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SPECIFIC CHARACTERISTICS OF INNERVATION OF GLUTEAL MUSCLES IN THE HUMAN FETUSES AND NEWBORNS

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Macroscopic study of peculiarities of the gluteal muscles innervation was conducted on 43 samples of fetuses aged 6-10 months and on 7 newborns. It was established that, in the depth of the glutei maximus, medius and minimus, the gluteal muscles branch out in a main or loose ways. Distribution of the inferior gluteal nerve branches in the depth of the gluteus maximus is even. In the depth of the gluteus medius the branches of the superior gluteal nerve do not reach the edges of the muscle. Distribution of the superior gluteal nerve branches in the depth of the gluteus minimus is uneven, concentrating in the upper and middle third parts of the muscle. The topography of the inferior gluteal nerve in the perinatal period of the human ontogenesis is characterised by significant individual and age differences. There are connective branches between some of the gluteal nerves branches stipulating formation of fine loop-like plexuses.

Key words: gluteal muscles, gluteal nerves, fetus, newborn, person.

Investigation is a fragment of the planned complex interdepartmental theme of the department of human anatomy named after M.H. Turkevych (the head – prof. B.H. Makar) and the department of anatomy, topographic anatomy and operative surgery (the head – prof. Ju.T. Akhtemiichuk) of Bukovyna state medical university “Appropriatenesses of perinatal anatomy and embryotopography. Identification of sexual-age specific characteristics of the structure and topographoanatomical interrelations of organs and structures of the human ontogenesis” (№ of state registration 0110U003078).

Introduction

A necessity of correction of the congenital and acquired deformities of the body circuits of various localizations, that arise as a result of diseases or traumas and their consequences increases both in Ukraine and all over the world. Active introduction of aesthetic operations (lifting of the soft tissues of the area of buttocks and thighs, dermatolipectomy of the buttocks, endoprosthesis of the buttocks with lipofillings, liposuction, deliverance from stretchings and other contour plastics) and reconstructive-restorations plastics of the defects of the perineum and sacrococcygeal area demands from the plastic surgeons comprehensive knowledge both of normal structure and sintopy, and age and individual variability of the muscles, interfascial cellular spaces, vessels and nerves of the gluteal area [2, 4, 5]. Reports pertaining to compression of the nerves of the sacral plexus in the pelvic area, or higher the sciatic fold in different age periods of a person's life occur in the literature [1, 3, 6]. Significantly less attention is paid to specific characteristics of innervation of gluteal nerves in a postnatal period of human ontogenesis in despite of sufficient quantity of scientific investigations devoted to the piriform muscle syndrome, compression syndrome of the inferior and posterior gluteal and sciatic nerves in a postnatal period of human ontogenesis.

The aim of the reseasch

To reveal specific characteristics of innervation of musculus gluteus maximus, musculus gluteus medialis and musculus gluteus minimus in human fetuses and newborns.

Materials and methods

Investigations of innervation peculiarities of gluteal muscles were carried out on 43 preparations of fetuses of 186.0-375.0 mm of parieto-coccygeal length (PCL) and 7 human newborns by means of

the methods of ordinary and fine preparation under the control of binocular loupe and morphometry. Only those cases when the cause of death was not associated with pathology of the pelvic cavity organs, pelvic cavity muscles and vascular-nervous formations of gluteal area were studied. Investigations of fetuses preparations by wight mass of 500.0 g and more, as well as the newborns was carried out in the Chernivtsi Regional Municipal Medical Establishment “Pathologoanatomical Bureau” according to the agreement about collaboration. Besides, preparations of fetuses and stillborns from the museum collection of the department of human anatomy named after M.H. Turkevych of Bukovyna State Medical University were used for the investigation of typical and variational anatomy of the superior and inferior gluteal nerves.

The results and their discussion

In human fetuses and newborns the superior gluteal vascular-nervous fascicle passes through piriform orifice, which represents itself the bone-fascial fissure, formed by the bone margin of the greater sciatic notch and fascia of the piriform muscle. Over-piriform orifice is covered with the gluteal fascia layer and parietal fascia of the pelvis. Branches of the superior gluteal nerve are defined in the space between gluteus minimus and gluteus medius muscles, which it innervates. Musculus gluteus minimus and musculus gluteus medius are mainly of three-cornered form in human fetuses and newborns. Superior gluteal nerve gives as a rule one branch to the tensor of femoral fascia lata. Elongated ribbonshaped form is peculiar to the latter one. Branches of the superior gluteal nerve go to the posterior margin of the internal surface of the musculus gluteus medius. The majority of devarications of the superior gluteal nerve penetrates into the thickness of musculus gluteus medius along arched line, parallel to the superior margin of the

muscle, at the distance of 8.0-11.0 mm from it. It should be noted, that divarications of the superior gluteal nerve are located in different layers of the musculus gluteus medius, herewith nerve branches do not reach the superior, anterior and posterior muscle margins. Connecting branches, a numbers of which is variable, are revealed in anterior and posterior portions of musculus gluteus medius between intramuscular nerves.

A loose type of ramification of the superior gluteal nerve, at which its branches have mainly ascending direction, is revealed in 18 fetuses and 3 newborns. Branches of superior gluteal nerve go both in ascending direction and the direction to the flat tendon of the musculus gluteus medius crossing herewith its muscular bundles under acute angle in the main type (25 examined fetuses and 4 newborns). Short small trunk which the main type of ramification is peculiar to individually go from the sacral plexus to the musculus gluteus medius in 6 fetuses and one newborn.

The above-mentioned small trunk of the sacral plexus is dichotomically divided and connective branches are defined between its separate branches in 2 fetuses (195.0 and 240.0 mm PCL).

Branch which, in the majority (34) investigated fetuses and 5 newborns in the area of its inferior-superior angle, is divided into superior and inferior stems, goes from the superior gluteal nerve to the exterior surface of the musculus gluteus minimus. Superior small trunk goes parallel to the superior margin of the musculus gluteus minimus herewith crossing muscular bundles under acute angle and ramifying mainly according to the main type. Loose type of ramification of the superior small trunk was revealed in 9 fetuses and 2 newborns. The inferior small trunk is mainly divided to anterior and posterior branches. However, ramification of the inferior small trunk in the right and left musculus gluteus minimus is characterized by significant individual differences. Branches of inferior small trunk are mainly located in the posterior portions of the superior and median one third of the musculus gluteus minimus and only in one fetus they were revealed within limits of the inferior one third of the muscle. Separate connective branches are revealed between individual nerves within limits of the median one third of the musculus gluteus minimus. Slender nervous branches, which go along ramifications of the superior gluteal artery, go to intramuscular arteries.

The inferior gluteal and genital vascular-nervous fascicles, posterior dermal nerve of the thigh and sciatic nerve go through subpiriform orifice. Subpiriform orifice is restricted by the inferior margin of the piriform muscle, sacrotuberal ligament and superior gemellary muscle. From the side of the pelvis subpiriform orifice is closed by the parietal fascia of the pelvis and by the fascia of piriform muscle, fascial compartments of the musculus gluteus medius, internal obturative and gemellary muscles which are connected in the orifice ranges from the side of the

gluteal muscles. Fascial compartment of the musculus gluteus maximus is formed by superficial and median layers of the gluteal fascia. Deep layer of the gluteal fascia separates musculus gluteus maximus from musculus gluteus medius and tensor of femoral fascia lata. Musculus gluteus maximus is innervated by the branches of the inferior gluteal nerve. Variability and asymmetry of the forms of the right and left musculus gluteus maximus were revealed by us both in one age group of fetuses and different age groups.

Musculus gluteus maximus has mainly an appearance of a wide quadrangular plate, but diamond-shaped, flattened and smoothed pyramidal forms are observed rarely. It should be noted that topography of the branches of the inferior gluteal nerve in human fetuses and newborns varies by significant individual and age differences. In 11 fetuses and 3 human newborns under study the inferior gluteal nerve is divaricated into 2 small trunk: upper, median and lower (the latter one has greater diameter), which, in their turn, are ramified according to the main (fig. 1) or loose type. The majority of branches of the inferior gluteal nerve enters the thickness of the musculus gluteus maximus along the line, which is run between superior and inferior margins of the muscle on the borders of its medial and median one third or in the area of the median one third of the muscle. Ramifications of inferior gluteal nerve are mainly divided in the upper and lower portions of the musculus gluteus maximus.

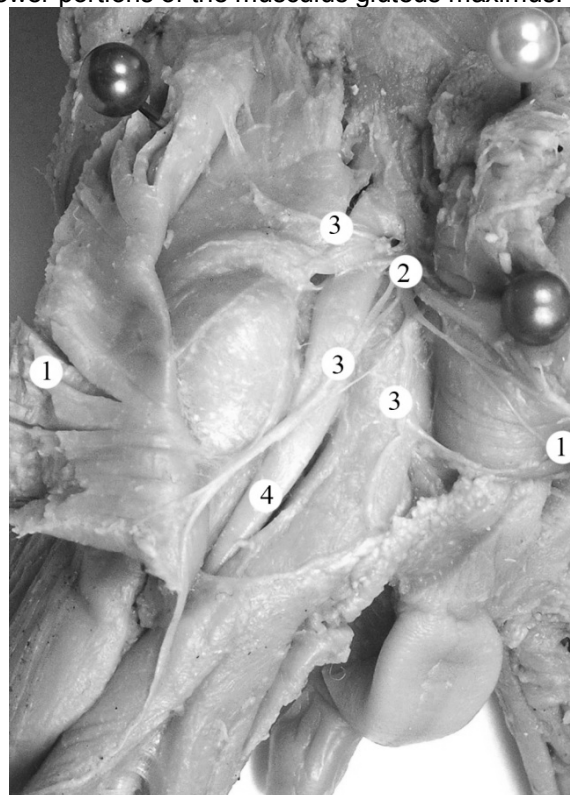


Fig. 1. Innervation of the left musculus gluteus maximus in fetus of 195.0 mm PCL. Macropreparation. Magnification 2.6 \times : 1 – gluteus maximus; 2 – inferior gluteal nerve; 3 – upper, median and lower stems of inferior gluteal nerve; 4 – sciatic nerve.

Loose type of ramification of the inferior gluteal nerve, which is characterized by the fact that 6-13 branches of the nerve go in lateral direction, was revealed in 18 fetuses and 2 newborns (fig. 2). Some of the branches of inferior gluteal nerve are located superficially and reach a lateral margin of

the gluteus maximus.

The majority of branches of the inferior gluteal nerve penetrates into the thickness of gluteus maximus and has less extent. Thereby branches of inferior gluteal nerve are divided more or less evenly in all parts of gluteus maximus.

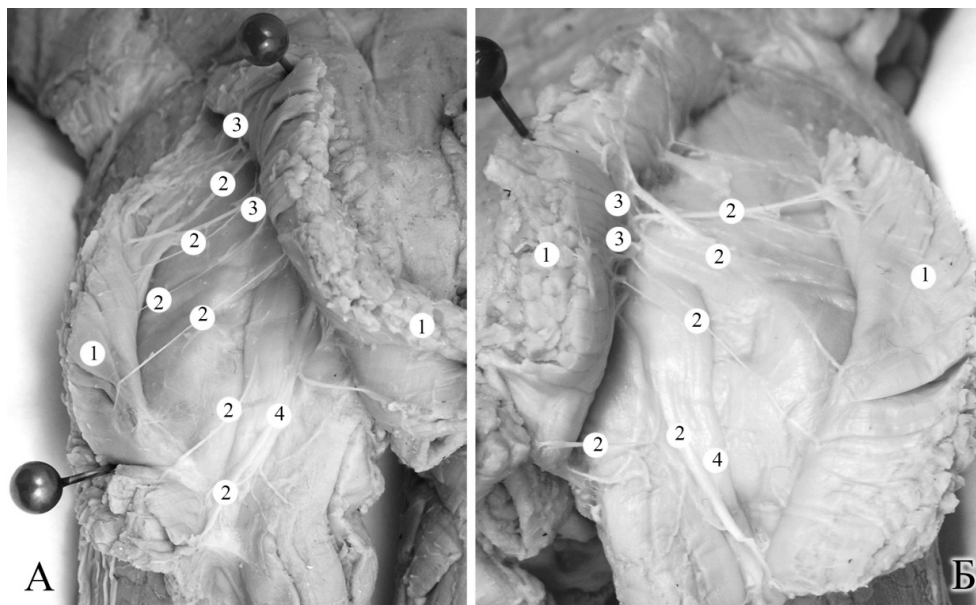


Fig. 2. Innervation of the right (A) and left (B) gluteus maximus in fetus of 260.0 mm PCL. Macropreparation. Magnification 2.3^x:
1 – gluteus maximus; 2 – branches of inferior gluteal nerve; 3 – connective branches; 4 – sciatic nerve.

Intramuscular nerves cross the muscular fascicles of gluteus maximus under various angles. Numerous connective branches are revealed between separate ramifications of inferior gluteal nerve, mainly in the medial portions of gluteus maximus, the finelooped plexus is formed as a result of it.

Single slender branches of nerves are defined in the thickness of gluteus maximus before intramuscular branches of inferior gluteal artery which go along the latter ones ramifying in the wall of arteries.

Conclusions

1. Gluteal nerves are ramified according to the main or loose type in the thickness of gluteus maximus, gluteus medius and gluteus minimus.

2. Branches of inferior gluteal nerve are evenly divided in the thickness of gluteus maximus while ramifications of the superior gluteal nerve are situated unevenly since they do not reach the borders of gluteus medius as well as the lower one third of the gluteus minimum.

3. Gluteus maximus and gluteus medius are characterized by a great number of ramifications of inferior and superior gluteal nerves correspondingly.

4. Connective branches which stipulate the formation of finelooped plexuses are revealed in the thickness of gluteal muscles between separate ramifications of the gluteal nerves.

5. Topography of the branches of the inferior gluteal nerve in perinatal period of human ontogenesis is notable for significant individual and age differences.

Perspectives of further developments consist in identification of projector-syntopic interrelations of the superior and inferior gluteal vascular-nervous bundles in fetal and early neonatal periods of human ontogenesis.

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Реферат

ОСОБЛИВОСТІ ІННЕРВАЦІЇ СІДНИЧНИХ М'ЯЗІВ У ПЛОДІВ І НОВОНАРОДЖЕНИХ ЛЮДИНИ

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Ключові слова: сідничні м'язи, сідничні нерви, плід, новонароджений, людина.

Макроскопічне дослідження особливостей іннервації сідничних м'язів проведено на 43 препаратах плодів 6-10 місяців і 7 новонароджених людини. Встановлено, що у товщі великого, середнього і малого сідничних м'язів сідничні нерви розгалужуються за магістральним або розсипним типом. Розподіл гілок нижнього сідничного нерва у товщі великого сідничного м'яза рівномірний. У товщі середнього сідничного м'яза розгалуження верхнього сідничного нерва не досягають країв м'язу. Гілки верхнього сідничного нерва розподіляються у товщі малого сідничного м'яза нерівномірно, концентруючись у верхній і середній третинах м'яза. Топографія гілок нижнього сідничного нерва у перинатальному періоді онтогенезу людини відрізняється значними індивідуальними та віковими відмінностями. У товщі сідничних м'язів між окремими розгалуженнями сідничних нервів виявляються сполучні гілки, які обумовлюють утворення дрібнопетлих сплетень.

Реферат

ОСОБЕННОСТИ ИННЕРВАЦИИ ЯГОДИЧНЫХ МЫШЦ У ПЛОДОВ И НОВОРОЖДЕННЫХ ЧЕЛОВЕКА

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Ключевые слова: ягодичные мышцы, ягодичные нервы, плод, новорожденный, человек.

Макроскопическое исследование особенностей иннервации ягодичных мышц проведено на 43 препаратах плодов 6-10 месяцев и 7 новорожденных человека. Установлено, что в толще большой, средней и малой ягодичных мышц ягодичные нервы разветвляются по магистральному и рассыпному типу. Распределение ветвей нижнего ягодичного нерва в толще большой ягодичной мышцы равномерное. В толще средней ягодичной мышцы разветвления верхнего ягодичного нерва не достигают краев мышцы. Ветви верхнего ягодичного нерва распределяются в толще малой ягодичной мышцы неравномерно, концентрируясь в верхней и средней третях мышцы. Топография ветвей нижнего ягодичного нерва в перинатальном периоде онтогенеза человека отличается значительными индивидуальными и возрастными различиями. В толще ягодичных мышц между отдельными разветвлениями ягодичных нервов обнаруживаются соединительные ветви, которые обуславливают образование мелкопетлистых сплетений.