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CHARACTERISTICS OF THE EXPRESSION OF MONOCLONAL ANTIBODIES DURING THE PERIOD OF THE MARGINAL AND THORACIC NUCLEI FORMATION

Prykhodko S. O., Shkolnikov V. S., Aleksyeyenko N. S., Zalevskiy L. L., Danylevych V. P.

Abstract. *Introduction.* Despite the number of conducted studies, the study of intrauterine development of the spinal cord does not lose its relevance. It is one of the structures of the central nervous system, which ensures the interconnection of the structures of the human body with the brain. Also, it provides the transmission of all types of sensitivity and motor impulses. In addition, there was an opportunity to compare recently obtained data with data from ten years ago and perform further in-depth analysis. The study of embryogenesis makes it possible to identify the causes and mechanisms of birth defects of the spinal cord, which is important for the development of their diagnosis, treatment and preventive measures methods. Immunohistochemical methods play the main role, and are important for progress in medicine and biology, as they allow researchers to accurately and specifically study changes in tissues.

Object and research methods. 134 preparations of human embryos and fetuses aged from 6-7 to 39-40 weeks of intrauterine development were studied using the immunohistochemical method. Monoclonal antibodies from the company "DacoCytomation" (Denmark) were chosen for the study: vimentin, synaptophysin, Ki-67, CDX2, S-100.

The results. The 5-6th week of gestation is characterized by active proliferation processes, which is why a strong expression of Ki-67 was observed. In the future, the proliferation processes gradually fade away, which is directly proportional to the expression of Ki-67. As for S-100, in the embryonic period the expression is weakly expressed and begins to increase and is noted as strong from the 14-15th week of gestation. As for vimentin and CDX-2, they are characterized by strong expression at the end of the embryonic period.

Conclusions. Based on the results of immunohistochemical methods, it was found that before the end of the period of intrauterine development, the expression of Ki-67 is weak, and vimentin and CDX-2 are completely absent. Instead, the expression of S-100 and synaptophysin in the studied nuclei is alternately relatively strong.

Key words: central nervous system, spinal cord, gray matter, intrauterine development, neuron.

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ANATOMICAL AND FUNCTIONAL CHARACTERISTICS OF COMPLEX FLAPS OF THE SUBCLAVIAN ARTERY BASIN IN RECONSTRUCTIVE SURGERY OF THE HEAD AND NECK

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The article presents the anatomical variations of the blood vessels supplying the muscles that are clinically important for the safe performance of surgical procedures such as skin-muscle flap reconstruction. Because much of the discussion revolves around the arterial anatomy of muscles, venous drainage is often overlooked. However, a possible cause of flap loss may be impaired venous drainage. Purpose: to consider the anatomical variants of branching of the vessels of the subclavian artery and to investigate the peculiarities of the blood supply of the skin part of the skin-muscle flap of the sternocleidomastoid muscle in the experiment. It was established that the anatomical

variants of the branches of the subclavian artery and the common carotid artery determine the vascularization of skin-muscle flaps. The study showed that the blood supply of the skin part of the skin-muscle flap goes beyond the projection of the sternocleidomastoid muscle, provided that the perforators of the upper thyroid artery are preserved. The obtained data are important in reconstructive and restorative surgery of the head and neck for a clear understanding of the limits of the guaranteed blood supply of the specified flap.

Key words: head and neck neoplasms/surgery, plastic surgery procedures, subclavian artery/abnormalities, sternocleidomastoid myocutaneous flap.

Connection of the publication with planned research works.

The work is a fragment of the research project of the National Pirogov Memorial Medical University, Vinnytsia of the Ministry of Health of Ukraine "Features of compensatory-adaptive processes with various diseases and damages of the human and animal body and clinical-experimental substantiation of new surgical treatment methods", state registration number 0118U007342.

Introduction.

The number of patients with large, combined injuries caused by trauma, especially when using modern combat weapons, the number of oncological diseases that require surgical treatment, namely plastic closure of significant skin, soft tissue, and mucous membrane defects, is increasing. Complex subclavian artery (SA) basin flaps can be used in head and neck reconstructive surgery to close defects that occur after removal of tumors, burns, trauma, or congenital anomalies. Inadequate knowledge of gross anatomy and variations in arterial branching patterns have led to difficulties in plastic and reconstructive surgery, particularly in planning SA basin musculocutaneous flaps. It is important for surgeons to take into account abnormalities of the branches of the main vessels of the aortic arch. Quite a large number of variants of anomalies of the aortic arch and its branches have been studied and studied. The following variations of branching of SA and its branches are known. The absence of the main branches of the right SA on its angiographic image has been described [1]. If with a typical version of the structure of the aortic arch itself, its branches can branch both classically and non-classically, then atypical variants of the aortic arch are almost always accompanied by non-classical branching of its branches [2]: the right SA or brachiocephalic trunk sometimes departs as the last branch of the aorta from places of the beginning of the descending aorta; the left SA, together with the ascending aorta, surrounds the trachea and esophagus, as a result of which compressive symptoms may occur. Some authors [3] discovered individual variability of the branches of the aortic arch and described rare variants of the beginning of its vessels. In the first case, the brachiocephalic trunk is absent, and 6 arteries depart directly from the aortic arch: right and left SA, right and left common carotid arteries, right and left vertebral arteries. Anomaly of the right SA is rare, anomalies of the aortic arch have been described with a prevalence of 0.4-2%, of which the right SA has a retrotracheal course in 15%, and the rest of aberrant right SA occupies a retroesophageal course [4]. It is described that the law is aberrant SA, which passes between the esophagus and the trachea, causes clinical manifestations in patients, including dysphagia (difficulty swallowing), dyspnea (difficulty breathing), chest pain, cough, and weight loss [5].

Anatomic options for vascular branching are important for the safe performance of surgical procedures such as flap reconstruction. Microvascular free tissue transfer, also known as free flaps, is quite commonly used in head and neck reconstruction [6]. Surgical flaps are usually classified by the type of vascularization and their proximity to the primary defect. Regarding the proximity of the defect, flaps can be classified as local, regional, or free [7]. An example of a regional flap is a skin-muscular flap of the pectoralis major muscle supplied by the thoracic branch of the thoracoacromial artery. The skin-bone flap of the scapula has become a more popular option for complex reconstruction of the middle part of the face [7].

Musculoskeletal flaps depend on the integrity and functional availability of the dorsal scapular artery. Likewise, cervical-spinal and cervical-scapular flaps are based on the superficial cervical artery.

The use of a supraclavicular artery basin flap in the plastic closure of head and neck defects is an alternative choice in relation to a free graft [8, 9]. The arterial supply of the flap is most often a branch of the transverse cervical artery (a branch of the thyroid-cervical trunk), less often from the suprascapular artery (also a branch of the transverse cervical artery) [10].

The advantages of the supraclavicular flap include the reliability and stability of the vascular pedicle, ease of cutting, matching in color and texture, lack of abundant hair growth, the possibility of closing large defects, minimal defect in the donor area. The integrity of the cutaneous nerves of the cervical plexus makes it possible to preserve the skin sensitivity of the flap [11].

SA branching pattern has been reported. Thus, the thyrocervical trunk and the transverse cervical artery were absent on both sides, the lower thyroid artery was a direct branch from the SA with the presence of the dorsal scapular artery. All branches of SA originated from its first part [12]. The anatomical variations presented are clinically important for the safe performance of surgical procedures such as flap reconstruction. Because most of the discussion revolves around the arterial anatomy of muscles, venous drainage is often ignored [13]. However, a possible cause of flap loss may be impaired venous drainage.

In the last decade, there has been a growing interest in the sternocleidomastoid myocutaneous flap (SCMF). There are 4 types of SCMF: muscular, cutaneous-muscular, split cutaneous-muscular on the sternal (medial) peduncle, and cutaneous-muscular-osseous with a fragment of the clavicle. The flap can be used to eliminate defects of the soft tissues of the middle and lower face below the level of the zygomatic arch [14], parotidectomy [15], defects of the floor of the oral cavity, mucosa of the cheek, marginal and segmental defects of the lower jaw up to 11 cm in length [16], plastics of orostomas, pharyngeal fistulas, pharyngostomas and even the temporal area [15]. However, until now there are no clear indications and contraindications for the use of SCMF.

Three sources of blood supply of the SCMF are described. The upper part receives blood supply from the occipital artery, the middle one – from the upper thyroid artery, the lower one – from the thyroid -cervical trunk (inferior thyroid artery, suprascapular artery). The vessels pass through the sheet of fascia, enter the muscle and are located along its axis, anastomosing with each other [17]. Longitudinal orientation of vessels ensures reliable and sufficient blood supply to a long and relatively narrow (up to 4-5 cm) muscle. The dominant artery of the SCMF is believed to be the occipital artery. Most authors are convinced that the limits of the guaranteed blood supply of the skin part of the flap are located in the SCMF projection [18]. However, until now there are no anatomical studies of the features of the blood supply of the skin-muscle SCMF.

Allocation of a flap on the occipital artery made it possible to obtain a sufficient arc of rotation to replace the defects of the maxillofacial area. Unsatisfactory blood supply of the skin part of the flap and, in connection with this, the high frequency of its necrosis, limited its wide use in clinical practice, and currently the flap is considered reserve and controversial [19].

A small number of studies have shown that its use with the inclusion of perforators of the superior thyroid artery to SCMF reduces the incidence of necrosis of the skin part of the flap, but the arc of rotation and, accordingly, the possibilities of clinical application are limited. Harvesting of the skin part of the flap below the clavicle and transection of the SCMF in the upper third above the level of the branches from the superior thyroid artery to increase the arc of rotation have not been studied. Some authors report that the skin area may extend beyond the muscle, but there are no clear data on the guaranteed blood supply of this part of the flap. Complications of muscle and musculocutaneous flaps include infection, partial or complete loss of the flap, seroma or hematoma of the donor and recipient sites, fat necrosis, and wound dehiscence [20]. However, reconstructive operations based on vascularized perforating flaps until now have a high level of complications and unsatisfactory treatment results due to microcirculation disorders and loss of part or the entire flap, which is due to the variability of the blood supply of covering and soft tissues with significant polymorphism of tissue angioarchitectonics. Partial necrosis is often associated with the flap borders going beyond the limits of sufficient blood supply during its formation [21].

There are contradictions regarding the use of SCMF in patients with suspected or existing metastatic lymph nodes of II, III, IV groups of the neck. However, the donor site after flap collection is an ideal access point for radical modified lymph node dissection of the neck, and the selective selection of perforating vessels of the flap does not violate the principles of ablastics.

The aim of the study.

To consider the anatomical variants of the branching of SA vessels and to investigate the peculiarities of the blood supply of the skin part of the SCMF skin-muscle flap in the experiment.

Object and research methods.

The research was conducted in accordance with the requirements of the Helsinki Declaration of the World Medical Association, the Council of Europe Convention on Human Rights and the methodological recommendations and the "Procedure for the removal of biological objects from the dead, whose bodies are subject to forensic examination and pathological examination, for scientific purposes". The research was approved by the Bioethics Commission of National Pirogov Memorial Medical University, Vinnytsia, protocol № 15, December 12, 2016.

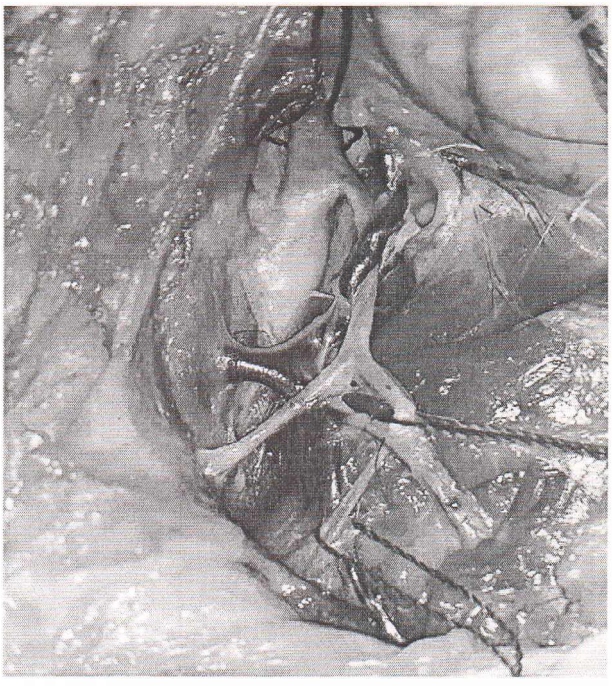

Figure 1 – The upper thyroid artery and its branches are isolated. Ligatures are placed on the external carotid artery, above the departure of the superior thyroid artery and on the branches going to the thyroid gland and to the muscles below the hyoid bone.

The study was performed on 17 cadavers. They studied the perforators of the upper thyroid artery and vein, which provide blood supply and venous drainage of the skin-muscle flap of the sternocleidomastoid muscle. After dissection of the upper thyroid artery, its catheterization was performed above the level of the exit of the perforant from it to the SCMF **(fig. 1)**. Methylene blue in the amount of 20 ml was used for contrast. The color of the skin was evaluated 2 minutes after the injection of the dye.

Research results and their discussion.

Perforators of the superior thyroid artery and vein were found in all 17 (100%) anatomical preparations. In 6 (35.3%) cases, 1 arterial and 1 venous perforator was found; in 6 (35.3%) – 1 arterial and 2 venous perforators; in 4 (23.5%) – 2 arterial and 1 venous perforator; in 1 (5.8%) – 2 arterial and 3 venous perforators. Skin discoloration was found to extend beyond the SCMF above and below the level of the clavicle. In 14 (82.4%) cases, skin discoloration was observed 1.5-2 cm below the collarbone **(fig. 2)**; in 3 (17.6%) – by 1-1.5 cm. Above the clavicle, the skin discoloration spread 1-1.5 cm in front and behind the SCMF in all 17 (100%) cases.

SCMF a universal option for patients in whom long-term free flap surgery is inappropriate [21]. Modern methods of vascular visualization can optimize preoperative planning. A better understanding of the anatomy of blood vessels and the nature of skin circulation became possible thanks to numerous studies of cadavers. As a result, it became possible to widely use perforator flaps, both on the leg and free [22].

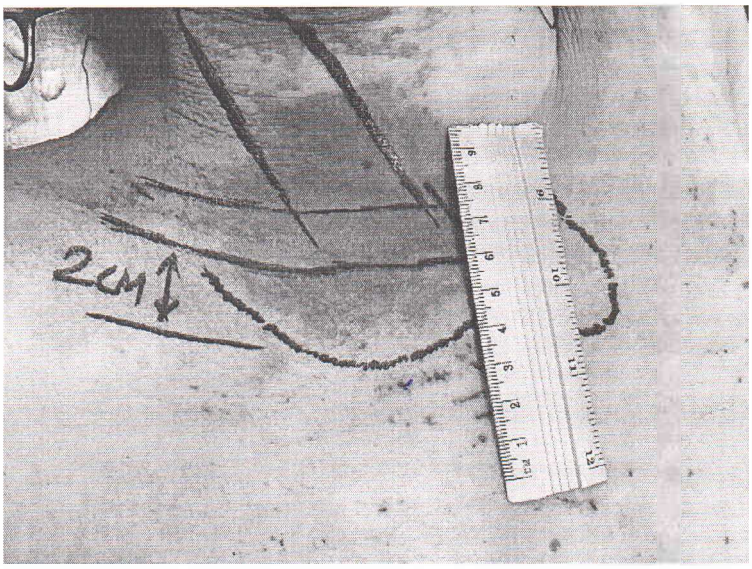

Figure 2 – Coloration of the skin of corpse M. after the injection of dye into the perforant to the sternocleidomastoid muscle from the upper thyroid artery.

The SCM flap has been associated with some complications. The top-supported SCM skin flap is usually subject to partial or complete necrosis due to its distance from the occipital artery, which limits its clinical use [23]. Several investigators have found that preservation of the superior thyroid artery flap can significantly improve the survival rate of SCMF. Anatomical studies revealed three possible branching patterns for the occipital artery and six branching patterns for the superior thyroid artery. These fluctuations in blood supply affect the rotation of the flap and the state of perfusion [24].

Ideally, the tissue used should be reliable, functional, and cosmetically acceptable, in addition, the flap should be of sufficient size with minimal morbidity at the donor site and match the recipient site in color, texture, and thickness [25]. The SCMF muscle can be used effectively to correct contour deformity after parotidectomy, but will therefore create deformity at the donor site, especially in lean young patients. This defect becomes more apparent when the large flap is lifted or the patient performs neck movements on the opposite side. The SCM flap is the most commonly used because of its constant and known blood supply from the occipital and superior thyroid arteries. The authors believe that preservation of only the superior thyroid arteriovenous system is sufficient to ensure survival of the SCM flap, and preservation of the occipital artery is not necessary. They also suggest preserving the cranial part of the external jugular vein to improve the venous return of the skin part of the flap [25].

It is important to keep these anatomic variations in mind because of the high frequency with which the lateral cervical region is involved in diagnostic and surgical procedures.

The success of precision surgery and the long-term results of treatment depend significantly on the angioarchitectonics of the flap, the length of its mobilization, the level of the location of the point of rotation of the vascular pedicle and the option of its placement, as well as the etiopathogenetic features of the origin of tissue defects.

Conclusions.

Anatomic variants of SA branches and common carotid arteries determine the vascularization of skin-muscle flaps. The blood supply of the skin part of the skin-muscle flap goes beyond the SCMF projection, provided that the perforators of the upper thyroid artery are preserved. The obtained data are important in reconstructive and restorative surgery of the head and neck for a clear understanding of the limits of the guaranteed blood supply of the specified flap.

Prospects for further research.

It is appropriate to investigate the blood supply of flaps on the leg and the possibilities of moving free tissue for surgical reconstruction of large traumatic defects of the upper and lower extremities.

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АНАТОМІЧНА ТА ФУНКЦІОНАЛЬНА ХАРАКТЕРИСТИКА СКЛАДНИХ КЛАПТІВ БАСЕЙНУ ПІДКЛЮЧИЧНОЇ АРТЕРІЇ В РЕКОНСТРУКТИВНІЙ ХІРУРГІЇ ГОЛОВИ ТА ШИЇ

Феджага І. П., Кравець О. В., Півторак В. І., Булько І. В., Півторак К. В.

Резюме. За останнє десятиліття в усьому світі збільшується кількість травм, особливо у бойових умовах, що обумовлені опіками, мінно-вибуховим та осколочним ураженням. Для досягнення оптимальної реконструкції військових ран важливим є цілеспрямоване топографоанатомічне дослідження особливостей кровопостачання шкірно-м'язових клаптів, що будуть використані у реконструктивній хірургії при заміщені уражених тканини. Мета роботи: розглянути анатомічні варіанти розгалуження судин підключичної артерії та дослідити особливості кровопостачання шкірної частини шкірно-м'язового клаптя грудинно-ключично-соскоподібного м'яза в експерименті. Дослідження виконано на трупах. Вивчено перфоранти верхньої щитоподібної артерії і вени, які забезпечують кровопостачання та венозний дренаж шкірно-м'язового клаптя грудинно-ключично-соскоподібного м'яза. Після препарування верхньої щитоподібної артерії проводилась її катетеризація над рівнем відходження від неї перфоранта до грудинно-ключично-соскоподібного м'яза. Для контрастування використано метиленовий синій. Оцінено поширення забарвлення шкіри. Перфоранти верхньої щитоподібної артерії та вени виявлялися у всіх анатомічних препаратах. Встановлено, що забарвлення шкіри поширювалось за межі грудинно-ключично-соскоподібного м'яза над ключицею та нижче її рівня. У 14 випадках спостерігали забарвлення шкіри на 1,5-2 см нижче ключиці; у 3 – на 1-1,5 см. Над ключицею забарвлення шкіри розповсюджувалось на 1-1,5 см спереду та позаду грудинно-ключично-соскоподібного м'яза у всіх 17 випадках. Таким чином, кровопостачання шкірної частини шкірно-м'язового клаптя виходить за межі проекції грудинно-ключично-соскоподібного м'яза за умови збереження перфорантів верхньої щитоподібної артерії. Отримані дані важливі в реконструктивно-відновній хірургії голови та шиї для чіткого розуміння меж гарантованого кровопостачання зазначеного клаптя.

Ключові слова: новоутворення голови та шиї/хірургія, процедури пластичної хірургії, підключична артерія/аномалії, грудинно-ключично-соскоподібний міокутантний клапоть.

ANATOMICAL AND FUNCTIONAL CHARACTERISTICS OF COMPLEX FLAPS OF THE SUBCLAVIAN ARTERY BASIN IN RECONSTRUCTIVE SURGERY OF THE HEAD AND NECK

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Abstract. Over the last decade, the number of injuries has been increasing all over the world, especially in combat conditions, caused by burns, mine-explosive and shrapnel injuries. In order to achieve optimal reconstruction of military wounds, it is important to conduct a targeted topographic-anatomical study of the features of the blood supply of the skin-muscle flaps that will be used in reconstructive surgery when replacing the affected tissues. The aim: to consider the anatomical variants of branching of the vessels of the subclavian artery and to investigate the peculiarities of the blood supply of the skin part of the skin-muscle flap of the sternocleidomastoid muscle in the experiment. The study was performed on cadavers. Perforators of the upper thyroid artery and vein, which provide blood supply and venous drainage of the skin-muscle flap of sternocleidomastoid muscle, were studied. After preparation of the upper thyroid artery, its catheterization was carried out above the level of departure of the perforant from it to the muscle. Methylene blue was used for contrast. The spread of skin discoloration was assessed. Perforators of the superior thyroid artery and vein were found in all anatomical preparations. It was established that the skin coloration extended beyond the sternocleidomastoid muscle above the clavicle and below its level. In 14 cases, skin discoloration was observed 1.5-2 cm below the collarbone; in 3 – by 1-1.5 cm. Above the clavicle, the skin discoloration spread 1-1.5 cm in front and behind the muscle in all cases. Thus, the blood supply of the skin part of the skin-muscle flap goes beyond the projection of the sternocleidomastoid muscle, provided that the perforators

of the upper thyroid artery are preserved. The obtained data are important in reconstructive and restorative surgery of the head and neck for a clear understanding of the limits of the guaranteed blood supply of the specified flap.

Key words: head and neck neoplasms/surgery, plastic surgery procedures, subclavian artery/abnormalities, sternocleidomastoid myocutaneous flap.

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RELATIONSHIPS OF THE AMPLITUDE INDICATORS OF THE RHEOVASOGRAM OF THE THIGH WITH THE PARAMETERS OF THE EXTERNAL BODY STRUCTURE IN TRACK-ATHLETES-SPRINTERS WITH THE ECTO-MESOMORPHIC TYPE OF CONSTITUTION

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Determining the state of peripheral hemodynamic indicators is one of the modern challenges, which can be a barrier for athletes of a particular type of sport of a certain somatotype in relation to individual constitutional features and prevent achieving sports results. The aim of the work was to study the relationship between the parameters of the rheovasogram of the hip with anthropometric dimensions and components of body weight and somatotype in track and field athletes with a high level of mastery of the ecto-mesomorphic somatotype. We conducted a study of high-level sprinters using the method of P.P. Shaparenka where 50 anthropometric body sizes were determined. The component composition of body weight was carried out using the Matejko method, and the Heath-Carter method was used for score assessment of the somatotype components. It was determined that 28 track and field athletes belonged to the ecto-mesomorphic constitutional type. Rheovasographic indicators of the thigh were measured on a computer diagnostic multifunctional complex by using tetrapolar rheography. Correlation analysis was performed using Spearman's non-parametric statistical method in the STATISTICA 5.5 program.

It was established that in sprinters who belong to the ecto-mesomorphic somatotype, there are numerically reliable correlations between the amplitude parameters of the hip rheovasogram with anthropometric dimensions and somatotypological indicators. The greatest strength and number of relationships was seen between between longitudinal, girth, transverse, body dimensions, the thickness of skin and fat folds, components of somatotype and body weight and basic impedance, amplitudes of the systolic wave and rapid blood filling, where the average strength of the connections prevail. The characteristics of the relationship between the amplitude indicators of the rheovasogram of the thigh and the indicators of the external structure of the body, which we determined, confirm the conditioning of the indicators of peripheral hemodynamics by constitutional features.

Key words: correlation, peripheral hemodynamics, anthropometry, somatotype, athletics.

Connection of the publication with planned research works.

The work is a fragment of the planned research work of National Pirogov Memorial Medical University, Vinnytsya "Somato-visceral features of the human body in different periods of ontogenesis", state registration number 0121U113772.

Introduction.

In sports selection, somato-morphological approaches are significantly relevant for identifying signs of the