surrounding the Turkish saddle and 3 – caudal, passing into the petrous. Next, we determined the morphometric indicators of three departments of the cavernous sinus, which were subjected to statistical analysis, followed by entering the results into the table presented in our work.

Key words: cavernous sinus, dog, sinus departments, venous anastomoses, morphometry.

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TOPOGRAPHIC AND ANATOMICAL JUSTIFICATION USING THE TRICEPS SURAE FOR MYOPLASTY OF DEFECTS OF THE TIBIA

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Myoplasty of tibial defects is of great practical importance for improving regenerative capabilities in the treatment of tibial fractures with significant defects and in osteomyelitis of this segment, especially caused by gunshot wounds. The use of this technique requires an understanding of the topography of the vessels and nerves of the muscles to preserve the functionality of the remaining part of the muscle and the viability of the flap. A detailed knowledge of the anatomy of the nerves inside the muscles is necessary for the successful fabrication of flaps. Intramuscular nerve damage can be as dangerous to the flap as vascular damage.

The purpose of this study was to establish the feasibility of using the triceps muscle to fill tibial cavities and soft tissue defects by the muscle plastic method, taking into account the intramuscular distribution of nerves and arteries. The sources of innervation and blood supply of the triceps surae, the number of muscle branches, and the levels of their departure and entry into the heads of the triceps surae were determined by the method of macromicroscopic layer-by-layer preparation of nerves and arteries on preparations of the lower limbs of fetuses of 4-10 months and cadavers of mature people. Special attention is paid to the topographical and anatomical relationship of nerves and arteries when they enter the triceps surae and intramuscular branching in the heads of the gastrocnemius and soleus.

It was established that the intramuscular nerve and arterial branches in the lateral and medial heads of the gastrocnemius are located along the muscle bundles and do not go beyond the muscle. The gastrocnemius and soleus are suitable for filling defects on the inner and back surfaces of the upper half of the tibia since their nerves and vessels enter mainly in the upper third of the muscles. Depending on the size of the defect, it is possible to move part of the longitudinally dissected muscle or the entire belly separated from the tendon.

The peculiarities of the location of the nerve and arterial branches of the triceps surae in fetuses and adults allow safe movement of the muscle heads during surgical interventions, preserving the integrity of nerves and vessels.

Key words: *myoplasty, triceps surae, intramuscular branching, tibia, human.*

Connection of the publication with planned research works.

The study is a fragment of the planned comprehensive research work of the Department of Traumatology and Orthopedics «Development and implementation of new technologies of osteosynthesis and endoprosthetics» state registration № 0122U002210.

Introduction.

Currently, leg muscle plastic surgery is widely used in the treatment of injured patients with bone and soft

tissue defects and osteomyelitis. This contributes to the improvement of blood supply and, as a result, activation of the regenerative properties of the damaged segment.

Tamponade of the bone cavity with muscle after radical surgery for gunshot osteomyelitis was also used after the Second World War [1]. At the same time, in some patients, the transplanted muscle flap was not used in the bone cavity. In such cases, fistulas appeared again with a long discharge of pus. One of the causes of such complications may be a violation of the integrity of the nerves and vessels of the moving muscle flap [2, 3].

Recently, the field of application of muscles for plastic surgery is constantly growing, which is explained by several valuable properties of muscle tissue, first of all, its good blood supply and high plasticity, which allows you to give the flap the necessary shape [4].

Cutting muscle flaps requires knowledge of the topography of their vessels and nerves. This is important both from the point of view of preserving the function of the part of the muscle that remains and for preserving the viability of the excised flap. Only if the blood supply and especially the innervation are preserved, the flap will be able to fully fulfill the role that is entrusted to it during this operation [5, 6].

When studying the innervation of muscles, until now the main attention of researchers has been directed to the extra-organ part of the nerves, that is, to the sources of innervation, the ways of approach of the nerves to the muscles («muscle gates»). Correct cutting of flaps is possible only with a clear knowledge of the topography of the nerves inside the muscles. Damage to these nerves can be no less dangerous for a muscle flap than damage to its vessels [7, 8].

In literature sources, there are single publications on the blood supply and innervation of the triceps surae in fetuses [9, 10] and adults [11, 12]. However, in the literature, insufficient attention has been paid to the intramuscular distribution of nerves and arterial vessels in the heads of the triceps surae, which can determine rational methods of cutting flaps from the heads of this muscle.

The aim of the study.

Take into account the intramuscular distribution of nerves and arteries in the heads of the triceps surae and soleus, it is necessary to establish the expediency of using the triceps surae to fill the tibial cavity by muscle plastic surgery.

Object and research methods.

The sources of innervation and blood supply of the triceps surae, the number of muscle ulcer branches, levels of their departure from nerves and arteries, and levels of entry into the head of this muscle. Special attention is paid to the topographical-anatomical relationship of nerves and arteries when they enter the triceps surae and the peculiarities of the intramuscular branching in the heads of the gastrocnemius and the soleus.

The study was performed in accordance with the contract of cooperation between the Chernivtsi regional communal medical institution “Chernivetske oblasne patholohoanatomichne biuro”, Chernivtsi Regional Bureau of Forensic Medical Examination and the Bukovinian State Medical University.

The study was conducted by the basic bioethical provisions of the Council of Europe Convention on Human Rights and Biomedicine (from April 4, 1997), the Helsinki Declaration of the World Medical Association on Ethical Principles of Scientific Medical Research with Human Participation (1964-2013), the order of the Ministry of Health of Ukraine No. 690 dated 23.09.2009 and taking into account the methodological recommendations of the Ministry of Health of Ukraine «Procedure for the extraction of biological objects from deceased persons whose bodies are subject to forensic medical examination and pathological examination for scientific purposes» (2018). The Commission on Biomedical Ethics of the Bukovyna State Medical University (protocol № 3 dated 16.11.2023) did not detect any violations of moral and legal norms during the conduct of research work.

Research results and their discussion.

In human fetuses of different ages, variability in the number of nerve-muscle branches and the directions of their entry into the thickness of the triceps surae was found. It is worth noting that the gates of entry of the nerve-muscle branches of the tibial nerve into the heads of the gastrocnemius are located next to the entry points of the arterial branches. The sources of blood supply to the medial and lateral heads of the gastrocnemius are the popliteal artery system, namely the sural arteries, and the inferior lateral and medial genicular arteries. At the same time, the number of sural arteries ranges from 2 to 6. Sural arteries provide blood supply to the proximal parts of the triceps surae and the soleus; branches of the inferior lateral genicular artery – the lateral head of the gastrocnemius; branches of the inferior medial genicular artery – the medial head of the gastrocnemius. In the studied fetuses, the entry gate of both nerve and arterial muscle branches into the medial head of the gastrocnemius is mainly located 3.0-7.0 mm above the penetration of arteries and nerves into the lateral head of this muscle **(fig. 1)**.

Moreover, the number of arterial and nerve-muscle branches that enter the thickness of the medial head (from 3 to 6) prevails compared to the number of arterial and nerve trunks of the lateral head (from 1 to 4) of the gastrocnemius. In the thickness of the heads of the gastrocnemius, the nerve-muscle branches go ahead of the arterial ones. At the same time, the direction of the intramuscular nerve and arterial branches, as well as their branches, does not coincide with the direction of the muscle bundles. The trunk and loose forms of intramuscular branching of arteries and nerves in the heads of the gastrocnemius were revealed: the loose type of branching is characteristic of the main nerve and arterial trunks, and the trunk type is characteristic of their descending branches. In isolated cases, arterial anastomoses in the form of loops and arcades were found in the lower third of the belly of the medial head of the gastrocnemius, while we did not observe intramuscular arterial anastomoses in the lateral head of this muscle. Intramuscular nerve connections were also found in the lateral head of the gastrocnemius, in contrast to the medial head of this muscle.

In late fetuses, in the belly of the soleus, the medial and lateral bipinnate parts can be distinguished, which are connected to each other by an intermediate zone. To the upper third of the soleus at an acute angle to its longitudinal axis, mainly the anterior and posterior nerve trunks from the tibial nerve, which branch out in the zones of the soleus. The branches of the anterior trunk branch in the thickness of the medial and lateral parts of the soleus into two branches of the same name – medial and lateral. The latter in the thickness of the lateral part, as a rule, branches according to the loose form, and the

middle branch of the front trunk branches according to the mixed form. The intramuscular distribution of the branches of the posterior trunk in the intermediate part of the soleus, as a rule, occurs according to the trunk shape **(fig. 2)**.

In the thickness of the front surface of the soleus, the front nerve trunk goes, and in the thickness of the back surface of the muscle – the back trunk of the tibial nerve, which are connected to each other thanks to connecting branches. Nerve connections are best developed in the distal part of the soleus – in the middle and lower thirds of its belly.

The gate of entry of arterial muscle branches into the soleus, which we found along the inner and outer edges of the front surface along the entire length of the belly of the muscle, is very unstable. Anatomical variability is observed in the intramuscular distribution of arteries in the thickness of the soleus. The main arterial branches go to the soleus at an acute angle and in the thickness of its abdomen go, as a rule, in front of the nerves, and only in rare cases cross with the neuromuscular branches. Arteries in the thickness of the belly of the flounder muscle branch mainly in loose, rarely in mixed form and do not form anastomoses. The directions of the intramuscular arteries and nerves, as well as the muscle bundles of the soleus, do not coincide with each other.

In people of the second period of adulthood, mostly one muscle branch (8 specimens), rarely two branches (2 observations) departs from the outer surface of the tibial nerve at an acute angle to the lateral head of the gastrocnemius. Moreover, we found significant individual fluctuations in the levels of departure of this branch. Thus, the highest level is marked 8.0 cm above the joint space of the knee joint, and the lowest level is 3.0 cm below it. It should be emphasized that before entering the lateral head of the gastrocnemius, at some distance from the point of departure from the tibial nerve, this muscle branch divides into branches of the second order. At the level of the joint space of the knee joint, one arterial branch departs from the popliteal artery to the lateral head of the gastrocnemius, which also divides into second-order arterial branches before entering this head. The latter, as well as the nerve branches of the second order, enter the thickness of the upper edge of the front (deep) surface of the belly of the lateral head of the gastrocnemius, slightly outward from the midline of the lower limb. At the same time, the "gates" of the nerves and arteries of the lateral head of the gastrocnemius are located at the level of, or slightly below, the joint space of the knee joint. The width of the area of the "gate" of nerves and arteries of the lateral head of the gastrocnemius in people of the second period of adulthood varies from 1.5 to 4.0 cm.

To the medial head of the gastrocnemius from the inner surface of the tibial nerve, at the same level or slightly higher than the nerve branch of the lateral head of the gastrocnemius, departs separately from other branches of the superficial muscles of the posterior group of the lower leg, a relatively thick muscle branch. The highest level of departure of this nerve branch is noted in people of the second period of adulthood 10.0 cm above the joint space of the knee joint, and the lowest level – 2.0 cm below it. A fairly significant arterial branch departs from the popliteal artery to the medial head of the gastrocnemius, which, together with the nerve branch, goes medially and downwards and enters together into the front surface of the upper part of the

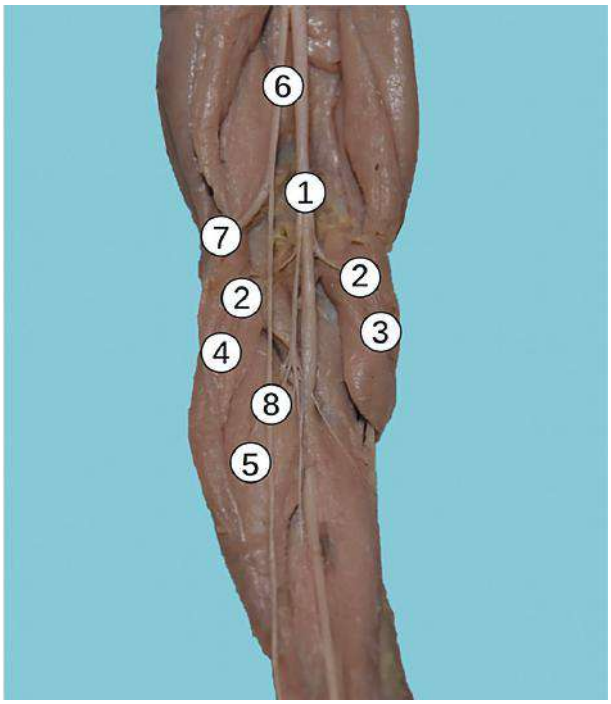

Figure 1 – Innervation of the muscles of the posterior region of the left leg of the fetus 210.0 mm PCL. Photo of macropreparation. Magnification: ×2.1. Designation: 1 – tibial nerve; 2 – muscular branches of the tibial nerve; 3 – medial head of the gastrocnemius; 4 – lateral head of the gastrocnemius; 5 – soleus; 6 – common fibular nerve; 7 – superficial fibular nerve; 8 – lateral sural cutaneous nerve.

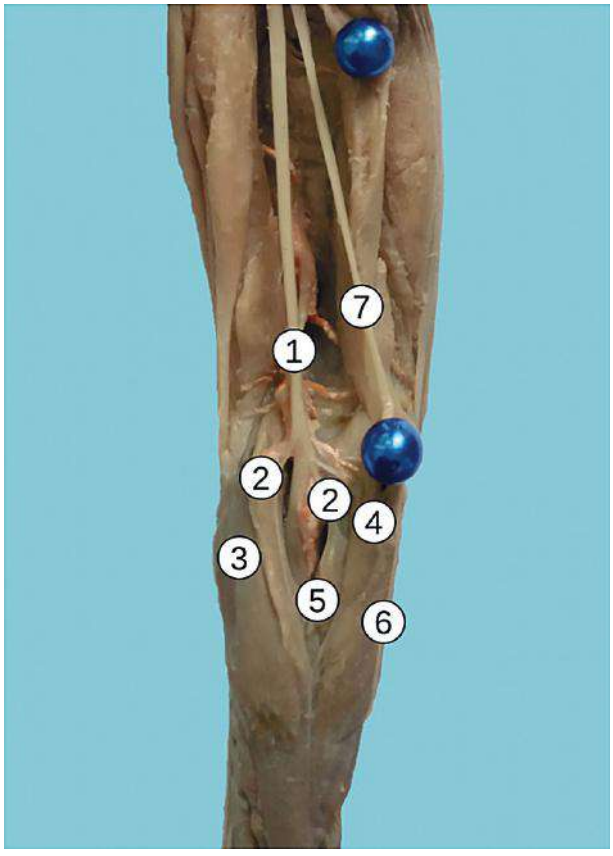

Figure 2 – Innervation and blood supply of the muscles of the posterior region of the right leg of the fetus 210.0 mm PCL. Photo of macropreparation. Magnification: ×2.1. Designation: 1 – tibial nerve; 2 – musclar branches of the tibial nerve; 3 – medial head of the gastrocnemius; 4 – lateral head of the gastrocnemius; 5 – soleus; 6 – lateral sural cutaneous nerve; 7 – common fibular nerve.

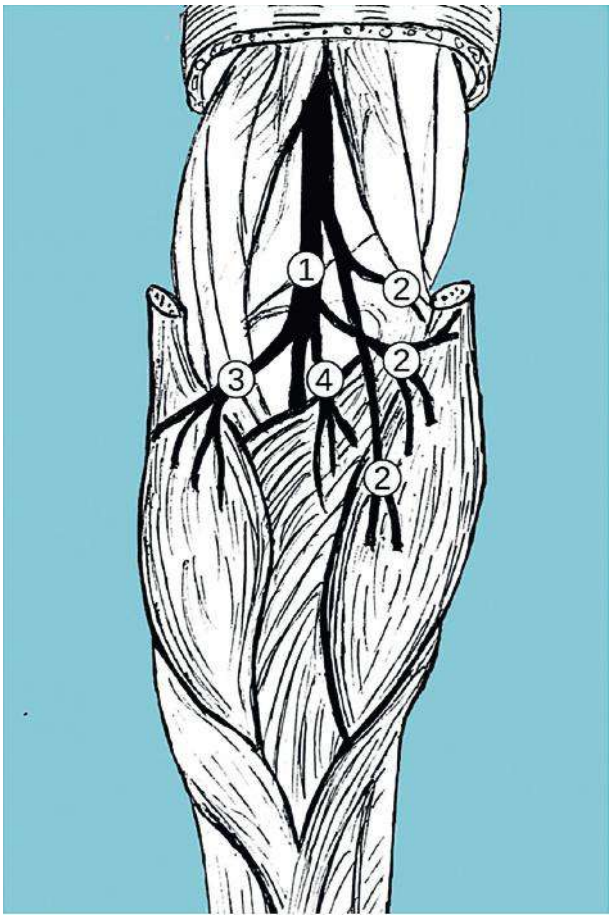

Figure 3 – Innervation of the right triceps surae of a 42-year-old man (diagram). Designation: 1 – tibial nerve; 2 – branches to the lateral head of the gastrocnemius; 3 – branch to the medial head of the gastrocnemius; 4 – a branch to the soleus.

lateral head of the gastrocnemius, previously dividing into branches of the second order. It should be noted that the intramuscular nerve and arterial branches in the lateral and medial heads of the gastrocnemius, as a rule, are located along the muscle bundles and do not go beyond the muscle.

In our opinion, this arrangement of nerve and arterial muscle branches allows moving the lower ends of the lateral and medial heads of the gastrocnemius without violating the integrity of the nerves and arteries of this muscle both at high and low levels of their departure. For the transfer, one or both heads of the gastrocnemius should be crossed slightly above their transition into the tendon, which allows you to preserve a wide feeding leg. Small tibial cavities can be filled with part of the head of the gastrocnemius, which should first be divided in the longitudinal direction. Such a dissection also preserves the integrity of the longitudinally located nerves and vessels of the gastrocnemius.

When elucidating the innervation features of the soleus in people of the second period of adulthood, it was found that it is innervated, as a rule, by two muscle branches of the tibial nerve, which separate from it one lower than the other, and the levels of neuromuscular branches have significant individual fluctuations. The highest level of departure of the upper nerve branch of the flounder muscle was found in people of the second period of adulthood 7.0 cm above the joint space of the knee joint, and the lowest level – 2.0 cm below it. In people of the second period of adulthood, the high level of departure of the lower nerve branch of the soleus is noted 5.0 cm above the articular space of the knee joint, and the lowest level is 1.5 cm below this level. It should be noted that the upper branch of the tibial nerve penetrates into the back surface of the soleus, and the lower branch into the front surface of the muscle. The «gate» of entry of the nerve-muscle branches is located within the upper third of the abdomen of the soleus.

In one case, only one muscle branch was directed from the tibial nerve to the upper third of the right soleus, which, in turn, divided into three branches. Three branches went from the tibial nerve to the upper and middle thirds of the lateral head of the gastrocnemius, while only one muscle branch went to the upper third of the medial head of the gastrocnemius **(fig. 3)**.

Attention is drawn to the fact that in mature people, nerve-muscle branches enter the soleus together with rather large muscle branches of the posterior tibial and peroneal arteries. In addition, from 4 to 9 thin and short branches from the posterior tibial and fibular arteries enter the lower half of the soleus. Intramuscular nerve and arterial branches are located along the length of the longitudinal axis of the soleus. Thus, both the entire soleus and part of the longitudinally split muscle with the upper broad base can be used to fill the bone cavities of the tibia.

Thus, the peculiarities of the topography of the tibial nerve, namely the place of origin and the nature of the branching in the thickness of the triceps surae, contribute to the search for the latest methods of restoring damaged muscles, which is consistent with the publications of some authors [13, 14]. The conducted research complements the fragmentary data [15, 16] about the peculiarities of the intramuscular branching of nerves in the thickness of the heads of the gastrocnemius and soleus and is the basis for creating anatomical maps of the distribution of nerves in the muscles of the tibial area.

Conclusions.

1. Intramuscular nerve and arterial branches in the lateral and medial heads of the gastrocnemius, as a rule, are located along the muscle bundles and do not go beyond the muscle

2. To replace defects on the inner and back surfaces of the upper half of the tibia, the gastrocnemius, and soleus are suitable since nerves and vessels enter mainly in the area of their upper third. Depending on the size of the defect (cavity) of the tibial bone, it is possible to move either a part of the longitudinally dissected calf or soleus or the entire abdomen, separated from the tendon.

3. Features of the location of the nerve and arterial branches of the triceps surae in fetuses and adults make it possible to safely move the muscle heads for surgical interventions, preserving the integrity of nerves and vessels. Innervation of the soleus is carried out by the tibial nerve, and its branches vary according to the level of departure. This opens up possibilities for new methods of muscle recovery and the use of muscle structures to fill the cavities of the tibial bone.

Prospects for further research.

To determine the practical significance of individual and age-related anatomical variability of arteries and nerves in the muscle thickness of the lower limb.

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ТОПОГРАФО-АНАТОМІЧНЕ ОБГРУНТУВАННЯ ВИКОРИСТАННЯ ТРИГОЛОВОГО М'ЯЗУ ЛИТКИ ДЛЯ МІОПЛАСТИКИ ДЕФЕКТІВ ВЕЛИКОГОМІЛКОВОЇ КІСТКИ

Ковальчук П. Є., Хмара Т. В., Комар Т. В., Тулюлюк С. В.

Резюме. Повномасштабна війна в Україні відновлює інтерес травматологів та хірургів до використання м'язів для заміщення дефектів нижніх кінцівок. Як відомо, м'язова тканина характеризується хорошим кровопостачанням і високою пластичністю, однак не завжди міопластика є успішною, іноді клапоть не приживається через пошкодження нервів і судин. Метою дослідження було встановити особливості внутрішньом'язового розподілу нервів і артерій у головках триголового м'яза литки та визначити доцільність використання цього м'яза для м'язової пластики порожнин великогомілкової кістки. Особливості іннервації та кровопостачання триголового м'яза литки, кількість м'язових гілок, рівні їхнього відходження від нервів та артерій і рівні входження у головки цього м'язу з'ясовували методом макромікроскопічного препарування нервів і артеріальних судин задньої гомілкової ділянки на препаратах правої і лівої нижніх кінцівок 15 плодів 4-10 місяців і 5 трупів людей обох статей другого періоду зрілого віку. Особливу увагу приділено топографо-анатомічним взаємовідношенням нервів і артерій при їх вступі у триголовий м'яз литки та особливостям внутрішньом'язового галуження у головках литкового м'яза та у камбалоподібному м'язі литки. Дослідження виконано з врахуванням біоетичних принципів та методичних рекомендацій з проведення наукових досліджень. Встановлено розсипний та магістральний типи внутрішньом'язового галуження артерій і нервів у головках литкового м'яза. Встановлено, що іннервація камбалоподібного м'яза здійснюється великогомілковим нервом, а його гілки мають різні рівні відходження. Для заміщення дефектів на внутрішній і задній поверхнях верхньої половини великогомілкової кістки підходять литковий і камбалоподібний м'язи, оскільки нерви і судини вступають переважно в ділянці їхньої верхньої третини. Залежно від величини дефекту (порожнини) великогомілкової кістки, в неї можна переміщати або частину поздовжньо розсіченого литкового чи камбалоподібного м'яза, або все черевце, відокремлене від сухожилка.

Отже, розуміння внутрішньом'язового розподілу нервів і артерій у головках триголового м'яза литки може допомогти в розробці раціональних методів виготовлення клаптів для м'язової пластики порожнин великогомілкової кістки.

Ключові слова: міопластика, триголовий м'яз литки, внутрішньом'язове галуження, великогомілкова кістка, людина.

TOPOGRAPHIC AND ANATOMICAL JUSTIFICATION USING THE TRICEPS SURAE FOR MYOPLASTY OF DEFECTS OF THE TIBIA

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Abstract. The full-scale war in Ukraine renews the interest of traumatologists and surgeons in the use of muscles to replace defects in the lower extremities. As you know, muscle tissue is characterized by good blood supply and high plasticity, but myoplasty is not always successful, sometimes the flap does not take root due to damage to nerves and blood vessels. The purpose of the study was to establish the peculiarities of the intramuscular distribution of nerves and arteries in the heads of the triceps surae and to determine the feasibility of using this muscle for

muscle plasticity of the tibial cavity. Features of the innervation and blood supply of the triceps surae, the number of muscle branches, the levels of their departure from the nerves and arteries, and the levels of entry into the heads of this muscle were determined by the method of macromicroscopic preparation of the nerves and arterial vessels of the posterior tibial region on the right and left preparations of the lower limbs of 15 fetuses of 4-10 months and 5 corpses of people of both sexes in the second period of maturity. Special attention is paid to the topographical-anatomical relationship of nerves and arteries when they enter the triceps surae and the peculiarities of the intramuscular branching in the heads of the gastrocnemius and the soleus. The research was carried out taking into account bioethical principles and methodological recommendations for conducting scientific research. Loose and trunk types of intramuscular branching of arteries and nerves in the heads of the gastrocnemium muscle have been established. It was established that the innervation of the soleus is carried out by the tibial nerve, and its branches have different levels of departure. To replace defects on the inner and back surfaces of the upper half of the tibia, the gastrocnemius and soleus muscles are suitable, since nerves and vessels enter mainly in the area of their upper third. Depending on the size of the defect (cavity) of the tibial bone, it is possible to move either a part of the longitudinally dissected gastrocnemius or soleus muscle or the entire abdomen, separated from the tendon.

Therefore, understanding the intramuscular distribution of nerves and arteries in the heads of the triceps surae can help in the development of rational methods for the production of flaps for myoplasty of tibial cavities.

Key words: myoplasty, triceps surae, intramuscular branching, tibia, human.

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ANALYSIS OF AGE-RELATED DYNAMICS IN FACIAL STRUCTURE SYMMETRY IN WOMEN

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The article is dedicated to studying the frequency of visualization of physiological asymmetry of various facial structures in women of different ages and clarifying the peculiarities of their age dynamics. It was found that in childhood, 30% of girls do not have visual signs of facial asymmetry, in adolescence - 10%, in youth and mature age, signs of asymmetry were found in all examined individuals. Asymmetry by one indicator was detected in 40% of children, 70% of adolescents, 50% of girls in youth age, and women of the first period of mature age, and in 30% of examined women of the second period of mature age; by several indicators - in 30% of children, 20% of adolescents, 50% of girls in youth age, and women of the first period of mature age, and in 70% of women of the second period of mature age. Asymmetry of the smile and the mismatch of the midline between the central incisors of the upper and lower jaw were found in all age groups of the examined. Asymmetry of the smile has the highest frequency of detection, and asymmetry of the ears - the lowest.

Key words: *symmetry, asymmetry, face, women, age dynamics.*