NEUROHISTOLOGICAL CHANGES IN THE NERVE GANGLIA OF THE CELIAC PLEXUS FOLLOWING TRANSECTION OF THE MESENTERIC NERVE FIBERS IN EXPERIMENTAL CONDITIONS

Zhalilov Asliddin Kholmatovich. PhD, Associate Professor

Department of Propaedeutics of Childhood Diseases

Samarkand State Medical University

Abstract: The article investigates the neuronal composition of the celiac plexus ganglia under experimental conditions. In cats under general anesthesia, nerves connecting the mesenteric nerve fibers with the celiac plexus ganglia were transected. The results demonstrated that transneuronal degeneration occurred in the nerve cells of the celiac plexus ganglia as a response to the loss of pericellular connections (synapses). This indicates that a significant portion of celiac plexus neurons receive preganglionic fibers via the mesenteric nerves.

Keywords: experiment, cats, celiac plexus, nerve cells, hematoxylin and eosin staining, toluidine blue staining.

НЕЙРОГИСТОЛОГИЧЕСКИЕ ИЗМЕНЕНИЯ В НЕРВНЫХ УЗЛАХ СОЛНЕЧНОГО СПЛЕТЕНИЯ ПРИ ПЕРЕРЕЗКЕ НЕРВНЫХ ВОЛОКОН БРЫЖЕЙКИ КИШЕЧНИКА В ЭКСПЕРИМЕНТЕ

Жалилов Аслиддин Холматович, к.м.н., доцент

Кафедра пропедевтики детских болезней

Самаркандский государственный медицинский университет

Резюме: В статье изучен состав нейронов узлов солнечного сплетения в экспериментальных условиях. У кошек под общим наркозом производилась перерезка нервов, соединяющих нервные волокна брыжейки кишечника с узлами солнечного сплетения. Полученные результаты показали, что в нервных клетках узлов солнечного сплетения возникла транснейрональная дегенерация как реакция на потерю перицеллюлярных связей — синапсов. Это указывает на то, что значительная часть нейронов солнечного сплетения получает преганглионарные волокна через нервы брыжейки кишечника.

Ключевые слова: эксперимент, кошки, солнечное сплетение, нервные клетки, окраска гематоксилином и эозином, окраска толуидиновым синим.

Introduction. In the literature, scientific studies devoted to the examination of the ganglia of the solar (celiac) plexus are rarely encountered [1,2]. Reports on serious complications arising in certain cases from nerve transection during surgical interventions on abdominal and pelvic organs are also infrequently found [3,4]. From a neurohistological perspective, the solar plexus holds particular significance; in addition to nerve cells with established functions, it contains large ganglion clusters whose physiological roles remain incompletely elucidated [5,6]. The majority of histological studies on the solar plexus focus on describing the nerve fiber composition of its ganglia, particularly the receptor apparatus, though these data have been inadequately explored [7]. Individual experimental studies have primarily addressed the afferent innervation of the solar plexus, with insufficient attention paid to its neurons [8].

Aim of the Study. To investigate neurohistological changes in the ganglia of the solar (celiac) plexus following experimental transection of nerve fibers in the mesentery of the intestines.

Materials and Methods. Under experimental conditions, in 25 adult cats under general anesthesia, nerves leading to the intestinal mesentery were transected above and below the ganglia of the celiac plexus. After a specified period, nerve tissues were excised and processed using general histological staining with hematoxylin-eosin and neurohistological staining with toluidine blue. In addition, on serial sections of the ganglia with a thickness of 8–9 μm stained with toluidine blue, the number of retrogradely altered cells was counted. As a control, the celiac plexus ganglia from 10 practically healthy cats were examined.

Results. Forty-eight hours after transection of the nerves directed toward the celiac plexus ganglia, massive degeneration of presynaptic nerve fibers occurs in the celiac plexus, along with degeneration of the synaptic apparatus in some nerve cells of the celiac ganglia. Transection of the celiac nerves also causes a series of structural disturbances in the bodies of nerve cells. In preparations stained with

toluidine blue, chromatolysis is observed in many neurons 8–15 days after the operation; this process begins at the cell periphery and gradually spreads toward the center. The reduction in cell size is confirmed by cytometric data and variational statistical analysis of the numerical material. According to our measurements, nerve cell sizes in intact animals show considerable variability. However, three groups can be distinguished: 1) 1–30 planimetric units; 2) 31–60 planimetric units; 3) 61–100 planimetric units. In the norm, the largest number of cells (up to 93 out of 200) measure 31–45 planimetric units. Ten to fifteen days after bilateral splanchnicotomy, the number of smaller cells increases significantly. For example, 14 days after celiac nerve transection, the majority of celiac plexus neurons (up to 118 out of 200) measured 16–30 planimetric units. Comparison with nerve cell sizes in control animals showed that mesenteric nerve transection reduces cell size twofold by day 14. Thus, the cytometric data align with visual observations and provide objective evidence of transneuronal degeneration in celiac plexus nerve cells, which arises as a response to the loss of perocellular synaptic connections following preganglionic fiber transection. When sympathetic nerves were transected below the celiac plexus ganglia by cutting 1–5 nerve branches passing through the mesentery, degeneration of thin myelinated nerve fibers was detected in the celiac plexus ganglia by impregnation methods 36–48 hours post-operation. Eight to ten days after mesenteric nerve transection, many celiac plexus neurons exhibited retrograde changes. These cells appeared slightly swollen, with Nissl substance almost completely absent, persisting only in small amounts at the cell periphery or around the nucleus. The finding that a significant proportion (14–27%) of celiac plexus neurons—primarily large ones—underwent retrograde alteration after mesenteric nerve transection indicates that these nerves contain numerous axons originating from celiac plexus nerve cells. In this experimental series, only a small number of neurons showed transneuronal changes, which we attribute to the presence of both efferent and afferent nerve fibers in the mesenteric nerves. Notably, in both the first and second experimental

series, alongside retrogradely and transneuronally altered neurons, unchanged nerve cells with preserved synapses were also observed.

Conclusion. The obtained results demonstrate that the celiac plexus and its nerve fibers represent a complex neurohistological structure—an anatomical center that performs reflex neurophysiological functions. The neurites of cells located in its ganglia extend not only distally within the mesenteric nerves but also proximally within the celiac nerves. Retrograde degeneration of a substantial number of neurons in the celiac plexus ganglia following transection of nerves in the mesentery of the small intestine indicates that these cells, together with neurons of the Meissner and Auerbach plexuses, serve as an additional source of motor innervation for the small intestine.

References.

1. Ахмедова С. М. и др. Антропометрические показатели физического развития у детей до 5 лет в самаркандской области //SCIENTIFIC RESEARCH IN XXI CENTURY. – 2020. – С. 250-258.
2. Axtamovna, Achilova Feruza, and Jalilov Asliddin Xolmatovich. "Applications of Josamycin in the Treatment of Urethrogenic Prostatitis." (2023).
3. Маматалиев А. Р. НЕЙРОГИСТОЛОГИЧЕСКИЕ ИЗМЕНЕНИЯ БЛУЖДАЮЩЕГО НЕРВА ПОД ВЛИЯНИЕМ КОЛХИЦИНА В ЭКСПЕРИМЕНТЕ //Экономика и социум. – 2025. – №. 11-1 (138). – С. 1011-1014.
4. Маматалиев А. Р. Особенности нейрогистологическое строение интразонального нервного аппарата вне печеночных желчных протоков у крыс //экономика и социум. – 2024. – №. 3-2 (118). – С. 692-695.
5. Орипов Ф. С. и др. Адренергические нервные элементы и эндокринные клетки в стенке органов среднего отдела пищеварительной системы в сравнительном аспекте //Современные проблемы нейробиологии. Саранск. – 2001. – С. 46-47.

6. Зохидова С., Маматалиев А. Морфофункциональная и гистологическом строении эпителия языка крупного рогатого скота //евразийский журнал медицинских и естественных наук. – 2023. – Т. 3. – №. 2. – С. 133-139.
7. Маматалиев А. Р. Нервный аппарат внепеченочных желчных протоков у кролика после экспериментальной холецистэктомии //international journal of recently scientific researcher's theory. – 2024. – Т. 2. – №. 4. – С. 161-165.
8. Маматалиев А. Р. Нервный аппарат внепеченочных желчных протоков у кролика после экспериментальной холецистэктомии //international journal of recently scientific researcher's theory. – 2024. – Т. 2. – №. 4. – С. 161-165.