation of CTS as wrist pain and the rich anatomy of the wrist, there is no golden standard for diagnosing CTS. However, common techniques include Tinel's sign, Phalen's test, Durkan's Test, palmar muscle atrophy and electromyography (EMG), an X-ray and others, each with different sensitivity and specificity statistics (*Zhang,* 2020; *Boyer*, 2009). The treatment ranges from lifestyle changes to pharmacological to surgical interventions, depending on the severity and time exposed to discomfort. Each year, over 600 000 carpal tunnel surgeries are conducted in the United States alone. CTS risk factors include prolonged (months to years) repetitive wrist motions and vibrations in the environment, for example at work, wrist injury, genetic predispositions that manifest with age, gender and other predisposing conditions (*Zimmerman*, 2022). Treatment for CTS

includes, firstly, prevention and care, such as changes in lifestyle to relieve pressure from the wrist, secondly, the use of NSAID's and corticosteroids to relieve pain, thirdly, the use of a wrist splint at night and/or day, and lastly – surgery with a multiple month post-operative recovery period (*NIAMS*, 2023). The study of topographical anatomy revealed that through the carpal tunnel pass of nine tendons of the following muscles: *m. flexor pollicis longus* (1), *m. flexor digitorum superficialis* (4) *et m. flexor digitorum profundus* (4) and their synovial sheets as well as *n. medianus*. It branches out in *nn. digitales palmares communes* (3), that innervate 1st and 2nd *mm. lumbricales* and *m. abductor pollicis brevis*, *m. opponens pollicis* and *m. flexor pollicis brevis,* after that they branch to *nn. digitales palmares proprii*. The latter innervate the skin of the fingers Ist, IInd, IIIrd, and the radial side of the IVth on the palmar surface, and their terminate branches involve in the innervation of the dorsal surface of distal and medial phalanges of the same fingers.

Conclusions. Analysis of the literature revealed that CTS is the most presented mononeuropathy in the highly congested area and thus prone to compression of *n. medianus* affecting motor and sensory fibers, that is, making up 90 % of cases with a general population prevalence of 1–5 %, with higher rates in individuals aged 45–60 years. Gender unrelated risk, physical ergonomic, traumatic factors could cause increasing pressure within the carpal tunnel, leading to misfunction of *n. medianus*.

Anatomical and topographical aspects of carpal tunnel revealed that nine tendons of muscles and their synovial sheets, as well as *n. medianus* pass through it. Understanding the anatomy of the carpal tunnel is essential for determining treatment, and it varies for each individual and their presented case.

Analysis of the Morphological Variations in the Hyoid Bone

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Introduction. The hyoid bone is a U-shaped structure in the anterior cervical area at the third or fourth cervical vertebra level, where it acts as an anchor for muscles involved in swallowing, speech and respiration (*Cotter et al.*, 2015). The standard anatomical and clinical textbooks provide only basic information

about this bone (*Bhavna et al.*, 2024), describing it as a symmetric U-shaped bone. Scientists have also documented asymmetric, parabolic and hyperbolic hyoid shapes (*Kimet al.*, *Koebke* & *Saternus*, 1979). A well-known classification which includes five types (B, D, H, U and V types) has been done by *Papadopoulos et al.*, 1989. The described morphological variations are relevant in anatomical studies, as the variations can influence speech mechanics and airway stability (*Kurbanova et al.*, 2023).

Aims. This study aimed to evaluate the variations of hyoid bones, compare the results with those reported in other studies and recreate all five variations of the hyoid bone according to the system described by *Papadopoulos*.

Materials and Methods. Thirty-eight hyoid bones were measured from the material provided by the Laboratory of Anatomy of the Department of Morphology of the Institute of Anatomy and Anthropology. Eight bones from dissected anatomical wet specimens and one dry bone specimen were measured using a digital caliper. In contrast, the rest of the bones (29 bones) found on "*Anatomage*" table were isolated from whole scanned bodies and measured by placing digital markers on different points of the bone for distance measurement. All the hyoid bones were compared and analyzed using known anatomical bone variations. Digital examination of two measurements (width and central transverse axis) of each hyoid bone was done, and data, including mean values and standard deviations (SD), were analyzed using Excel. At last, all five variations described by *Papadopoulos et al.* (1989) were recreated using a metal wire as a base, self-hardening plastic for creating the bone shape and a transparent varnish for surface protection.

Results. The morphological types of hyoid bones were classified according to the Papadopoulos system. The findings were as follows: type U (U-shaped) hyoid bone was observed in 34.2 % (13 bones), type H (horseshoe type) hyoid bone in 5.3 % (2 bones), type B (boat-shaped) hyoid in 50 % (19 bones), type D (deviating type) hyoid in 7.9 % (3 bones) and type V (V-shaped) hyoid in 2.6 % (1 bone).

Additionally, measurements of the hyoid bones were taken to detect variations, revealing significant differences among the specimens. The first measurement was the width of the hyoid bone, defined as the distance between the distal ends of the greater cornua. The maximum width recorded was 51.35 mm, while the minimum was 21.12 mm. The mean width was 39.47 ± 6.8 mm.

The second measurement was the central transverse axis, defined as the distance between the inner contours of the greater horns. The maximum value observed was 38.65 mm and the minimum was 16.47 mm. The mean value for the central transverse axis was 29.82 ± 4.36 mm.

Conclusions.

1. Significant morphometric differences exist between the hyoid bones in the population.
2. There is no correlation of the variation occurrence in different studies.
3. Considerable differences were detected in hyoid bone shapes, with type B and type U being the most common bone variations.
4. Detected bone variants could help predict the possible outcomes of cervical injuries, as the fractures could depend on their shape to define the morphologic features for clinical diagnosis, treatment of discomforts in the neck region and surgical procedures.
5. Further studies are recommended to gain more information about the measurements of the hyoid bone, and these investigations could also consider bone calcification, a person's age, sex and population.

Autonomic Ganglia of the Head and Neck and Their Clinical Significance

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Introduction. In the head region, four pairs of autonomic, parasympathetic ganglia (ciliary, otic, pterygopalatine and submandibular) are involved in essential functions, including ocular accommodation, salivation and glandular secretion. Despite their importance, the morphology, anatomical variations and clinical implications of these ganglia remain insufficiently explored.

Aim. The study aims to investigate the anatomical characteristics and clinical significance of autonomic ganglia in the head. Furthermore, a cadaveric dissection was conducted to compare real anatomical findings with literature data.

Materials and Methods. A literature review was performed using sources such as *Gray's Anatomy*, *Netter's Atlas of Human Anatomy*, and scientific databases like *PubMed* and *Scopus*. Additionally, a cadaver dissection was conducted at the RSU Department of Morphology, where four autonomic ganglia were identified, dissected, measured and then were documented and compared with published data.

Results. The anatomical locations of the dissected ganglia were consistent with literature descriptions. However, variations in size were noted: *ganglion submandibulare* was 4.5 × 4 × 1 mm, *ganglion ciliare* 3 × 2 × 0.8 mm, *ganglion oticum* 5.5 × 3 × 1 mm, and *ganglion pterygopalatinum* 2.5 × 3 mm. Differences in size may be attributed to individual anatomical variations, preservation methods or measurement techniques.

Conclusions. This study confirms that the topography of the autonomic ganglia in the head aligns with existing literature, with minor anatomical variations observed. The findings emphasize the need for further investigation into ganglionic involvement in clinical conditions such as Frey's syndrome, chronic headaches and autonomic neuropathies. Enhanced anatomical understanding could improve surgical approaches and therapeutic interventions.

Back Pain in Adults with Leg Length and Shoulder Height Discrepancies

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Dr. med., Professor Jānis Vētra

Introduction. Musculoskeletal disorders, which include chronic back pain, are one of the leading causesfor longest years lived with disability. However, information about the effect of leg discrepancies on back pain is disparate, and information about shoulder discrepancies is scarce and inconsistent.

Aim. The study aimed to evaluate whether there is a relationship between gender, leg and shoulder discrepancies, and chronic back pain.

Materials and Methods. A study enrolled 574 adult participants from a cross-sectional study carried out in Piebalga in 2024. Further, participants were divided into two groups by back pain prevalence. The back pain group consisted of 188 (32.7 %) participants, while the control group contained 386 (67.3 %) participants. The height of the *spina iliaca anterior superior* was measured from the floor with an anthropometer to evaluate leg length, and to *acromion* of the scapula for the shoulder length. A statistical analysis was performed with nonparametric tests to determine the association between back pain and gender; differences in both leg and shoulder discrepancies across back pain groups.

Results. The back pain group consisted of 32.6% males and 67.4% females, while the control group had 40.0% males and 60.0% females. The median for shoulder height discrepancy was 0.99 cm (IQR: 0.40–1.40) in the back pain group; 0.80 cm (IQR: 0.30–1.10) in control. While the median for leg length discrepancy was 0.50 cm (IQR: 0.20–1.00) in the back pain group; 0.30 cm (IQR: 0.10–0.60) in control. Mann-Whitney U test showed statistically significant differences in the distribution of shoulder ($p = 0.015$) and leg ($p < 0.001$) discrepancies across back pain groups.

Conclusions.

1. Back pain prevalence did not differ amongst genders.
2. A statistically significant difference was observed between shoulder and leg discrepancies across back pain groups, suggesting that discrepancies predispose to back pain.

Exploring Renal Artery Variations in Cadavers and Their Impact on Percutaneous Renal Sympathetic Denervation Eligibility

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Introduction. Approximately 1.3 billion people in the world suffer from arterial hypertension (AH) (*WHO*, 2023), and ~28% in Latvia (*Ērglis et al.,* 2020), it is one of the leading causes of premature death. One of the possible treatments for resistant AH is percutaneous renal sympathetic denervation (RSD) (*Kasprzycki et al.*, 2023). Studies have shown that RSD effectiveness is impacted by aspects like accessory renal arteries (ARA) and main renal artery (MRA) variations (*Id et al.*, 2013; *Wu et al.*, 2024). The presence of ARA in the population is 25–30%, and even higher in patients with AH ~ 40–59% (*Sanghvi et al.*, 2022; *VonAchen et al.,* 2016). Therefore, only half of AH patients are eligible for the RSD procedure (*Rimoldi et al.* 2014).

Aim. This study aimed to determine the main anatomical variations of the renal arteries and the prevalence of ARA in human cadaveric materials, analyze the role of observed renal vascularization features in RSD, and determine the potential eligibility for this procedure.

Materials and Methods. The study involved eight human cadaver dissections of the renal region provided by the Laboratory of Anatomy of the Department of Morphology of the Institute of Anatomy and Anthropology. Anatomical measurements of the renal arteries were obtained from 15 kidneys (8 on the right side and 7 on the left side). A Vernier digital calliper was used to measure MRA and ARA length, diameter, and number. The number of potential cadaver kidneys with anatomical variations of the renal arteries that would be eligible for RSD procedure was determined by specific renal artery anatomical criteria, based on *Rimoldi et al.* (2014): no multiple MRA were observed, MRA length greater than 20 mm and diameter greater than 4 mm, no ARA was observed. In cases where the anatomical parameters of the arteries did not meet any of the criteria, the renal material was considered not eligible for the RSD procedure. The data was collected and analyzed in *Excel*, determining minimum, maximum, mean values and standard deviations.

Results. The most common MRA variations on the right side were 1 MRA with two branches and 1 MRA with two branches that divide dichotomously; however, on the left side, 1 MRA with two branches that divide dichotomously. The right MRA were longer and wider (35.98 ± 16.15 mm; 12.17 ± 10.77 mm) than the left MRA (21.65 ± 11.42 mm; 6.92 ± 2.93 mm). On the right side, the prevalence of ARA was higher (62.5 %) than on the left (57.1 %). The mean diameter and length of ARA were found to be greater on the right side (44.52 ± 20.98 mm; 3.78 ± 0.66 mm) than on the left side (43.89 ± 27.55 mm; 2.94 ± 0.89 mm). Based on the literature review, in ~53 % of cases the renal artery anatomy meets the anatomical selection criteria for RSD (*Rimoldi et al.*, 2014). This cadaveric study found that only 4 out of 15 (26.7 %) kidneys met the RSD selection criteria. The main reason for the non-eligibility was the presence of ARA (60.0 % of the cases). The second most frequent reason for the non-eligibility was MRA length of less than 20 mm (40.0 % of the cases).

Conclusions.

1. Significant anatomic variations of renal arteries were observed on both sides of cadaver kidney materials, which may affect the efficacy of RSD.
2. MRA variations were noted on both right and left sides, with a higher frequency of two branches dividing dichotomously.
3. The study sample showed a high prevalence of ARA, with a higher prevalence on the right side (62.5 %) than on the left side (57.1 %).
4. Based on the study criteria, only 26.7 % of kidney cadaver materials were potentially eligible for the RSD procedure, mainly due to the high prevalence of ARA.

Comparative Assessment of Parotid Gland Dimensions in Human Cadaveric Specimens

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Introduction. The parotid gland is the largest of the major salivary glands in the human body, located bilaterally on either side of the mouth, anterior to the ears and extending over the mandibular ramus. Its size and shape can vary among individuals and are influenced by age, genetics and physiological factors. In some cases, asymmetry between the left and right glands may be observed (*Cilingiroglu Anli et al.*, 2023). Additionally, accessory parotid glands can occasionally be present along the parotid duct, contributing to salivary secretion. These variations are essential in clinical practice, as they may affect surgical approaches, imaging interpretations and the presentation of glandular pathologies.

Aim. This research aims to assess the anatomical variations in length and width between the left and right parotid glands across different human bodies.

Materials and Methods. Materials and the virtual dissecting table "*Anatomage*" were provided by the Laboratory of Anatomy of the Department of Morphology of the Institute of Anatomy and Anthropology, Rīga Stradiņš University. A study was conducted on ten human parotid glands obtained from two natural human bodies and three virtual models. It included five left parotid glands and five right parotid glands. Several measurements were taken bilaterally using a ruler and a digital caliper with an accuracy of 0.01 mm. All measurements were expressed in millimeters. The calculations (means, minimal and maximal scores) and statistical analysis were performed in *Excel.* Data from scientific literature (*PubMed*, *Scopus*) were used and analyzed to observe parotid gland size patterns. The parotid gland's measurements, length and width were evaluated and compared with the study of *Dost* (1997).

Results. The measurements of the left and right parotid glands were recorded for five individuals to assess anatomical variations in their length and width. On average, the left parotid gland measured 55.04 mm in length and 41.75 mm in width, whereas the right parotid gland had a mean length of 56.24 mm and a mean width of 43.78 mm. In the first individual examined, the left parotid gland exhibited notable dimensions, measuring 58.74 ± 0.62 mm in length and 36.04 ± 0.48 mm in width, while its counterpart, the right parotid gland, was larger, measuring 68.92 ± 0.86 mm in length and 38.94 ± 0.56 mm in width. The second individual presented a distinctly smaller left parotid

gland, measuring 35.68 ± 0.80 mm in length and 41.42 ± 0.33 mm in width, whereas the right parotid gland measured 31.58 ± 0.65 mm in length and a wider 49.44 ± 1.09 mm in width, indicating a varied asymmetry. In the third individual, the left parotid gland displayed measurements of 46.43 ± 0.48 mm in length and 47.27 ± 0.80 mm in width, while the right parotid gland was slightly smaller, measuring 43.39 ± 0.62 mm in length and 51.84 ± 1.17 mm in width, demonstrating a unique balance. The fourth individual had a left parotid gland that measured a robust 60.00 ± 1.00 mm in length and a narrower width of 34.67 ± 0.58 mm. The right parotid gland in this case measured 62.33 mm in length and 39.33 mm in width, showcasing a significant size but lesser breadth. Finally, the fifth individual showcased the most impressive dimensions: the left parotid gland measured 74.33 ± 0.58 mm in length and a generous width of 49.33 ± 1.53 mm. The right parotid gland was slightly larger still, measuring 75.00 ± 1.00 mm in length and 39.33 ± 0.58 mm in width, revealing a strikingly pronounced expressions of these glands in this subject.

Compared to the research by *Dost*, which analyzed 50 subjects and reported a mean parotid gland length of 46.30 ± 7.70 mm and a width of 37.40 ± 5.60 mm, in the sample of five individuals obtained, the parotid glands tended to be longer and wider on average, though individual variations were observed. Only a few measurements were within the range of previous research.

Conclusions.

1. The results indicate individual variations in the dimensions of the parotid glands, revealing slight discrepancies in length and width between the left and right glands.
2. On average, the right parotid gland exhibited a tendency to be somewhat longer and broader; however, notable variations were observed among individuals.
3. These findings underscore the necessity of taking anatomical differences into account in medical and surgical applications involving the parotid gland.

From Childhood to Maturity: Gender Differences in Pelvic Development

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Introduction. Anthropometric measurements of the pelvis are essential for understanding growth patterns and developmental differences between genders, as well as for assessing clinical implications related to pelvic morphology. The pelvis is the most sexually dimorphic region of the human skeleton, with structural variations that influence not only locomotion but also reproductive function and overall biomechanics (*Christensen et al.,* 2014). Since the pelvis plays a key role in movement and posture, its dimensions are particularly important in medical practice, aiding in areas such as obstetrics and orthopedics. Understanding these variations is crucial for diagnosing and managing conditions related to pelvic structure, such as childbirth complications. Sexual dimorphism in the human pelvis has evolved in response to several jointly acting selection regimes that result from the pelvis multiple roles in locomotion and childbirth, among others (*Fischer et al.,* 2017). These evolutionary adaptations have led to distinct structural differences between male and female pelves. While studies have extensively examined adult pelvic morphology, there remains a lack of comprehensive longitudinal data on how the pelvis develops throughout childhood and adolescence.

Aims. The aim of this study was to describe and analyze the growth patterns and gender-specific differences in pelvic anthropometric measurements in children aged 2 to 18 years, focusing on intercristal distance and symphysion height.

Materials and Methods. The longitudinal study started in 2005/2006 and concluded in 2025. It contains data from 284 children – 139 boys and 145 girls, aged 2–18. Annual anthropometric measurements were conducted at the Anthropology Laboratory of the Institute of Anatomy and Anthropology, Rīga Stradiņš University. Measurements included intercristal distance and symphysion height, using standardized instruments. Data processing involved using Microsoft Office Excel 2021 and IBM SPSS Statistics 28.0 (IBM SPSS, Armonk, NY, USA). The collected data were evenly distributed into age groups, tabulated, and then analyzed using descriptive statistics.

Results. From age 2 to 10, girls consistently showed a smaller intercristal distance than boys (mean value: girls – 19.60 cm vs. boys – 20.07 cm). At age 11, the intercristal distance for girls was longer than boys and this continued until age

of 13 (26.43 cm for girls vs. 26.03 cm for boys at the age 13). At the age of 18, the final intercristal line sizes for both genders were: 30.21 cm for boys, 28.57 cm for girls.

The mean value for symphysion from 2–8 years of age was very similar for boys and girls (e.g., symphysion: 57.74 cm for boys and 57.83 for girls at the age 6). From age 9 to 11 girls had a longer symphysion than boys (mean value for symphysion from age 9–11: 73.44 cm for girls vs. 72.97 cm for boys). Boys overtook girls at the age 12 and this pattern continued until age 18, when both genders reached their maximum (90.31 cm for boys vs. 87.06 cm for girls).

Conclusions. Up to age 10, boys consistently had a larger intercristal line than girls, but from age 11 to 13, girls temporarily surpassed boys, likely due to their earlier pubertal growth spurt. By age 18, however, boys had a greater final intercristal distance (30.21 cm) compared to girls (28.57 cm). A similar trend was observed in symphysion height. Boys and girls had nearly identical measurements up to age 8, but from ages 9 to 11, girls exhibited a longer symphysion than boys. This difference was short-lived, as boys surpassed girls at age 12 and maintained this lead throughout adolescence. By age 18, boys had a greater final symphysion height (90.31 cm) compared to girls (87.06 cm).

Transformations and Increased Height in Intervertebral Discs of the Lumbar Spine

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Introduction. The intervertebral disc is a cushion of fibrocartilage and the principal joint between two vertebrae in the spinal column. The intervertebral disc consists of three distinct components: a central nucleus pulposus, a peripheral annulus fibrosus and two vertebral endplates that cover the superior and inferior aspects of the disc. The maximal height of the intervertebral disc in the adult lumbar spine is typically at the L4/L5 level, ranging from approximately 8.7 to 12.3 mm (*Türkhun et al.*, 2023). Intervertebral discs can become enlarged due to a process called hypertrophic differentiation, which occurs during disc degeneration. It is associated with increased collagen type X production and calcification in chondrocytes (*Ning et al.*, 2023).

Aim. The study aimed to evaluate height of lumbar intervertebral discs, estimate potential hypertrophic changes and identify possible conditions or diseases that may contribute to these transformations.

Materials and Methods. Lumbar intervertebral discs were measured on a cadaver provided by the laboratory of Anatomy of the Department of Morphology of the Institute of Anatomy and Anthropology, Rīga Stradiņš University. During the dissection *lig. longitudinale anterius* and *m. psoas major* were removed from the anterior and lateral areas of the lumbal spine. Measurements were taken using a compass (drawing tool) and a ruler at three specific points: the center, right side and left side (approximately halfway between the center and the lateral margin). Four intervertebral discs were evaluated. For comparison, analogous measurements were performed on two virtual cadavers (Caucasian and Asian males) using virtual table "*Anatomage*".

Results. Four intervertebral discs were carefully evaluated, providing valuable measurements for each disc's middle, right and left sections. The average dimensions are as follows: L2/L3 disc: 15.0 ± 0.5 mm (middle), 17.7 ± 0.5 mm (right) and 11.0 ± 0.5 mm (left); L3/L4 disc: 16.7 ± 0.5 mm (middle), 16.7 ± 0.5 mm (right) and 18.0 ± 0.5 mm (left). L4/L5 disc: 18.3 ± 0.5 mm (middle), 18.7 ± 0.5 mm (right) and 20.7 ± 0.5 mm (left); L5/S1 disc: 19.3 ± 0.5 mm (middle), 19.7 ± 0.5 mm (right) and 19.3 ± 0.5 mm (left). Notably, the L3/L4 and L4/L5 discs exhibit significant asymmetry, characterized by a pronounced enlargement on the left side. Conversely, the other examined discs demonstrate a gradual increase in height as one moves from the central region outward toward both lateral sides.

Furthermore, the average measurements obtained in this study are strikingly higher by 3.0 to 8.0 mm than those documented in the existing literature and comparisons with virtual cadaver data. These findings strongly suggest that the intervertebral discs are experiencing enlargement due to hypertrophic transformations of chondrocytes, pointing to potential underlying mechanisms affecting disc morphology.

Conclusions.

1. All the lumbar intervertebral discs measured show an abnormal increase in height due to hypertrophic changes in the cartilage.
2. Two of the discs exhibit asymmetrical enlargement, with the left side measuring 1.5 to 2 mm higher than the right.
3. It is essential to understand the environment that prevents chondrocyte hypertrophy in tissue to help delay or prevent cartilage hypertrophy and ossification.
4. Additionally, understanding the connection between disc hypertrophy and degenerative cartilage conditions is crucial for early diagnosis of spinal pathologies.

The Role of Antimicrobial Peptides and Proteins in the Pathogenesis of Cholecystitis in Children: A Pilot Study

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Introduction. Cholecystitis in children is an inflammation of the gallbladder, which can be acute or chronic, calculous or non-calculous. In recent decades, there has been an increase in the incidence of cholecystitis among children, associated with dietary changes leading to metabolic disorders and obesity. One of the key factors in the pathogenesis of cholecystitis is the dysregulation of the immune response, particularly the imbalance of antimicrobial peptides and proteins such as beta-defensins, cathelicidin (LL-37), galectins and the CD163 receptor.

The aims of this study were to investigate the expression of antimicrobial peptides and proteins in gallbladder tissues of children with cholecystitis and to evaluate their role in the development of the disease.

Materials and Methods. The study included gallbladder tissue samples obtained from 11 patients aged 12 to 17 years diagnosed with chronic calculous cholecystitis. The control group consisted of 5 patients without gallbladder pathology. Immunohistochemistry was used to assess the expression of antimicrobial peptides (BD2, BD3, BD4, LL-37) and proteins/anti-inflammatory cells (galectin-10, CD163). Statistical analysis was performed using non-parametric tests (Mann-Whitney U test) and Spearman's correlation analysis.

Results. The patient's gallbladder wall demonstrated notable infiltration with inflammatory cells until the muscle layer in some cases. A statistically significant increase in the expression of positive for antimicrobial peptides BD2, BD3, BD4 and LL-37 cells was observed in the epithelium and stroma of the gallbladder in patients with cholecystitis compared to the control group ($p < 0.05$). Elevated number of galectin-10 and M2 (CD163) were also detected in the tissues of patients, indicating activation of the immune response and suppression of the inflammatory processes. Correlation analysis revealed strong positive relationships between the expression of BD2 and BD3 ($\rho = 0.866$, $p < 0.01$), BD2 and BD4 ($\rho = 0.797$, $p < 0.01$), as well as between BD4 and CD163 ($\rho = 0.683$, $p < 0.01$), suggesting potential interactions between these markers in the pathogenesis of cholecystitis.

Conclusions. Antimicrobial peptides (BD2, BD3, BD4, LL-37) and proteins (galectin-10), and anti-inflammatory macrophages (CD163) significantly increase in the cholecystitis-affected gall bladder indicating the tissue trial to compensate the disease in children. Increased expression of these markers and intercorrelations in gallbladder tissues indicate the mutual local immune defense, however, being not able to remove the etiology for persistent inflammation.

Creation and Exploring Anatomical Drawings of the Human Skull and Its Pathologies

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Introduction. Artistical visualizations of the structures and their details are essential concepts for first- and second-year medical students. For medicine, Anatomy is the "*Kingdom of the Images*", and the use of drawings, where an image is created from a blank template, has long been used for outlining relationships and continuity from one region to another and has shown positive outcomes for an understanding the normal and pathological sign in the human body (*Greene*, 2019). Drawing as a tool for teaching anatomy can play a significant role in the medical curriculum (*Borrelli et al.*, 2018). Basically, learning also requires a series of descriptive and educational sources in front of the student to build the human body (*Amin*, 2020), especially the skull.

Aim. This study aimed to develop anatomical illustrations of the human skull employing a range of visualizations that could enhance medical students' understanding of its anatomy and structure and facilitate the identification of any differences in the presence of visible pathologies.

Materials and Methods. To create by hand a set of ten anatomical drawings, a variety of professional-grade pencils and specialized art supplies were employed to capture the intricate differences in the structure of the human skull with remarkable realism. The drawing process was significantly enhanced by providing natural human skull models from the Laboratory of Anatomy at the Department of Morphology, Rīga Stradiņš University. This invaluable resource allowed for a detailed examination of the anatomical features. Furthermore, a selection of scientific databases was utilized as references, providing essential information and insights to enrich the visualizations and ensure accuracy in the representations.

Results. The skulls were a perfect combination of simple and complex geometric shapes. The anatomical drawings of the anatomically correct skull and the following different pathologies related to the skull allow the comparison of each pathology's visual differences. Anatomical drawings of the human skull provided detailed illustrations of its complex structure, highlighting key components such as the frontal, parietal, occipital, temporal and face bones. These drawings revealed the intricate relationships between these bones, showcasing how they protected the brain and supported facial features. In addition to depicting the normal anatomy, these drawings illustrated various pathological conditions affecting the skull (fractures, deformities), helping to visualize the impact of these conditions on the structures and functions.

Such anatomical drawings were invaluable educational tools, aiding in understanding the complexities of skull anatomy and its pathologies. They were frequently utilized in textbooks, medical journals and online platforms to improve learning and understanding. Moreover, in clinical settings, these drawings served as diagnostic aids, assisting healthcare providers in diagnosing and planning treatment for skull-related conditions. They were used as references during surgical procedures and other medical interventions, ensuring precise and effective treatment.

Conclusions.

1. Anatomical drawings improved an understanding of the skull's anatomy and structure.
2. Visual aids facilitated the recognition of visible pathologies, such as fractures and deformities.
3. The illustrations proved to be effective teaching tools, enhancing learning outcomes.
4. These visualizations can support healthcare professionals in diagnosing and planning treatments for skull-related conditions.
5. Employing various visualization methods provided a comprehensive understanding of the skull's anatomy and pathologies.

Investigation of Inflammatory Markers in Pediatric Calculous Cholecystitis: A Focus on the Proinflammatory and Cellular Activity Markers and Gene Proteins

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Introduction. Calculous cholecystitis is associated with inflammation and several problems. Although it is a frequent condition in children, morphopathogenesis remains unclear. By understanding the specific roles of these markers, would be possible to provide insights into the morphopathogenesis of the disease, thus helping in identification of potential diagnostic and/or therapeutic targets.

Aim of the study was to explore the role of specific inflammatory markers (IL-1β, IL-12, IL-13, HSP60, SHH and NF-κβ p105) in the morphopathogenesis of pediatric calculous cholecystitis.

Materials and Methods. Tissue samples were obtained from 11 female patients, aged 12 to 17, who underwent surgery for calculous cholecystitis. 5 unaffected gallbladders were used as the control group. Immunohistochemical analysis was performed with tissue samples immunohistochemically stained. After staining, slides were examined under light microscopy to assess the presence and localization of these markers. Differences between samples were evaluated using the Mann–Whitney U test, with statistical significance set at $p < 0.05$.

Results. Commonly, the epithelium and connective tissue of patients demonstrated more factor expression than the controls. IL-1β, IL-13 and SHH was notably lower in the control epithelium, while the connective tissue demonstrated almost the lack of all factors here. Statistically significant differences between epithelial layer in patients and controls were observed for IL-13 and HSP60. In connective tissue statistically significant difference between patient and control was found for IL-1β, IL-12, IL-13, HSP60, NF-κβ p105.

Conclusion. The inflamed gall bladder shows all markers increase suggesting the persistent inflammatory reaction in case of calculous cholecystitis. From the tissue, the epithelium seems to be more rigid to inflammatory changes proved by the significant increase only of IL-13 and cellular activity marker HSP60, while significant elevation of almost all tissue factors in connective tissue proves the mutual interconnected inflammatory and cellular activation along the inflammation.

Comparative Analysis of Foramen Dimensions in Human Skulls

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Introduction. Foramina are openings in the skull that allow the passage of nerves and blood vessels, and their dimensions can vary significantly among individuals. This variability can impact surgical approaches, diagnostic procedures, and the understanding of certain medical conditions. Accurate knowledge of these dimensions' aids in the precise localization of neurovascular structures. Understanding the variations in foramen sizes can help in the diagnosis and treatment of conditions such as cranial nerve compression syndromes and vascular anomalies (*Kabakci et al.*, 2024).

Aims. The primary objective of this study is to provide a comprehensive analysis of the dimensions of five various foramina in human skulls, as well as to identify patterns of their asymmetry and variability.

Materials and Methods. This study utilized eight human skulls provided by the Laboratory of Anatomy of the Department of Morphology of the Institute of Anatomy and Anthropology, Rīga Stradiņš University. A complete internal cranial base identified each skull was carefully examined to ensure that the foramina were intact and suitable for measurement. For each skull, the following measurements were taken: the *foramen ovale, foramen spinosum, foramen lacerum, fissura orbitalis superior* and *foramen jugulare*. The length and width of each foramen were measured using a digital caliper separately for the right and left sides. The recorded measurements were analyzed to calculate descriptive statistics, including each foramen's average, minimum and maximum values, and separately to identify any asymmetry or variability. The data were processed using *Excel* to ensure the accuracy and reliability of the results.

Results. The analysis of the 160 measurements reveals several trends. For the *foramen ovale*, the average length on the right side is 7.67 mm with a width of 3.33 mm with an area of 20.21 mm^2, while on the left side, the average length is slightly larger at 7.91 mm and the width is 3.72 mm with an area of 23.11 mm^2. The minimum and maximum lengths for the right side are 6.61 mm and 9.19 mm, respectively, and for the left side, they are 7.06 mm and 9.16 mm. The widths range from 2.83 mm to 4.02 mm on the right and 2.90 mm to 4.34 mm on the left.

For the *foramen spinosum*, the right side has an average length of 2.49 mm and width of 2.03 mm, with lengths ranging from 1.75 mm to 4.20 mm and widths from 1.07 mm to 2.74 mm, and an area of 3.97 mm^2. On the left side, the average length is 2.92 mm, and the width is 2.13 mm, with lengths ranging from 1.88 mm to 4.70 mm and widths from 1.42 mm to 2.84 mm, and an area of 4.88 mm^2.

The *foramen lacerum* shows consistent sizes between the right and left sides. The average length on the right is 6.78 mm with a width of 6.38 mm with an area of 33.97 mm^2, while on the left, the average length is 6.92 mm, and the width is 6.15 mm with an area of 33.42. The lengths on the right range from 5.62 mm to 7.97 mm, and on the left, from 5.61 mm to 8.07 mm. The widths range from 5.21 mm to 7.65 mm on the right and 5.34 mm to 6.85 mm on the left.

The *fissura orbitalis superior* is larger on the left side, with an average length of 18.57 mm and width of 7.91 mm but an area of 115.37 mm^2, compared to the right side's average length of 17.88 mm and width of 9.70 mm but an area of 136.22 mm^2. The lengths on the right range from 14.60 mm to 20.41 mm, and on the left, from 10.59 mm to 24.81 mm. The widths range from 5.36 mm to 16.89 mm on the right and 5.52 mm to 13.57 mm on the left.

Finally, the *foramen jugulare* is larger on the right side, with an average length of 16.57 mm and width of 8.50 mm with an area of 110.62 mm^2, compared to the left side's average length of 13.72 mm and width of 7.27 mm with an area of 78.34 mm^2. The lengths on the right range from 13.38 mm to 23.80 mm, and on the left, from 12.02 mm to 15.42 mm. The widths range from 6.08 mm to 16.80 mm on the right and 6.05 mm to 10.89 mm on the left.

Conclusions.

1. The measurements indicate that certain foramina exhibit asymmetry, with some tending to be larger on one side than the other.
2. The *foramen ovale* and *fissura orbitalis superior* are generally larger on the left side, while the *foramen jugulare* is larger on the right side, but the *foramen spinosum* and *foramen lacerum* show more variability in their sizes between the sides.
3. These findings underscore the importance of understanding anatomical asymmetry, particularly in relation to the essential arteries and nerves that traverse these foramina.

Comparison of Surgical Techniques for Simulated Gastric Perforation Repair

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Introduction. The *omentum majus* consists of four mesothelial layers forming a double sheet of the peritoneum filled with adipose tissue. Due to its unique biological properties, anatomical structure and strategic location, it plays a crucial role in gastrointestinal surgery, particularly in the closure of perforations. One of the most widely used techniques for gastrointestinal perforation closure is *Graham's patch repair*, considered the gold standard in internal surgery (*Itama et al.*, 2024). However, variations in its application and suture techniques require precision and accuracy, as improper execution may lead to complications.

Aims. This study aimed to perform, compare and analyze three different surgical methods for repairing simulated gastrointestinal perforations, as well as to assess their complexity, time efficiency and potential post-operative outcomes.

Materials and Methods. The study was conducted at the Laboratory of Anatomy, Department of Morphology, Institute of Anatomy and Anthropology, Rīga Stradiņš University. Human anatomical specimens, including isolated gaster and fragments of isolated *omentum majus*, were utilized. Suturing was preformed using a non-absorbable nylon monofilament 3/0. The three perforation closure techniques examined were: (1) primary closure; (2) primary closure with pedicled omentoplasty; (3) *Graham's patch repair*. Each technique was initially performed on human specimens and subsequently applied to a cadaver for further assessment. The methods were evaluated based on technical complexity, duration of the procedure and the likelihood of post-operative complications as inferred from scientific literature and theoretical models.

Results. The isolated gaster was selected from the available materials based on its appropriate size and degree of tissue preservation. The *omentum majus* was taken from *colon transversum* material, which was cut into two equivalent pieces. One perforation was repaired using the primary closure with interrupted sutures, then covered with pedicled omentoplasty. The other perforation was closed by applying the *Graham's patch repair*. Similar procedures were performed on a partially dissected human cadaver without isolating organs. Comparative analysis revealed notable differences in procedural complexity, efficiency and anticipated clinical outcomes. Primary closure with interrupted sutures was the simplest and least time-consuming technique but lacked additional reinforcement, which may contribute to an increased risk of leakage. Primary closure with pedicled omentoplasty provided superior wound healing and reduced leakage risk due to the biological properties of the *omentum majus*. However, it was more technically demanding and required longer operative time. *Graham's patch repair* remained a well-established and effective method, balancing ease of application and biological reinforcement. Nonetheless, its success depends on proper suture placement and tissue viability, with outcomes comparable to alternative repair techniques.

Conclusions.

1. Primary closure with interrupted sutures is the simplest and fastest method but may have a higher risk of leakage compared to reinforced techniques.
2. Primary closure with pedicled omentoplasty enhances wound healing and reduces post-operative leakage but is more complex and time-consuming.
3. *Graham's patch* presents the greatest complexity and requires a high level of surgical skill to be performed correctly, ensuring the preservation of its biological function.
4. The biological properties of the *omentum majus* make it a valuable adjunct in simulated gastric perforation repair surgery but comparative data suggest that its use does not always result in significantly better outcomes than alternative repair techniques.

Simulating the Surgical Treatment of Radial Artery Aneurysms: Saphenous Vein Grafting and Anatomical Insights

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Introduction. Pseudoaneurysms in the upper limb require prompt treatment to prevent both local and systemic complications, including skin erosion, rupture with potential bleeding, and nerve compression, which can lead to paresthesia, pain, and restricted mobility. Aneurysms of the *a. radialis* are relatively rare; however, with the increasing use of invasive monitoring techniques, reports of pseudoaneurysms are becoming more frequent (*Gabriel et al*., 2013; *Simmons et al*., 2020). Importantly, untreated problems can result in serious complications, such as thrombosis, embolism, and potentially life-threatening conditions like arterial thromboembolism (*Kharazm et al.,* 2023).

Aims. This study aims to evaluate a surgical approach for treating radial artery pseudoaneurysms, with a particular focus on the use of a saphenous vein graft for arterial reconstruction. The objectives include assessing the feasibility and efficacy of autologous vein grafts in replacing the affected segment of the radial artery. Furthermore, the study seeks to measure the diameters of the radial artery at various anatomical points to assess individual variations and explore their potential impact on surgical outcomes and graft selection.

Materials and Methods. The study was conducted at the Laboratory of Anatomy in the Department of Morphology, Institute of Anatomy and Anthropology of the Rīga Stradiņš University, which provided the necessary instruments and one cadaver for the experiment. Initially, the radial artery's diameter and length were measured in 5 cm segments, beginning from the bifurcation of the brachial artery down to the location where the radial pulse is typically palpated. Measurements were taken from both hands to document any anatomical variations. A segment of the great saphenous vein was harvested from the bifurcation of the external iliac vein and prepared for grafting. The section of the radial artery affected by the simulated pseudoaneurysm was excised, and an end-to-end anastomosis was performed using the harvested saphenous vein, thereby restoring arterial continuity.

Results. In this study, the part of the saphenous vein was used to preserve more of the blood vessel for grafting. During the procedure, it was noted that the arterial diameter varied significantly across segments, with the proximal sections of the radial artery being larger in diameter compared to the distal

segments, which could influence the choice of graft size and type. Despite the variation in available vein grafts, the saphenous vein provided a suitable substitute for the excised radial artery segment, achieving an effective end-to-end anastomosis. No immediate complication, such as graft failure, was observed post-surgery. This suggests that radial artery pseudoaneurysm repair using vein grafts offered promising results, with minimal immediate complications and good potential for long-term success, though individualized approaches based on anatomical assessments were crucial for optimal outcomes.

Conclusions.

1. The use of autologous saphenous vein grafts for radial artery pseudoaneurysm reconstruction is a feasible and effective solution, as demonstrated by successful anastomosis in the cadaveric model.
2. Anatomical variations in the radial artery diameter should be considered during graft selection, as larger proximal segments may require tailored graft sizes for optimal surgical outcomes.
3. The procedure highlights the importance of using the most appropriate vein segment to minimize complications.
4. Further studies are recommended to investigate the long-term patency and functional outcomes of saphenous vein grafts in radial artery pseudoaneurysm repairs, as well as to refine surgical techniques based on anatomical variations.

The Suzuki Frame Fracture Model: A Standardized Approach for Studying Bone Healing and Regenerative Strategies

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Introduction. In 1994, *Suzuki et al.* introduced a method for the treatment of comminuted intra-articular fractures and fracture-dislocations affecting the proximal interphalangeal joint of the hand. This technique involves the use of pins and a rubber traction system. The authors successfully applied this approach to five complex fractures of the thumb. Since its inception, this technique has

been regarded as minimally invasive and effective in the fields of both adult and pediatric traumatology (*Rishabh et al*., 2024). Its relevance lies in its minimally invasive approach, ability to preserve soft tissue, and facilitation of early mobilization. That factors are critical for optimal recovery, that makes it one of the best approaches nowadays.

Aim. This study aimed to provide a thorough evaluation of the Suzuki frame fracture model, placing particular focus on its biomechanical stability, clinical implications and relevance in the context of translational research, as well as replicating a severe and complex fracture of the middle phalanx, which plays a critical role in finger function.

Materials and Methods. In this investigation, three distinct Suzuki frame models were meticulously applied to a human cadaver sourced from the Laboratory of Anatomy Department of Morphology, Institute of Anatomy and Anthropology Rīga Stradiņš University. A variety of surgical materials were employed, including multiple Kirschner wires, a precision drill machine, and flexible rubber bands, all of which were utilized to construct a robust stabilization frame. This careful assembly aimed to ensure optimal support and alignment of the fractured bone segments, thereby contributing to a deeper understanding of the model's effectiveness in clinical settings.

Results. Three distinct variations of the Suzuki frame stabilization construction were carefully modelled on a cadaver to evaluate their effectiveness and usability. The first variation employed a classic design, utilizing two Kirschner wires that were connected by a rubber band situated in the middle. This configuration allowed for adjustable traction forces, making it a versatile option that could be easily manipulated depending on the specific needs during stabilization of the fracture. The simplicity of its application also contributed to its effectiveness, enabling quick setup and modification in response to the condition of the cadaveric tissue.

The second variation presented a hybrid of classic and modified features. It also utilized two Kirschner wires but connected them with an elastic band. However, this design included an additional Kirschner wire strategically placed at the midpoint of the intermedial phalangeal joint. This enhancement provided not only adjustable traction but also improved stabilization of the intermedial phalangeal area. This variation proved to be easy to apply, combining the benefits of adjustable force with enhanced structural support.

The third variation represented a complete modification of the previous designs. In this version, two Kirschner wires were interconnected without the use of additional elastic bands or rubber components. This particular setup did not allow for adjustable traction forces, which could pose challenges in achieving

desired stabilization levels. Furthermore, the installation of this model proved to be more complex and difficult to execute compared to the other two variations. However, this modification eliminated the need for rubber bands, addressing potential issues related to their use, such as wear or breakage during the stabilization process.

Conclusions.

1. There is a direct correlation between the various models and the specific application techniques employed, highlighting the necessity for a comprehensive analysis of their effectiveness.
2. The assessment of Suzuki frame construction methodologies in cadaveric applications reveals distinct advantages and limitations associated with each variation.
3. The classic Suzuki frame is noted for its user-friendly design, offering adjustable traction force.
4. Conversely, the modified variation, although more complex to install and lacking adjustable traction, eliminates the need for rubber bands, thus offering a distinctive solution for particular situations.
5. The classic/modified variation further enhances this framework by introducing intermedial phalangeal stabilization while maintaining ease of use.

Reconstruction Method for the Posterior Medial Horn of the Meniscus

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Introduction. The posterior horn of the medial meniscus is the most important weightbearing portion of the meniscus. While the medial meniscus absorbs 50 % of the weight transmitted across the medial compartment, the posterior horn of the medial meniscus is the most important portion of the meniscus that provides the shock absorbing capacity (*LaPrade*, 2025). Tears of the posterior medial meniscal horn are frequently the result of excessive rotational strain, significant mechanical stress or traumatic injury to the knee. These injuries contribute substantially to joint instability, chronic pain and a diminished range of motion, adversely affecting an individual's quality of life and athletic performance. The prevalence of posterior medial meniscal horn tears has risen in conjunction

with the increasing incidence of sports-related injuries and physical traumas. If not addressed promptly, these injuries can lead to enduring functional limitations.

Aims. This study evaluated a novel approach for meniscal reconstruction by utilizing a posteromedial dissection of the knee. It involved the creation of a meniscus implant derived from the meniscus of a pig's hind leg. This method aimed to provide a potentially effective alternative to traditional meniscal repair techniques, enhancing functionality and improving outcomes for patients with meniscal injuries.

Materials and Methods. A cadaver, provided by the Laboratory of Anatomy at the Department of Morphology, Rīga Stradiņš University, underwent meticulous surgical dissection using dissection instruments. During the procedure, the compromised meniscus was carefully removed from the cadaver's knee. A pig's hind leg knee joint was dissected, and the meniscus was isolated. The meniscal defect in the posterior horn was repaired by affixing a biologically derived meniscus from a pig's hind leg to the extracted cadaveric meniscus, ensuring anatomical congruency.

Results. The posteromedial surgical approach was utilized effectively to extract the cadaveric meniscus and subsequently implant a biologically sourced substitute. This technique involved meticulously measuring the dimensions of the native meniscus, which ensured that the implant fit accurately within the anatomical constraints of the knee joint. Following the implantation, a specialized suturing technique was employed to provide stable fixation of the substitute to the existing native meniscus, thus facilitating a strong integration between the two structures.

The procedure's outcome was promising, as the reconstructed meniscus exhibited a favorable anatomical alignment. This alignment indicated that the posteromedial approach holded significant potential for restoring the integrity of the meniscus and improving overall joint function. However, the complexity associated with the dissection in the posteromedial region posed various technical challenges. These challenges necessitated a high level of surgical precision and attentiveness throughout the procedure to safely navigate the intricate anatomical structures present in that area.

Conclusions.

1. The study shows that while posteromedial dissection is complicated, it is an effective method for restoring the meniscus.
2. Creating a universally standardized model for posterior medial meniscus implantation is still impractical.
3. Advanced manufacturing technologies like 3D printing could enhance precision and reproducibility in future surgical practices.

The Correlation between Brugsch Index, FEV1/FVC Ratio and Respiratory Disease in the Piebalga Municipality Population Aged 40 to 60 Years

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Introduction. The Brugsch Index (BI) and modified Tiffeneau-Pinelli index (FEV1/FVC ratio) is used to assess potential health issues.

Aim. This research aims to assess the correlation between BI, FEV1/FVC and respiratory diseases among the population of Piebalga municipality in the age group 40–60 years old.

Materials and Methods. A cross-sectional study was carried out to identify correlation between BI, respiratory diseases and FEV1/FVC ratio results among the population of Piebalga municipality. The study was conducted from July to August 2024 in Vecpiebalga and Jaunpiebalga, Latvia. The participants signed a consent form prior to participating in the study. The participants answered a survey, body measurements were collected by using anthropometry and spirometer. The BI was calculated by dividing chest circumference (cm) by body length (cm) and multiplying by 100. The data gathered were analyzed using IBM SPSS 29.0.

Results. The study evaluated 690 residents of Piebalga municipality. In the age group 40–60 were 35.51 % (245) participants. Men were 36.73 % (90), and women were 63.27 % (155). Mean age was 51.70 (range 40–60 years). 2 % (5) based on their report have had respiratory disease in their lifetime and at the time of study. 87.76 % (215) had FEV1/FVC extremes, in men 34.88 % (75) and in women 65.12 % (140). There is no significant correlation between men, women and BI ($p = 0.304$, $p = 0.642$) or between FEV1/FVC and BI ($p = 0.656$). However, there is a weak positive correlation between respiratory illnesses ($p = 0.056$). The difference in FEV1/FVC between men and women is nearly statistically significant ($p = 0.055$).

Conclusions.

1. It was shown that self-reported respiratory illnesses were uncommon; however, abnormal FEV1/FVC ratios were common in the studied age group, especially among women.
2. There is no significant association between BI and gender, lung function.
3. There is a weak significant association between BI and respiratory illnesses.
4. The minor significance between men and women in FEV1/FVC ratio indicates lower prevalence of obstructive respiratory diseases in women.

Assessing the Ratio and Variability of Wall Thickness between the Right and Left Atria

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Introduction. The left and right atria are essential components of the human heart. Despite differences in wall thickness due to varying hemodynamic loads, both of them pump the same blood volume. Altered atrial wall thickness can result from pressure or volume overload, leading to conditions like myocardial hypertrophy or arrhythmia. Such changes may impair heart function and contribute to heart failure (*Whitaker*, 2016).

Aims. This study aimed to examine the correlation between the thicknesses of the atrial walls and to determine a coefficient if such a correlation exists. Additionally, the study sought to explore possible causes for a theoretical shift in the coefficient, and how this shift could affect the heart's ability to perform its necessary functions.

Materials and Methods. All necessary materials and equipment were provided by the Laboratory of Anatomy at the Institute of Anatomy and Anthropology of Rīga Stradiņš University. Five human heart specimens were selected and analyzed. Measurements were taken at four specific locations on the superior and lateral walls of both the left and right atria using a caliper. These locations included: the middle of the lateral wall of the right atrium (RA), the point between the openings of the superior and inferior vena cava on the superior wall of the RA, the point between the left and right inferior pulmonary veins on the superior wall of the left atrium (LA) and the middle of the lateral wall of the LA. Each measurement was repeated three times and performed at least 1 cm above the atrioventricular groove to minimize the influence of fatty deposits on the data (*Buja*, 2022). Measurement points were selected based on a review of the scientific literature and examination of available specimens. Data analysis was conducted using Microsoft Excel, and the wall thickness coefficient was calculated by dividing the mean thickness of the RA wall by the mean thickness of the corresponding LA wall. A coefficient greater than 1 indicated a thicker RA wall, while a coefficient less than 1 indicated a thinner RA wall. These coefficients were compared across the five specimens to identify potential correlations.

Results. The results varied greatly, not only between heart specimens but also across individual measurements. For instance, the superior wall of the right atrium in the second specimen was measured at 0.75 mm, 1.60 mm, and 1.11 mm

despite being measured in three closely located points. The average coefficient of the superior atrial walls ranged from 0.92 to 1.68. Only one of the five specimens had a thicker left atrial superior wall than the right atrial superior wall (0.92), while the remaining four specimens had a thicker superior wall in the right atrium (1.29, 1.68, 1.32 and 1.09). The same variability was observed in the lateral wall coefficient measurements, which ranged from 0.70 to 2.18, with only one specimen having a thicker left lateral wall (0.70). The variation in lateral wall coefficients was more significant than in the superior wall coefficients, suggesting that different hemodynamic loads may have a larger impact on lateral atrial wall thickness compared to the superior atrial wall.

Conclusions.

1. There is a correlation between atrial wall thicknesses, although the results show considerable variability between specimens and measurement points.
2. The lateral walls of the atria appear to be more susceptible to external hemodynamic factors than the superior walls, as evidenced by the larger variability in the lateral wall coefficients.
3. The presence of significant variability in wall thickness, especially in the lateral walls, highlights the complex relationship between atrial morphology and external factors, such as pressure and volume overload.
4. Further studies are needed to establish a definitive correlation between the left and right atrial wall thicknesses and to investigate whether this relationship has diagnostic or prognostic significance for heart conditions such as arrhythmias or heart failure.

Characterization of Tissue Immunity and Angiogenesis Factors in Children before and during Primary Dentition with Unilateral Cleft Lip and Palate

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Introduction. Unilateral cleft lip and palate (CLP) is a severe orofacial birth defect, characterized by insufficient fusion of facial parts and disturbances of the orofacial functions. The defect manifests as a gap in the tissues of lip, hard and soft palate with present chronic inflammation and defective healing patterns.

Immunity defense factors modulate immune response, inflammation, and healing; therefore, they are vital in the assessment of the immunological status of the patient and in the understanding of morphopathogenesis of CLP.

Aim of the study was to assess the distribution of vascular endothelial growth factor (VEGF), transforming growth factor beta 1 (TGF-β1), common macrophages pool, their subtype M2, heat shock protein (HSP) 60 & 70 and nuclear factor kappa B (NF-κB) p50 & p65 subtypes in CLP-affected tissue of children before and during primary dentition.

Materials and Methods. Tissues were obtained from 15 patients aged from 3 to 8 months during veloplastic surgery; 5 controls were used for comparison of data. Immunohistochemistry, light microscopy, semi-quantitative evaluation (from 0 to ++++) and statistics (Mann-Whitney U-test and Spearman's rank correlation) were used to evaluate the data, their statistically significant differences and correlations between the groups.

Results. Epithelium of CLP presented with statistically significant increase of VEGF, common macrophages, NF-κB p65 and HSP60. CD163 presented as the only factor with significant decrease in the epithelial tissue. Blood vessels of cleft affected tissue showed statistically significant increase of NF-κB p50 and p65, but decrease of CD163. Connective tissue of CLP presented with only one statistically significant change – increase of HSP70. Spearman's rank correlation revealed multiple statistically significant correlations between the factors, from which 26 correlations were positive and 5 – negative.

Conclusions. Increase of VEGF and common macrophages pool shows signs of increased immune and inflammatory reactions. No changes in TGF-β1 suggest lack of connective tissue involvement in the tissue processes of CLP. Decrease of CD163 illustrate shift towards proinflammatory M1 macrophages. Increase of both NF-κB subtypes illustrate mutual cooperation in creation of chronic inflammation. Increased quantity of HSP70 demonstrates actions of pathological immune response suppression and protection against cellular stress. Mutually strong correlations between the factors show synergistic mechanisms of action.

Inflammatory, Cellular Activity and Local Immunity Factors in Bone and Connective Tissue of Patients with Orofacial Cleft

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Introduction. Cleft lip palate (CLP) develops in the embryonic development between weeks 4 to 7 and 6 to 12 accordingly. Both craniofacial anomalies require surgery for patients to ensure correct speech formation, improve nutrition via correct feeding as well as psychosocial factors related to facial appearance. Before surgeon performs such manipulations, it's important to know whether surrounding tissue and bone have high concentration of active inflammatory factors which can directly impact the success of surgery and patient recovery.

The aims of the study were to: (1) detect the appearance and distribution of NF-κB p65 and p105, HSP60 and HSP70 factors and Galectin-10 in the CLP patient materials; (2) perform statistical analysis of results to detect the connection between different factors.

Materials and Methods. Patient material was obtained during osteoplastic from 12 different patients – 6 from right facial side and the other 6 from left facial side of CLP. Prepared NF-κB p65 and p105, HSP60, HSP70 and Galectin-10 slides were microscopically analyzed using semi-quantitative method. Data was statistically evaluated using IBM SPSS Statistics Version 29.0 software. Statistical analysis using the Mann-Whitney U Test and Spearman's ρ tests was performed.

Results. From inflammatory indices, there was almost equal expression of NF-κB p65 and p105 positive cells in both CLP sides and control. From cellular activity indicators HSP60 and HSP70, the HSP60 demonstrated a notable decrease in positive structures of left side. The local immunity factor Galectin-10 showed just a few positive cells in all the CLP affected sides and controls as well.

Statistical analysis in Mann-Whitney U test showed statistically important data when comparing HSP60 presence on the left side connective tissue with control ($\alpha = 0.040$), as well as when comparing HSP60 presence on the right side connective tissue with control ($\alpha = 0.030$).

Spearman's ρ test showed results of correlation of right-side tissue and all other factors. Statistically significant correlation in bone was found between: NF-κB p65 and p105 ($\alpha = 0.005$); NF-κB p65 and HSP60 ($\alpha = 0.003$); NF-κB p65 and HSP70 ($\alpha = 0.005$); NF-κB p105 and HSP60 ($\alpha \leq 0.014$); NF-κB p105 and HSP70 ($\alpha = 0.005$); HSP60 and HSP70 ($\alpha = 0.005$). A statistically significant correlation in bone in the right side was also found between factor presence in connective

tissue – HSP60 and HSP70 ($\alpha = 0.003$) and between HSP70 in connective tissue and Galectin-10 in bone ($\alpha = 0.008$).

Spearman's ρ test also showed results of correlation between all control factors and control tissues. Statistically significant correlation between NF-κB p65 in bone and NF-κB p65 in connective tissue was found ($\alpha < 0.001$), between inflammatory factors in connective tissue-NF-κB p65 and HSP70 ($\alpha < 0.001$), between inflammatory factors in bone-NF-κB p65 and HSP70 ($\alpha = 0.029$), as well as between NF-κB p105 in connective tissue and HSP60 in bone ($\alpha < 0.001$).

Conclusions. The decrease of HSP60 on the left side indicates the possible selective cellular activity factor appearance selectively on the left side of CLP. The almost equal expression of inflammatory and local immunity factors indicates the lack of connection between these factor appearance and CLP. The correlations between the CLP-affected bone and connective tissue factors indicate string mutual involvement of these factors in the regulation of tissue homeostasis during the pathology.

The Characterization of BMP2/4, IL-10, NF-κB p105/p50, HSP70, LL-37, Gal-10 and Caspase 3 in Different Cleft Lip Palate Affected Tissue

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Introduction. Growth and fusion of palatal shelves is dependant of interaction between many environmental and biological factors. Failure in this process can lead to cleft lip and or palate (CLP) formation. Evaluation of different local tissue factors could be beneficial in understanding the potential mechanisms involved in the formation of this common craniofacial birth defect.

The aim was to determine expression and distribution of local tissue factors between sinistral, dextral and bilateral cleft affected soft and hard tissue.

Materials and Methods. Tissue was obtained from 19 children (5 girls, 14 boys) aged 6 years and 10 months to 15 years and 11 months undergoing osteoplasty. Inclusion criteria were children with unilateral or bilateral cleft lip or palate; however exclusion criteria consisted of patients with immunodeficiencies, chromosomal abnormalities and genetical syndromes. Controls were obtained from 5 similar age children relatively healthy oral tissue. The study analysed bone

morphogenetic protein 2/4 (BMP2/4), Interleukin-10 (IL-10), Nuclear factor kappa beta p105/p50 (NF-kB p105/p50), heat shock protein 70 (HSP70), Cathelicidin 37 (LL-37), Galectin-10 (Gal-10) and Caspase 3 by immunohistochemistry. Data were evaluated semi-quantitatively.

Results. Gal-10 was found in variable number of epitheliocytes and connective tissue cells in right-sided CLP than in left or both-side cleft affected tissue, with few to numerous positive structures. Caspase 3 appeared in increased numbers in right-sided cleft affected epithelium in comparison to the left and both side cleft, with moderate to numerous number of positive structures. Connective tissue had similar low expression levels in unilateral and bilateral cleft groups, with few to moderate number of positive structures. HSP70 appeared in increased numbers in bilateral cleft affected epithelium and left side cleft affected connective tissue with no to numerous amounts of positive structures. Low expression appeared in the right-side cleft affected epithelium and connective tissue, with few to moderate number of positive structures.

IL-10 appeared in epithelium and connective tissue in few to numerous numbers in right side affected tissue, the left and both side cleft affected epithelium and connective tissue had lower levels of expression from none to moderate number of positive structures. LL-37 appeared in similarly low expression in all cleft types-affected epithelium and connective tissue, with results from no positive structures to a few positive structures. BMP2/4 appeared with higher expression levels in right sided cleft affected epithelium and connective tissue. In the left and both sides of the cleft affected epithelium and connective tissue number of positive cells was lower with no positive structures to a moderate ones. NF-kB p105/p50 had similarly low expression levels between left, right and both side affected epithelium and connective tissue with results from no positive structures to a moderate number of positive structures.

Conclusions. Gal-10, Caspase 3, IL-10 and BMP2/4 domination in the right CLP epithelium and partial domination in this side connective tissue suggests slightly intensive programmed cell death, growth and local defence mechanisms of the right side. HSP70 elevation in bilateral CLP epithelium and left-sided connective tissue indicates cellular activation here without notable involvement of other molecular events. LL-37 and NF-kB p105/p50 indistinct expression across all CLP types exclude these factors' involvement in the pathogenesis of CLP.

Exploring Variations of Superficial Veins in the Cubital Fossa through the "Anatomage" Table Digital Resources

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Introduction. The cubital fossa is an anatomical structure in the upper extremity located proximally and anteriorly in the forearm. It supplies the hand, wrist and forearm with blood supply and nervous innervation. Prominent superficial veins of the cubital fossa are the basilic vein, cephalic vein and median cubital vein, but smaller superficial veins are the median antebrachial vein and cephalic accessory vein (*Homback-Klonisch et al.,* 2019). There are not many studies conducted to describe cubital fossa superficial vein variations.

Aim. The primary objective of this research was to conduct a thorough investigation and analysis of the anatomical variations of superficial veins in the cubital fossa. By utilizing the classification framework established by *Melaku et al.* in 2022, this study aimed to categorize these variations into distinct groups systematically. This categorization was intended to enhance understanding of their significance and potential implications for clinical practice.

Materials and Methods. Nine arm samples from digital cadavers from virtual dissection Table "Anatomage" were provided by the Laboratory of Anatomy of the Department of Morphology of the Institute of Anatomy and Anthropology, Rīga Stradiņš University. Two pairs of cadaver arms belonged to females, two to males, and one arm was of an unknown gender. Four arm samples were of Asian ethnicity, and four were of Caucasian ethnicity. Superficial veins were coloured, with a different colour assigned to each vein, which was used consistently across all samples. The superficial veins and their branches located within the cubital fossa were meticulously identified, and based on the comprehensive research conducted by *Melaku et al.* (2022), variations of these superficial veins in this specific anatomical region were categorized into distinct types. Following this classification, a detailed analysis of the results was performed to gain deeper insights into the patterns and characteristics of these venous variations.

Results. The superficial cubital veins identified in the samples exhibited considerable variation compared to the classifications proposed by *Melaku et al.* (2022). As a result, a new classification system was developed that emphasized the most significant similarities among the samples.

Type 2 (in the form of letter "N" or "H") of the superficial veins emerged as the most prevalent pattern, comprising 44.5 % of the total samples analyzed. Type 7 (type 1 "M" like subtype where the medial cephalic vein does not connect

to the cephalic vein) followed closely, which accounted for 33.5 % of the findings, while Type 1 (in the form of letter "M" or "Y") represented 22 %. Intriguingly, half of the samples that displayed paired types of superficial cubital veins exhibited consistency between both arms, and these samples predominantly originated from individuals of Asian descent. Conversely, the remaining 50 % demonstrated differences between arms and were sourced from individuals of Caucasian descent.

Among male cadavers, Type 2 of the superficial cubital veins was particularly dominant, found in a striking 75 % of the samples studied. In comparison, Type 7 was the most frequent type observed in female cadavers, appearing in 75 % of those samples. Ethnically, individuals of Asian descent predominantly exhibited Types 2 and 7, while those of Caucasian descent showed a broader diversity, encompassing Types 1, 2 and 7.

In the classification presented by *Melaku et al.* (2022), the cephalic accessory vein was limited to a single type. However, this vein was identified in all nine cadaver samples examined in our study, revealing a more complex reality. Due to this finding, researchers opted to exclude the cephalic accessory vein from being utilized as a reliable diagnostic tool, recognizing that its presence varied significantly across the samples.

Conclusions.

1. The most commonly identified type is type 2, followed by type 7, with the remaining specimens classified as type 1.
2. Type 2 was the most prevalent among male cadaver samples, while type 7 was predominantly observed in female samples.
3. In Asian individuals, vein types exhibited consistency across paired arms, whereas variations were detected in Caucasian individuals.
4. There is no universally accepted classification system for superficial cubital veins, underscoring the necessity for further research into potential variations.

Comparative Evaluation of Somsak's Procedure and Its Modifications in Cadaveric Studies

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Introduction. The axillary nerve (*n. axillaris*) is a peripheral nerve in the brachial plexus, which innervates the deltoid and the minor muscles. Due to its anatomical location, the axillary nerve is prone to injury, often resulting in shoulder motor dysfunction. Somsak's procedure is an intraplexal nerve transfer technique designed to restore deltoid function by transferring the nerve from the long head of the triceps muscle to the anterior branch of the axillary nerve. The modified Somsak's procedure transfers the nerve from the medial head of the triceps instead of the long head. This modification may offer greater advantages, as the medial head provides a longer nerve graft for the innervation of the entire deltoid muscle, rather than just a part of it (*Dympep et al.*, 2021). Additionally, preserving the long head of the triceps is crucial, as it contributes significantly to shoulder stability and function.

Aim. The study aimed to compare Somsak's procedure and the modified Somsak's procedure by evaluating their use in axillary nerve repair using cadaveric dissection.

Materials and Methods. The study was conducted using one cadaveric examination and provided necessary instruments at the Laboratory of Anatomy in the Department of Morphology, Institute of Anatomy and Anthropology of the Rīga Stradiņš University. This study conducted a comparative evaluation of Somsak's procedure and its modifications using cadaveric studies. Dissections were performed on upper limb specimens, exposing the axillary nerves to its terminal branch by the quadrangular space, as well as identifying the long and medial heads of the triceps muscle. Cadaveric specimens were selected based on predefined inclusion criteria. The original Somsak's procedure was meticulously followed, and various modifications were implemented, including adjustments in incision placement, tissue handling, and suturing techniques. The evaluation criteria included anatomical accuracy, technical feasibility and post-procedure analysis. Anatomical outcomes between the original and modified procedures were compared, and the ease of execution and reproducibility were assessed. Tissue integrity and healing post-procedure were also examined. Measurements and observations were systematically recorded and analyzed.

Results. The anatomical feasibility of both procedures was assessed by analyzing nerve length, accessibility and the potential for complete deltoid innervation. During cadaveric dissections, the axillary nerve was accessed through an anterior approach, exposing the quadrangular space to identify the nerve and its branches. The triceps muscle was dissected to locate both the long and medial heads' nerve branches. For Somsak's procedure, the nerve from the long head was mobilized and transferred to the anterior branch of the axillary nerve. For the modified Somsak's procedure, the medial head nerve was transferred to the axillary nerve. It was observed that the medial head of the triceps provided a longer nerve branch compared to the long head. This extended nerve length was sufficient to ensure innervation across all portions of the deltoid muscle. Both techniques were evaluated for surgical feasibility. The traditional Somsak's procedure had a more limited deltoid innervation, meanwhile the modified procedure required careful dissection and mobilization of the medial head nerve branch but offered a more advantageous donor nerve without significantly compromising triceps function.

Conclusions.

1. The modified Somsak's procedure allows for a more complete innervation of the deltoid muscle compared to the traditional procedure.
2. By using the medial head of the triceps as the donor nerve, a longer nerve graft is obtained, providing more comprehensive coverage of the deltoid muscle, which could lead to improved motor recovery and lower risk of partial muscle reinnervation compared to the traditional approach.
3. Despite requiring more meticulous and careful dissection, the modified Somsak's procedure offers superior functional outcomes, rather than using the traditional procedure.

Effects of Pulsed Radiofrequency on Anti-Inflammatory and Dual Function Cytokines in Spinal Ganglions

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Objectives. Pulsed radiofrequency (PRF) is a minimally invasive, target-selective technique increasingly recognized for managing chronic pain across diverse etiologies in different anatomical regions. The anti-inflammatory IL-4, IL-10, IL-13, and TGF-B1 cytokines have a significant role in the pathogenesis of neuropathic pain, providing antinociceptive and overall therapeutic effects. Still, the investigation into these cytokines in pain relief remains insufficient.

The aim was to define the expression and distribution of anti-inflammatory factors in spinal gangliocytes following PRF exposure and to compare the data with non-exposed control ganglion tissue.

Materials and Methods. Tissue use from the archive material of the Institute of Anatomy and Anthropology was obtained from the 7 domestic pig spinal ganglions following the PRF procedure. The Veterinary Medicine Ethical Committee permission was received for this research. Control was collected from the same animals contralaterally to the affected ganglions. Tissue samples were stained with H&E for routine histological examination. The IL-4, IL-10, IL-13, and TGF-B1 cytokines were detected by immunohistochemistry. The results were evaluated semi-quantitatively by counting positively stained neurons within the three visual fields and analyzed using the Wilcoxon signed-rank test and Friedman two-way analysis.

Results. Both the study and control groups exhibited equally expressed numerous to abundant IL-10, IL-13, and TGF-B1 positive cells and almost no to few IL-4 cytokine levels. Statistically significant differences were observed between the distribution of IL-4 and IL-10 within the PRF group and among IL-4 and IL-10/IL-13 cytokines in the control group.

Conclusions. Increased numbers of the anti-inflammatory IL-10, IL-13 and TGF-B1 cytokines after PRF exposure indicate the protective effect anti-inflammatory factors. Additionally, a similar expression of IL-10, IL-13 and TGF-B1 in both ipsilateral and contralateral to PRF-exposed ganglions reveals passive propagation of the RF current to different regions of the nervous system probably related to the broad neuroimmune response and the mechanism of clinical improvement associated with PRF treatment. Furthermore, a significantly decreased level of IL-4 cytokine compared to other factors raises questions about the effectiveness of pulsed radiofrequency in modulating this cytokine.

A Case Study on the Coronary Artery and Vein Tree: Detailed Topographical and Anatomical Analysis

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Introduction. Understanding the anatomy of the coronary arterial and coronary venous system is essential for developing medical devices and therapies that utilise these vessels (*Spencer et al.*, 2014). In the human body, arterial and venous trees can have anastomosis, and often are the interest of clinical studies as cardiovascular disease is the number one cause of death in the world. Evaluating human coronary arterial anatomy adjacent to the coronary veins is critical when applying therapies within the coronary venous system. Although limited literature quantifies the distance between adjacent coronary arteries and veins, previous studies have investigated comparative anatomy between the two coronary systems (*Maselli et al.*, 2006).

Aims. This study aims to (1) review the literature on coronary artery and vein branching and their variations; (2) dissect a human heart for better visualisation of coronary blood vessels; (3) identify known blood vessels and anastomosis; (4) measure diameter and length of coronary arteries and veins; (5) colour coronary arteries, veins and anastomosis; (6) make a 3D scan of the heart with coloured blood vessels.

Materials and Methods. The Laboratory of Anatomy of the Department of Morphology at the Institute of Anatomy and Anthropology provided a human heart sample at Rīga Stradiņš University. The coronary blood vessels in the heart sample were dissected using a scalpel and forceps. Afterwards, the known blood vessel and their branches were identified and coloured with textile acrylic colours accordingly – arteries and arterioarterial anastomosis were in red; veins and venovenous anastomosis in blue; arteriovenous anastomosis in purple. Additionally, the diameter and length of each coronary artery and vein were measured using a digital calliper with 0.1 mm precision. Finally, the coloured heart model was scanned using a portable 3D scanner, "*SHINING 3D, EinScan-H*", while suspended in air, creating a virtual model of a human heart with coloured blood vessels.

Results. The coronary artery and vein branching in this specific heart exhibited no significant variations. The left anterior descending artery presented with diagonal branches and two additional branches, one of which was bifurcated. The left circumflex artery featured two marginal branches, which were further

bifurcated. The right marginal artery had a single branch, while the posterior descending artery displayed two branches. The great cardiac vein, anterior interventricular vein, and middle cardiac vein each had two branches, whereas the small cardiac vein had one; the infundibular vein and the two anterior cardiac veins did not branch further. Four anastomoses were identified, consisting of two arterioarterial and two arteriovenous connections. In all instances, the diameter of the branches gradually decreased, while the length of the branches showed no consistent pattern. Potential areas for further detail include specifying the precise locations of bifurcations and anastomoses, providing measurements of vessel diameters and lengths, determining the coronary dominance, describing the venous drainage pathways, and noting any minor deviations from typical coronary anatomy. A detailed digital model of this heart's coronary vasculature was created using a 3D scan.

Conclusions.

1. This specific heart's coronary artery and vein branching exhibited no significant variations.
2. Arterial branches are typically easier to identify than smaller venous branches.
3. The precision of coronary blood vessel measurements can depend on the quality of the human tissue embalming process, as it impacts how well the blood vessels can be dissected.
4. A detailed digital model of this heart's coronary vasculature was created using a 3D scan.

Investigating the Correlation between Anthropometric Body Measurements and Spirometry Test Results: a Cross-Sectional Study

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Introduction. Spirometry is a lung function test commonly used in diagnosing obstructive and restrictive lung diseases. The main test results used in clinical practice are the forced expiratory volume during the first second of expiration (FEV1), forced vital capacity (FVC) and the Tiffeneau-Pinelli index (FEV1/FVC) (*Maldonado-Franco et al.,* 2023). A Tiffeneau-Pinelli index lower than the predicted value for the patient's age group is an indicator of obstructive lung disease (*Ostojic & Vujovic,* 2020). Spirometry test results can be affected by a wide array of factors, such as the health of the lungs, lifestyle characteristics of the patient, their muscle functionality and size of the lungs (*Higbee et al.,* 2022). For these reasons it is plausible to assume that a correlation between bodily measurements and spirometry test results exists.

Aim. This study aims to determine a correlation between spirometry test results, namely, FEV1, FVC and the Tiffeneau-Pinelli index and body mass index (BMI), height, scapular and shoulder height, chest and shoulder circumferences, as well as scapular elevation. The objective is reached through conducting an anthropologic investigation, during which spirometry tests are performed and body measurements are obtained.

Materials and Methods. An anthropometric investigation was executed in Piebalga municipality from July 22nd to August 11th, 2024, gathering data from 667 participants, 270 male and 397 female, aged 4 to 92 years old. A spirometer was used to determine FEV1 and FVC values, body height, shoulder and scapular height were measured, using an anthropometer, chest and shoulder circumferences were determined by a measuring tape, as well as each participant was weighed using a scale. Data analysis was performed via calculating Pearson's correlation coefficients and determining p-values to prove the significance of the correlations. This study has been approved by the Research Ethics Committee.

Results. Factors significantly correlating ($p < 0.001$) with a lower Tiffeneau-Pinelli index were age ($r = -0.436$), chest circumference ($r = -0.279$), as well as shoulder ($r = -0.250$) and scapular ($r = -0.249$) height, shoulder circumference ($r = -0.240$), and height of the body ($r = -0.230$), as well as BMI ($r = -0.207$).

Scapular elevation (r = −0.122; p = 0.002) showed a negative correlation with the Tiffeneau-Pinelli index as well. However, significant positive correlations ($p < 0.001$) were found between FEV_1 and body height (r = 0.775), scapular elevation (r = 0.755), shoulder (r = 0.740) and scapular height (r = 0.719), shoulder (r = 0.448) and chest circumference (r = 0.366). Similarly, significant positive correlations ($p < 0.001$) were identified between body (r = 0.801) and shoulder height (r = 0.770), scapular elevation (r = 0.761) and height (r = 0.750), shoulder (r = 0.491) and chest circumference (r = 0.420). A low negative correlation was determined between age and FEV_1 (r = −0.138; $p < 0.001$), as well as a low positive correlation between BMI and FVC (r = 0.102; p = 0.008) No significant correlation was found between scapular or shoulder asymmetry and spirometry test results.

Conclusions.

1. Factors significantly correlating with a lower FEV1/FVC index are age, chest and shoulder circumferences, shoulder and scapular heights, scapular elevation, body height and BMI.
2. Factors significantly correlating positively with FEV1 are body height, scapular elevation, scapular and shoulder height, chest and shoulder circumference.
3. There are no significant correlations between spirometry test results and scapular or shoulder asymmetry, and there is no significant correlation between BMI and FEV1.

Anthropometric Characteristics of the Body Mass Index, Chest Circumference and Shoulder Width of the Children Aged 1–18 in Latvia

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Introduction. Growth measurements and expected growth patterns are the gold standards by which clinicians assess the health and well-being of a child (*Casadei et al.*, 2022). The body mass index (BMI), chest circumference (CC) and shoulder width are anthropometric measures used to assess physical growth and health in children. BMI is a standard for identifying nutritional status, which is

categorised into underweight, healthy weight, overweight, and obesity based on percentile ranges. CC provides insights into thoracic development and overall physical growth as a critical parameter in identifying potential obesity and growth issues. Shoulder width reflects skeletal and muscular development, including additional context during periods of rapid growth, such as puberty. Together, these measurements offer a comprehensive understanding of a child's physical development, allowing early identification of health concerns and targeted interventions based on age and sex-specific data.

Aims. This study aimed to evaluate the anthropometric characteristics (body mass index, chest circumference, shoulder width), identify growth patterns among children aged 1–18 in Latvia and compare the data with other studies.

Materials and Methods. This longitudinal study involved 503 healthy children aged 1 to 18 years in Latvia, of which 247 were males and 256 were females. The study has been taking place since 2005/2006 and will be completed in 2024/2025. The body mass index (BMI) was calculated and analysed further as one of the key parameters. The anthropometrical measurements, including height, weight, chest circumference and shoulder width, were conducted according to the guidelines by *R. Martin, K. Saller* and *J. Prīmanis* at the Laboratory of Anthropology at the Institute of Anatomy and Anthropology, Rīga Stradiņš University. The data were analysed using descriptive statistics, Microsoft Office Excel, and IBM SPSS Statistics 29.0 (IBM SPSS, Armonk, NY, USA).

Results. The average BMI for males was 18.62 ± 2.38 kg/m^2 and 18.17 ± 2.28 kg/m^2 for females, both falling within the normal BMI range (5th to 84th percentile). The most significant BMI increase for males occurred between the ages of 14 and 15 (rising from 20.55 to 22.44 kg/m^2), while for females, the most significant increase was observed between 16 and 17 years (from 20.38 to 21.91 kg/m^2).

The average CC for males was 70.72 ± 14.98 cm and 68.95 ± 14.60 cm for females. Males experienced the most significant CC increase between 14 and 15 (84.19 to 91.03 cm). For females, the highest increase was between 12 and 13 years (from 77.23 to 81.74 cm). The average shoulder width for males was 30.60 ± 7.26 cm, while 29.55 ± 6.40 cm for females.

The most significant shoulder width increase for males occurred between the ages of 13 and 14 (35.27 to 35.75 cm), while for females, it was observed much earlier, between 1 and 2 years.

When comparing the results of this study to a similar one conducted in Hungary by *Joubert et al.* (2016), the average BMI values show close alignment: 18.19 ± 2.47 kg/m^2 for males and 18.10 ± 2.40 kg/m^2 for females. However, the average chest circumference is notably lesser in the Hungarian study, with values of 66.36 ± 5.50 cm for males and 66.13 ± 5.37 cm for females.

Conclusions.

1. The BMIs of both sexes are similar, falling within the standard, healthy weight range percentile (5th to 84th percentile).
2. BMI, chest circumference (CC) and shoulder width show consistent increases during the pubertal age range for both sexes, except for females, whose shoulder width exhibits the largest growth between the ages of 1 and 2.
3. Overall, males demonstrate relatively higher average values across all parameters than females.
4. Detecting changes in body proportions and anthropometrical measurements over time is useful in clinical and public health settings.

Unusual Branching of the Renal Vein: A Case Report and Clinical Implications

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Introduction. Renal veins are paired visceral veins that form in the renal hilum and end in the inferior vena cava at the level of the first lumbar vertebra. The renal veins play a crucial role in the venous drainage of the kidneys, usually exhibiting a predictable anatomical pattern (*Satypal et al.,* 2003). However, variations in their branching patterns are not uncommon and can have significant clinical implications, such as complications during the nephrectomy procedure (*Pandya et al.,* 2016). Some well-recognised branching patterns in clinical studies include the circumaortic renal, retroaortic and supernumerary veins (*Fuenzalida et al.*, 2024).

Aim. The study aimed to evaluate an unusual branching pattern of the renal vein discovered during the dissection of the cadaver and assess parameters of both left and right renal veins, like length, width, position about the inferior vena cava and the insertion angle of the renal vein into the inferior vena cava. Also, recognise the variations of the renal veins described in the literature.

Materials and Methods. Right and left renal vein branching and position about the inferior vena cava were evaluated from one cadaver provided by the Laboratory of Anatomy of the Department of Morphology of the Institute of Anatomy and Anthropology, Rīga Stradiņš University. During the dissection of the abdomen, the mesentery and peritoneum were separated from

the back of the abdominal wall to access the retroperitoneal tissues. The fascia surrounding the abdominal aorta and the inferior vena cava were also removed to visualise the renal veins' branching and positioning.

Results. Anatomical variations of the renal veins and their relationship to the inferior vena cava were analysed in two kidney specimens from a single cadaver. Supernumerary renal veins were discovered on the right side, making three renal veins. Their length varied from 25 to 29 mm from the inferior vena cava to the bifurcation point. The width of these three veins progressively increased from the bifurcation point to the entrance into the inferior vena cava, first from 11 mm to 15 mm, second from 10 mm to 13 mm and third from 6 mm to 7 mm. Two renal veins entered the inferior vena cava at an angle of 96° and the third at 104°. In this unique case, four branches from the kidney formed into one. The lengths of these branches were 23 mm, 15 mm, 17 mm and 30 mm, respectively. A previously formed single branch bifurcated into two separate veins drained into the inferior vena cava. The third renal vein didn't have any branches along its course. On the contrary, the left side only had one renal vein with two major branches. The width of the renal vein at the bifurcation point was 10 mm, reaching 15 mm at the entrance in the inferior vena cava. The length of the branches varied from 44 to 49 mm from the inferior vena cava to the bifurcation point. The renal vein entered the inferior vena cava at 91°.

Conclusions.

1. The presence of only right-side supernumerary renal veins suggests that renal vein anatomy can differ considerably between the right and left kidneys in one individual.
2. The left kidney vein branches were nearly twice as long as the right kidney veins, further highlighting a notable asymmetry in the venous anatomy.
3. The unique arrangement of four renal vein branches in the renal hilum, which form one branch before bifurcating into two separate veins, further emphasises the complexity of renal vascular patterns.
4. Variations in renal vein branching are common, so knowledge about these patterns is essential to understanding the possible complications of surgical procedures like nephrectomy.

The Impact of Sedentary Lifestyle on Youth: Improving Well-Being and Posture Through Activity

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Introduction. A sedentary lifestyle is prevalent among young people today, driven by the use of technology in studies, work, and leisure. Prolonged sitting negatively affects health, causing back pain, posture disorders, fatigue, and stress. Research has shown that physical activity is one way to counteract these issues. Therefore, it is important to explore how physical activity can mitigate the negative effects of a sedentary lifestyle and improve young people's well-being.

Aim. This study aimed to investigate the impact of a sedentary lifestyle on the health and posture of youth.

Materials and Methods. A survey (diary) was conducted to assess young people's time spent sitting, daily physical activity and well-being. Their posture was evaluated in both the sagittal and frontal planes. Postural symmetry measurements were conducted at the Institute of Anatomy and Anthropology using certified instruments – an anthropometer for longitudinal parameters and a measuring tape for the back rhombus. A 10000-Steps Challenge was implemented for two weeks to assess its impact on well-being. The study involved 30 students (15 females, 15 males) from Rīga Stradiņš University's Rehabilitation Faculty, aged 18–25. The reasearch took place from November to December 2024.

Results. 12 out of 30 participants showed moderate posture asymmetry in the frontal plane. 9 females and 4 males had symmetrical posture, while 1 female and 3 males exhibited asymmetry. In the sagittal plane, 19 participants had a rounded concave posture, 3 males had a rounded posture, 4 females had a concave posture, and 3 participants had normal posture. After the 10000-Step Challenge, 70 % of participants reported improved well-being.

Conclusions.

1. Postural measurements indicate that a sedentary lifestyle negatively affects young people's posture
2. Most participants had a rounded concave posture, suggesting prolonged sitting habits.
3. Physical activities, such as the 10000-Step Challenge, can help improve well-being.

Comparison of Reconstructive Techniques Following Simulated Segmental Mandibulectomy

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Introduction. The mandible, commonly referred to as the lower jaw, is a critical component of the facial structure, contributing significantly to the contour of the lower face (*Breeland et al.,* 2023). When defects occur due to trauma, tumor resection or congenital conditions, reconstructive techniques are essential to restore form and function (*Taqi et al.,* 2024). Over the years, head and neck reconstruction has significantly advanced, largely due to microvascular surgery and the ability to transfer free tissue flaps, which provide compatible soft tissue and bone from distant donor sites (*Fatani et al.,* 2022). Autogenous bone grafts and modern reconstructive techniques yield excellent long-term functional and aesthetic outcomes (*Kumar et al.,* 2015). The selection of the appropriate technique is influenced by various factors, including the size of the defect, the availability of vascular supply, and the requirements for functional restoration. Careful selection of the reconstructive technique is crucial for optimal mandibular reconstruction outcomes.

Aims. The objective of this study is to simulate a segmental mandibulectomy and to conduct a comparative analysis of its reconstruction using scapular and fibular free flaps. This research will evaluate the respective advantages and limitations associated with each technique.

Materials and Methods. This study used a real dry human mandible to simulate a segmental mandibular defect and evaluate reconstruction techniques using scapular and fibular free flaps. The Laboratory of Anatomy at the Department of Morphology, Institute of Anatomy and Anthropology, Rīga Stradiņš University, provided the cadaveric specimen and two mandibles. A controlled segmental defect was created in the mandibular body or angle region using a saw, replicating common mandibulectomy scenarios. The defect location was selected based on frequently observed clinical cases requiring reconstruction. To reconstruct the defect, a scapular bone segment was harvested, shaped and secured using mini plates and screws. Similarly, a fibular bone segment was contoured to fit the defect and fixated with mini plates and screws, following standard cutting and adaptation techniques. The degree of fit, ease of adaptation and fixation, alignment with the natural mandibular curvature and potential functional implications were assessed for each reconstruction method.

Results. The scapular flap offered excellent soft tissue coverage, promoting healing and aesthetic restoration. In contrast, the fibular flap better preserved the mandibular contour, ensuring a more precise reconstruction. Its straight, rigid structure allowed for superior geometric adaptation, requiring minimal modification for an optimal fit. Meanwhile, the scapular flap required additional contouring to align with the surrounding anatomy. During manual stress testing, the fibular flap exhibited exceptional structural integrity, while the scapular flap showed minor micro-movements, potentially affecting stability. However, the scapular flap demonstrated greater toughness, with a lower risk of fracture during implantation compared to the fibular flap. Both flaps were successfully secured with mini plates and screws, but the fibular flap offered a more stable and straightforward fixation, enhancing surgical reliability and functional outcomes.

Conclusions.

1. Each reconstruction method has distinct advantages and limitations.
2. The fibular flap offers superior stability and load-bearing capacity, making it more suitable for functional restoration.
3. The scapular flap, while highly adaptable for soft tissue reconstruction, has lower mechanical stability and requires additional contouring for optimal fit.
4. These findings highlight the importance of case-specific flap selection to achieve the best functional and aesthetic outcomes in mandibular reconstruction.

Comprehensive Study on the Branching Patterns and Visualization of the Human Axillary Artery

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Introduction. The axillary artery, a continuation of the subclavian artery, originates at the lateral margin of the first rib and extends to the lower border of the teres major, transitioning into the brachial artery at this point. Conventionally, it is acknowledged that this artery gives rise to six principal branches: the superior thoracic artery, thoracoacromial artery, lateral thoracic artery, subscapular artery, anterior circumflex humeral artery and posterior circumflex humeral artery.

Recent advancements in vascular surgery have highlighted the significance of comprehending the frequency of anatomical variations in the branching patterns of the axillary artery (*Hur et al.*, 2024). Given the prevalence of upper limb injuries in occupational environments, an in-depth understanding of the variations in the brachial artery and its branches is essential.

Aims. This study aimed to intricately describe and categorise the diverse variations of the axillary artery observed through the dissection of a cadaver. Following this detailed examination, the next phase involved the creation of a graphical representation of the specimens, employing both illustrative drawings and advanced three-dimensional (3D) scanning techniques to enhance the visual understanding of the anatomical structures.

Materials and Methods. This study involved the analysis of eleven human specimens obtained from the Laboratory of the Anatomy of the Institute of Anatomy and Anthropology at Rīga Stradiņš University. A longitudinal incision was made along the anterior axilla to facilitate exposure of the axillary artery (AA), which was subsequently isolated and traced from its origin to its termination. The branching patterns of the AA were meticulously examined, with distinct types identified and graphically represented. Distances between the various branches were measured with precision. Additionally, a three-dimensional scan of two specimens was generated to support educational initiatives.

Results. Following the dissection, a detailed graphical analysis was conducted on all samples, along with 3D scanning performed on two selected specimens. Each specimen underwent meticulous examination to provide an in-depth and comprehensive description of its branching patterns. Remarkably, only in one instance did the axillary artery (AA) exhibit the "classical" variation, with all six branches emerging directly from the AA in a clean, organized manner.

The superior thoracic and lateral thoracic arteries revealed four distinct rising variations, showcasing the intricate diversity in vascular anatomy. Meanwhile, the thoracoacromial and posterior circumflex humeral arteries were characterized by three unique branching patterns, each contributing to the complex network of blood supply in the region. Additionally, the posterior circumflex humeral artery presented two alternate configurations in its origin.

Notably, throughout the dissection, each instance of the subscapular artery consistently arose directly from the AA, emphasizing its crucial role in this vascular arrangement. Overall, the total number of branches originating from the AA varied significantly, ranging from three to seven, highlighting the variability and complexity of arterial anatomy in the specimens studied.

Conclusions.

1. The axillary artery (AA) exhibits diverse courses and branching patterns, with no two anatomical specimens displaying identical characteristics.
2. The superior thoracic artery and the lateral thoracic artery present four distinct variations, whereas the thoracoacromial artery and the anterior circumflex humeral artery each demonstrate three different configurations.
3. In contrast, the posterior circumflex humeral artery has only two recognized variations, while the subscapular artery is characterized by a single unique pattern.
4. Continued research on the axillary artery is imperative for uncovering additional variations, a pursuit that bears considerable clinical significance.
5. Future studies that include cadaveric analyses of sex, age and quantitative assessments of branching distances may yield further insights into the variability of the axillary artery.

Pulmonary Arterial Hypertension (PAH) Markers in Healthy Human Lungs and Such of Cardiac Patients in Ontogenetic Aspect

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Introduction. PAH is a condition associated with dysregulations in BMP signalling pathways causing remodelative changes in bronchial and lung vascular tissue, thus, increasing blood pressure in pulmonary vasculature.

Aim. The aim of the research was to perform the analysis of angiogenetic and lung protective tissue factor expression to reveal the possible presence of PAH in patients belonging to different age groups.

Materials and Methods. The lung tissue samples were gained from the archive of RSU Institute of Anatomy and Anthropology and included examples from 5 young patients (18–30 years), 5 old patients (60–80 years) and 5 patients with ischemic heart disease. The immunohistochemistry was used to detect VEGF, CD163, BMP2/4, gremlin-1 and IL-10 followed by semi-quantitative evaluation, Kruskal-Wallis, Mann-Whitney and Spearman's correlation coefficient statistical tests.

Results. CD163 expression notably differed in alveolary epithelium of sample groups, with it being higher in elderly people compared to younger ones, however, IL-10 positive cell count was different among both alveolary macrophages and bronchial connective tissue with young patients having higher levels of IL-10 macrophages compared to other samples, but elder patients having lower number of them in connective tissue compared to young and cardiac patients. VEGF expression was contrasting in the bronchial epithelium and alveolary macrophages, with elder patients having more positive cells than cardiac patients among macrophages, but more than both groups in bronchial epithelium. BMP2/4 positive cell count was distinct in blood vessels, bronchial muscle tissue and bronchial epithelium with older patients having more prevalent expression compared to cardiac patients in blood vessels and muscle tissue and compared to both of other groups in bronchial epithelium. Gremlin-1 was seen dispersedly in lung macrophages and alveolocytes of participants in each study group.

Conclusions. Increase of VEGF positive cells suggests more intense angiogenesis in elderly. Lungs of young people and cardiac subjects display the intensified anti-inflammatory response proved by elevation of IL-10 cells and M2. The increased BMP2/4 and limited gremlin-1 appearance don't exclude individual PAH conditions.

Age and Sex-Related Variations in the Correlation between Lower Limb Length and Foot Length: An Anthropometric Study

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Introduction. Understanding the relationship between lower limb length and foot length in different age groups may help to evaluate changes in body proportions as people mature. While previous research has established correlations within lower limb (*Ahmed*, 2014), there is limited data on how these relationships differ across age and sex.

Aim. This study aims to analyze the correlation between lower limb length and foot length across different age groups and sexes to identify growth patterns, developmental changes, and potential implications for clinical assessments and anthropological research.

Materials and Methods. Investigation was conducted in Latvia, with periodic data collection from July 22nd to October 24th, 2024. The sample population comprised 678 individuals, with 273 males and 405 females aged 1–99 years old. Measurements were done using anthropometers and spreading calipers in units of millimeters, ensuring the subject's body was in a neutral standing position. Measurements of the lower limb length were taken from the floor to the spina iliaca anterior superior. Foot length was measured between the acropodion and pternion. Afterwards, the data was divided into ten demographic groups based on sex and age. Statistical analysis was performed using IBM SPSS software platform. Pearson correlation coefficients were calculated and statistical significance of these correlations was assessed by calculating p-values. The study was approved by the Research Ethics Committee.

Results. Statistically significant correlations ($p < 0.001$) were found across all ten demographic groups. The highest correlations were observed in the youngest age group (<15 years) for both males ($r = 0.961$) and females ($r = 0.902$), suggesting a strong proportional relationship during early development. Correlation weakened notably in young adulthood (15–30 years), with males showing the lowest coefficient ($r = 0.393$) while females maintained a moderate correlation ($r = 0.726$). In middle-aged adults (31–50 years), correlation slightly increased for males ($r = 0.620$) but remained stable for females ($r = 0.726$). In the 51–65 years group, correlation values were $r = 0.583$ for males and $r = 0.580$ for females. However, in older adults (65+ years), correlation values increased again (males $r = 0.674$, females $r = 0.666$), indicating a stabilization of body proportions.

Conclusions. Findings of this study provide valuable insights into body proportions across the lifespan, highlight the importance of considering age and sex differences in studies of body proportions and offer a foundation for future studies to explore the factors influencing these variations.

Expression Patterns of Gene Proteins in Lung Tissues of Relatively Healthy Individuals across Specific Ontogenetic Periods

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Introduction. The expression of multiple genes has been observed in human lungs during the embryonic period, and they may play a crucial role in the developmental processes of lung tissues. Over time, the expression of these genes undergoes changes, with many genes becoming silenced. However, in certain ontogenetic periods, the expression of these genes/gene proteins may be altered.

The aim of this study was to analyze the expression patterns of gene proteins (Pax7, Pax9, Sox9, Wnt9b, Irf6, Wnt1, Wnt3a, Shh and Ihh) in lung tissues obtained from deceased individuals, who exhibited no signs of pathology and had relatively healthy lungs.

Materials and Methods. Lung tissue samples were collected from 10 deceased individuals, aged 9 to 29 years, who exhibited no evident pathology and had relatively healthy lungs. Immunohistochemistry was used to visualize the gene proteins Pax7, Pax9, Sox9, Wnt9b, Irf6, Wnt1, Wnt3a, Shh, and Ihh within tissue samples. Gene protein expression levels across different structures were evaluated on a scale from 0 (no expression) to ++++ (very high expression). The collected data were systematically compiled and analyzed using SPSS statistical software. Statistical correlations were assessed using Spearman's rank correlation coefficient, while group comparisons were performed using the Kruskal-Wallis test.

Results. Irf6 exhibited the highest overall expression across all structures. Wnt9b also showed relatively high expression, with several structures reaching ++ or higher. Pax7 demonstrated moderate to high expression, though its levels varied across structures. Sox9 and Pax9 exhibited variable expression, with some structures showing low levels, while others displayed moderate expression. Wnt1, Wnt3a, Sbh and Ihh showed minimal to no expression across the analyzed structures. The Spearman's tests heatmap illustrated the correlations between the expression levels of the nine analyzed genes in lung tissue samples. Strong positive correlations were found between: Pax9_Gl and Shh_Ep ($\rho = 0.92$); Pax7_Gl and Shh_Ep ($\rho = 0.90$); Pax9_Gl and Pax7_Gl ($\rho = 0.89$); Pax7_Ep and Shh_Ep ($\rho = 0.88$); Pax7_Ep and Pax9_Gl ($\rho = 0.88$).

Conclusions. The study highlights strong correlations between specific gene protein expressions, particularly Pax7, Pax9 and Shh, suggesting their potential functional role in lung tissue homeostasis in young age. From all gene proteins, Ifr6, Wnt9b and Pax7 relatively high number of positive structures indicate their role in the local immune response, canonical Wnt/β-catenin signaling pathway and cell migration in the relatively healthy lung.

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