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STRUCTURAL COMPONENTS OF AUTONOMIC INNERVATION OF MUCOSA OF NASAL CAVITY AND PARANASAL SINUSES

Abstract. *Autonomic innervation of mucosa of the nasal cavity and paranasal sinuses has been studied using complex morphological methods. It was determined that autonomic innervation of the nasal cavity and paranasal sinuses mostly occurs due to the branches of the pterygopalatine ganglion*
Keywords: *nasal cavity, paranasal sinuses, innervation, pterygopalatine ganglion, mucosa, anatomy.*

Introduction. Mucosa of nasal cavity is functionally large receptor surface with a very complex and various reflex connections. It is equipped with lots of blood and lymphatic vessels, which are surrounded with numerous nerve endings. The main factor in the regulation of trophic of the nasal cavity and paranasal sinuses is their autonomic innervation, consisted of trophic (sympathetic) and secretory (parasympathetic) fibers [1, 2].

The autonomic innervation of the nasal cavity is closely linked with the olfactory. Olfactory analyzer is one of the phylogenetically oldest body systems and is the leading analyzer for most mammals. Sense of smell in the human is not as highly developed as in certain animals, but the cerebral mechanisms of smell are closely linked to fundamental mechanisms of formation of needs, motivations and emotions [3, 4]. The peripheral element of olfactory analyzer consists of highly specialized epithelium of the upper nasal passage, short dendrites, which ends with receptors, and axons form olfactory filaments that enter the olfactory bulb where contact with other neurons [5].

Objective: to study ways of autonomic innervation of mucosa of nasal cavity and paranasal sinuses.

Materials and methods. 32 samples of nasal area of people of all ages were studied by complex of the following morphological methods: histological method, preparation, radiological and morphometric methods. The samples were obtained from corpses of people who died from causes unrelated to the ENT disorders. The study was performed in strict accordance with the Helsinki Declaration of the World Medical Association "Ethical Principles for

Medical Research Involving Human Subjects" (1964-2000). The study of the nasal area was carried out in Chernivtsi regional forensic medical bureau and M.G. Turkevych department of human anatomy of SHEI of Ukraine "Bukovinian State Medical University". The side walls of the nose and formations adjacent to them were dissected consistently with surgical instruments, starting from their posterior. The sphenopalatine foramen and pterygopalatine ganglion were determined, the nerve branches were dissected, and their path and the one of branches that branching from them were traced. Further back nasal branches of pterygopalatine ganglion were studied. The levels of their discharge and syntopy were revealed. Similar studies were carried out on frontal and horizontal autopsy of samples. From some samples the mucosa was dissected for histological study.

Results and discussion. The interest in the detailed study of the autonomic innervation of the mucosa of the nasal cavity and paranasal sinuses increased since the appearance of vidian neurectomy. It is known that the source of parasympathetic innervation of the mucosa of the nasal cavity and paranasal sinuses is a superior salivary nucleus, which belongs to the intermediate nerve, inherent in the reticular formation of pons [6].

Intermediate nerve is closely linked in its course with facial nerve, they go around the back edge of the pons, between the pedunculi cerebellares medii and lower oliva cerebelli. Then it enters the inner ear and deeply in it enters the channel of the facial nerve deep in the temporal bone. In the place where the channel changes its direction from the front side to the back some of parasympathetic fibers – the greater petrosal nerve leaves the channel and falls in the same sulcus on the front surface of the pyramid of the temporal bone, goes to the torn hole and leaves the cranial cavity through it, going into the pterygoid canal. In this place the sympathetic nerve - the deep petrosal nerve – approaches to the greater petrosal nerve, forming a trunk – the nerve of pterygoid canal. The latter, entering the channel and passing it reaches the pterygopalatine ganglion, located in the pterygopalatine fossa.

Segmental centers of sympathetic innervation of the mucosa of the nasal cavity and paranasal sinuses lay in the intermediolateral nucleus of the lateral horns of the gray matter of the upper thoracic spinal cord segments. The axons of the nucleus cells go out of the spinal cord as a part of the anterior roots. Departing from the latter, they form white connecting branches which approach the sympathetic trunk, namely the lower cervical ganglion or the stellate ganglion, the lower cervical and first thoracic ganglions are often connected forming the stellate ganglion. The preganglionic fibers rise by the sympathetic trunk and reach the upper cervical sympathetic ganglion and break up there. The postganglionic fibers that starting from the upper cervical ganglion – the internal carotid nerve, form the internal carotid plexus around the internal carotid artery, from which at the torn hole the branch – the deep petrosal nerve take the start. It should be emphasized that the greater petrosal nerve fibers are preganglionic and the deep petrosal nerve fibers are postganglionic. From this it follows that the nerve of pterygoid canal – which is known in the literature as Vidian nerve, is composed of parasympathetic preganglionic and postganglionic sympathetic nerve fibers.

The direct nerve trunks involved in autonomic innervation of these areas are the branches of the pterygopalatine ganglion.

The postganglionic sympathetic fibers are the part of the nerve trunks. Some of the sensitive fibers of the second branch of the trigeminal nerve, which are also the part of the branches of the pterygopalatine ganglion, also go through the pterygopalatine ganglion. The mucosa of the nasal cavity and paranasal sinuses receives sympathetic innervation, in contrast to parasympathetic one, not only from the pterygopalatine node, but also from the internal carotid plexus, the fibers of which reach the nasal cavity directly with end branches of the sphenopalatine, ophthalmic and ethmoidal arteries.

There are also indications that some of the sympathetic fibers, namely the vasoconstrictors

and secretory leaders, pass through the trigeminal ganglion and join its sensitive fibers going to the periphery and penetrating everywhere the latter go.

The branches of the pterygopalatine ganglion form the upper, the medial and lower groups. The upper branches or the orbitales of the pterygopalatine ganglion in most cases are connected with the ciliary ganglion and its branches, as well as participate in parasympathetic innervation of the lacrimal gland. The group of the lower branches is formed from the large and small palatine nerves, which come directly from the pterygopalatine ganglion and enter into the pterygopalatine canal, where go to the palatine foramens and innervate the blood vessels and glands of the mucosa of the hard and soft palate at the exit of the foramens. The branches of front of these nerves – the greater palatine nerve passes the medial wall of the channel near the back end of the inferior turbinate, enter the mucosa and branch there, and in the mucosa of the middle and lower nasal passages. They are also involved in autonomic innervation of the mucosa of the maxillary sinus.

The medial group consists of the pharynx and upper posterior nasal branches. They depart from the pterygopalatine ganglion, pass through the sphenopalatine foramen and enter the nasal cavity, passing close to the bottom wall of the sphenoid sinus. They end in the mucosa of the lateral surface of the throat, and sometimes can be traced to the pharyngeal opening of auditory tube. Most of these branches go independently from the pterygopalatine ganglion in the number of 3-5, and in some cases go from the total trunk with the back upper nasal branches. Sometimes the pharyngeal branches go directly from the pterygoid canal nerve.

Conclusions: The course, distribution, plant of the autonomic nerve branches in the mucosa of the nasal cavity, features of the innervation of the paranasal sinuses, their syntopy with the adjacent structures are not studied enough. Some studies are devoted to this question, but they are limited, not general and, of course, can serve as a basis for the development of surgery of autonomic nerves for the nasal cavity.

Prospects for further research. It is planned to study blood supply of nasal area and paranasal sinuses in different periods of human ontogenesis.

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