ANATOMO-HISTOLOGICAL STRUCTURE OF THE NERVE OF THE SQUAMOUS PART OF THE FRONTAL BONE IN HUMANS AND ITS CLINICAL SIGNIFICANCE

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Abstract: The article examines the anatomo-histological structure and clinical significance of the nerves of the squamous part of the frontal bone in humans. The study was conducted on 36 specimens obtained from 19 human cadavers of both sexes and various ages. The distribution of the nerves was traced down to their finest reticular branchings using a head loupe, binocular stand magnifier, and surgical microscope under incident drops of 0.5% acetic acid solution. The diameter of nerve trunks and branches was measured using an ocular micrometer. In those areas of the frontal bone where more tendon and muscle fibers are interwoven, a greater number of nerves enter.

Keywords: human cadavers, squamous part of the frontal bone, specimens, macromicroscopic, ocular micrometer, nerves

АНАТОМО-ГИСТОЛОГИЧЕСКОЕ СТРОЕНИЕ НЕРВА ЧЕШУЙЧАТОЙ ЧАСТИ ЛОБНОЙ КОСТИ У ЧЕЛОВЕКА И ЕГО КЛИНИЧЕСКОЕ ЗНАЧЕНИЕ

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Резюме: В статье изучены анатомо-гистологик тузилиши ва клиник ахамияти анатомо-гистологическое строение нерва чешуйчатой части лобной кости у человека. Исследование проведено на 36 препаратах от 19 трупов людей обоего пола и различного возраста. Распространение нервов прослежено до их мельчайших сетевидных разветвлений с помощью налобной и

бинокулярной штативной луп и хирургического микроскопа под падающей каплей 0,5% раствора уксусной кислоты. Диаметр нервных стволов и ветвей измерялся при помощи окуляр-микрометра. В тех участках лобной кости, где вплетается больше сухожильных и мышечных волокон, вступает и большее количество нервов.

Ключевые слова: Трупов людей, чешуйчатой части лобной кости, препараты, макромикроскопической, окуляр-микрометра, нервы,

Introduction. Detailed information about the nerves of the cranial bones is primarily essential for dentists, traumatologists, anesthesiologists, and neurologists when addressing diagnostic and prognostic tasks related to interventions in the head and face region [1,2]. The study and identification of neural connections between the nerves of the facial skull bones and the soft tissues of the face are of even greater clinical interest. The significance of innervation for the vital activity of bone is very high, since bone development and growth, regeneration processes, and metabolism in normal bone tissue, as well as a number of pathological processes occurring in it, are closely linked to the function of the surrounding soft tissues [3]. This connection of bone with other organs and tissues is realized through the vascular and nervous systems. Systematic studies of the connections between the nerves of the facial skull bones and the surrounding soft tissues have not been conducted. Data concerning age-related and comparative-anatomical characteristics are absent. Researchers have mainly focused on the morphology of cranial nerves within the soft tissues of the head and the bones covered with periosteum. A number of works are devoted to the study of nerves of the upper and lower jaws, orbit, oral and nasal cavities [4]. However, even in the listed works, the matter usually comes down to data on the innervation of teeth and the distribution of nerves in the accessory apparatus of the eye, as well as in the mucous membrane of the oral and nasal cavities [5]. It is interesting to note that the author attributes the topography of nerves spreading in the walls of various cranial cavities directly to the individual characteristics of the shape and size of these bone formations. To confirm his data, the author conducted an interesting experiment on animals, which consisted of separating the skin of the head and periosteum from the underlying tissues and performing trepanation of the skull.

Purpose of the study. We set ourselves the task of studying the nerves of the frontal bone and their interconnections as well as their connections with the nerves of the surrounding soft tissues.

Materials and Methods. The study was conducted on 36 specimens obtained from 19 human cadavers of both sexes and various ages. The nerves of the soft tissues and the above-mentioned bone (frontal bone) were examined using the macromicroscopic dissection method, which included drilling of bone substance, softening of bones with glycerin, acids, and pepsin, clearing and staining of nerves, as well as histological control. The distribution of nerves was traced down to their finest reticular branchings with the aid of a head-mounted loupe, a binocular stand-mounted loupe, and a surgical microscope under a drop of 0.5% acetic acid solution. The diameter of nerve trunks and branches was measured using an ocular micrometer.

Results. In order to achieve the most complete possible demonstration of nerves and their connections in the corresponding regions, we employed various approaches.

Nerves of the squamous part of the frontal bone: The nerves entering the squamous part of the frontal bone are, in the majority of cases, branches arising from nerves that innervate the frontal muscle, the periosteum covering the frontal bone, the subcutaneous tissue, blood vessels, and the skin of the forehead. The number of nerve trunks entering the periosteum and the bony substance of the frontal bone on each side is variable and ranges from 2 to 15. The diameter of these branches reaches 0.05–0.8 mm. These nerves most frequently penetrate the squamous part of the frontal bone together with branches of the supraorbital artery through independent bone foramina, which have inconstant location and shape. The largest number (10) of nerve twigs enters the squamous part of the frontal bone in the region of the superciliary arches and the superior orbital margin. In the overwhelming majority of cases, the nerves penetrating the frontal bone arise from their sources at acute angles (from 6° to 45°) and, after traveling a certain distance in an ascending direction, first enter the periosteum and then the squamous part of the frontal bone. The length of the bony canaliculi in the frontal bone through which the above-mentioned nerve twigs pass ranges from 1.2 mm to 5.8 mm. In specimens from young individuals (up to 35 years of age), the number of bone foramina and canals is greater than in older age groups. With advancing age, the size of the foramina and canals decreases, up to the complete disappearance of some of them. Inside the bony canaliculi, the nerves of the frontal bone are surrounded by adipose tissue. When nerves and vessels were studied together within bone canals, the layer of adipose tissue extends between them, separating one from the other. Nerve twigs entering the medial and middle parts of the superciliary arches arise from the trunk and lateral branches of the supraorbital nerve as well as from neural connections present between the branchings of the supraorbital and facial nerves. From each of these sources, 1 to 7 nerve twigs enter the frontal bone. They approach the bony substance of the frontal bone after passing between the fibers of the frontal muscle and the periosteum. The nerves of the glabella region enter the bone at acute angles or angles approaching right angles. After separating from the main nerve trunks, they travel a short distance and most frequently penetrate the bone accompanied by arterial branches of the frontal artery. The region of the frontal eminences receives nerve twigs from the lateral branchings of the supraorbital and facial nerves and from connections between them. Here, 1–3 nerve twigs are distributed, with lengths of 4–6.2 mm and diameters of 0.01–0.18 mm. Each twig, upon entering the spongy substance of the bone, continues to divide into smaller branches within it. The region of the temporal line of the squamous part of the frontal bone is innervated by 1–4 branches arising from the deep temporal nerve, which reach the bone by passing between the fibers of the temporal muscle. In 10 out of 36 cases, several nerve twigs (most often 2–5) penetrate through the thickness of the squamous portion of the frontal bone into the cranial cavity, lying within bony canaliculi. The length of these canaliculi does not exceed 7–9 mm (most commonly 3–5 mm), their diameter is 0.1–1.2 mm, and their direction is oblique (i.e., from below upward). Once inside the cranial cavity, the described nerve twigs are located between the periosteum covering the cerebral surface of the frontal bone and the dura mater of the anterior cranial fossa, and they penetrate into the outer surface of the latter.

Conclusion. Thus, within the thickness of the spongy substance of various parts of the squamous portion of the frontal bone, nerves that have penetrated from different sources are distributed inside bony canaliculi. These canaliculi, by connecting with one another and with other nerves spreading in adjacent cranial bones, form numerous permanent connections.

Our observations indicate that the nerves of the frontal bone are in close relationship with the nerves of other nearby cranial bones as well as with the nerves of the surrounding soft tissues (skin coverings, muscular elements, subcutaneous tissue, dura mater, etc.), periosteum, branchings of blood vessels, and paranasal sinuses. In those areas of the frontal bone where more tendinous and muscular fibers are interwoven, a greater number of nerves enter.

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