ISSN 2077-4214

Ukraine NOW

Українська академія наук
Полтавський державний медичний університет

ВІСНИК ПРОБЛЕМ БІОЛОГІЇ І МЕДИЦИНИ

BULLETIN OF PROBLEMS IN BIOLOGY AND MEDICINE

Випуск 1 (172)

DOI 10.29254
ISSN 2077-4214
E–ISSN 2523–4110
УДК 167: [61+616.31+616-053.2+611/612]-028.77

ВІСНИК ПРОБЛЕМ БІОЛОГІЇ І МЕДИЦИНИ

BULLETIN OF PROBLEMS IN BIOLOGY AND MEDICINE

Український
науково-практичний журнал
засновано у листопаді 1993 року

ЖУРНАЛ
виходить 1 раз на квартал

Випуск 1 (172)

Рекомендовано до друку
Вченою радою
Полтавського державного
медичного університету
Протокол № 6, від 13.03.2024 р.

Включений до індексу цитування
Google Scolar.
Розміщений на онлайнових базах даних
CrossRef, Ulrichsweb, Proqust, DOAJ,
Index Copernicus, ADL, Journals Pedia.

Відповідно до постанови
президії ДАК України
від 11 жовтня 2000 р. №1-03/8,
від 13 грудня 2000 р. №1-01/10,
від 14.10.2009 р. №1-05/4,
від 29.09.2014 №1081,
від 07.05.2019 р. №612,
від 28.12.2019 р. №1643.
журнал пройшов перереєстрацію
і внесений до списку друкованих періодичних
видань, що включаються до переліку наукових
фахових видань України (Категорія Б),
в якому можуть публікуватися результати
дисертаційних робіт
на здобуття наукових ступенів

Підписано до друку 20.03.2024
Замовлення № 2475
Тираж *200 примірників*

Біологія, медицина,
стоматологія, педіатрія

ВІСНИК ПРОБЛЕМ БІОЛОГІЇ І МЕДИЦИНИ

ЗАСНОВНИКИ:
Українська академія наук (м. Київ)
Полтавський державний медичний університет (м. Полтава)
Порядковий номер випуску і дата його виходу в світ:
Випуск 1(172) від 29.03.2024 р.
Адреса редакції:
36011, м. Полтава, вул. Шевченка, 23, ПДМУ
кафедра анатомії з клінічною анатомією та оперативною хірургією
Свідоцтво про Державну реєстрацію:
КВ №10680 від 30.11.2005 р.
Відповідальний за випуск: О. М. Проніна
Технічний секретар: Я. О. Олійніченко
Комп'ютерна верстка: А. І. Кушпільов
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м. Полтава, тел. (0532) 60-95-84, 60-96-12, (050) 668-68-51,
(098) 202-34-31

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Conflict of interest:
The Authors declare no conflict of interest.

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A – Work concept and design, **B** – Data collection and analysis, **C** – Responsibility for statistical analysis, **D** – Writing the article, **E** – Critical review, **F** – Final approval of the article.

Received 10.09.2023
Accepted 20.02.2024

DOI 10.29254/2077-4214-2024-1-172-425-429
UDC 616.716.4-092-053.9

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TYPICAL TOPOGRAPHIC-ANATOMICAL CHARACTERISTICS OF THE STRUCTURE OF THE SUBMANDIBULAR VEGETATIVE NODE IN ELDERLY AND OLD PEOPLE

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At the current stage of the development of morphology and clinical medicine, the interest in vegetative nodes, which are complex peripheral nerve centers connected to the central nervous system and are trophic and communication and distribution centers, does not decrease.

In this regard, it becomes clear that without the doctor's knowledge of the features of the topography and individual structure of the submandibular node (SMN) and its connections with neighboring nerves, it is not possible to provide significant help in understanding the pathogenesis and clinical manifestations of diseases of the node, developing new ones and optimizing already existing methods of treatment.

Before starting the main part of our study, we determined the shape of the head (skull) and face – head and face indices. In the future, we used anatomical preparation of the SMN after cosmetic access to it. The sizes of the node were measured using a millimeter ruler. Photography of the prepared SMN was carried out using a digital camera.

Based on the results of the research, we determined the main topographical positions of the SMN; revealed variants of the external structure of SMNs by frequency of occurrence and their sizes; the extreme types of the structure of the SMNs are established and it is shown in which forms of the head and face they occur; the topography of the branched connections of the SMN – adductor roots: tympanic-lingual, sympathic and efferent roots has been clarified.

The revealed dependence of the topographic-anatomical variability of the human SMN on the shape of the skull will help clinicians to justify the choice of the node blockade method in various pathological conditions.

Key words: *man, submandibular vegetative node (ganglion), topographic-anatomical structure, elderly and old age.*

Connection of the publication with planned research works.

This study is part of the research project “Morpho-functional study of human internal organs and laboratory animals in various aspects of experimental medicine”, state registration number 0121U108258.

Introduction.

At the current stage of the development of morphology and clinical medicine, the interest in vegetative nodes, which are complex peripheral nerve centers connected to the central nervous system and are trophic and communication and distribution centers, does not decrease [1, 2, 3, 4].

In this regard, it becomes clear that without the doctor’s knowledge of the features of the topography and individual structure of the SMN and its connections with neighboring nerves, it is not possible to provide significant assistance in understanding the pathogenesis and clinical manifestations of node diseases, developing new and optimizing existing treatment methods.

In addition, the clinical picture of the SMN syndrome is represented by severe pain and senostopathic phenomena that affect the mental state of patients, which can cause cancerophobia. Blockade of regional submandibular nodes is recommended to remove these phenomena and stop pain in the tongue area [5, 6, 7].

Interest in such changes as neurodegeneration in the structures of the nervous system in the elderly remains relevant even today [8].

Despite the fact that currently accesses to the SMN are sufficiently developed, there is still a need for detailed knowledge of the topographic-anatomical relationships of the site of localization of the submandibular vegetative node [9].

The aim of the study.

To establish the topography and external structure of the submandibular vegetative node in the elderly and senile people.

Object and research methods.

Before the material was collected, we had determined the shape of the head (skull) and face. The head and facial indices were calculated according to the well-known formula [10]. We have found out 20 cases of brachycephaly with chameprosopia, 23 cases of mesocephaly with mesoprosopia, and 28 cases of dolichocephaly with leptoprosopia in all age groups of our study.

The collection of material for our study was carried out at the CE (communal enterprise) of Poltava Regional Pathology Bureau of Poltava Regional Council. The cause of death excluded localization of the pathological process in the head and neck area. The deceased were aged 56-77 years (I elderly age – 1 case, II elderly age – 32 cases, I old age – 24 cases, according to the classification of V.V. Bunak, 1965).

In the course of our study, we used anatomical preparation of the PNSC after cosmetic access to it. Before dissection, a tissue complex measuring 7×7 cm was excised, including the submandibular salivary gland. Further research was carried out at the Department of Anatomy with Clinical Anatomy and Operative Surgery together with the Laboratory of Functional Morphology of the Poltava State Medical University (PSMU) and the Experimental Biological Clinic of the PSMU of the Ministry of Health of Ukraine. The node and its connections were dissected under a binocular magnifying glass. For this, the tissue block was attached to the wax plate with dissecting needles. With a special device for fixing fragments of the blade of safety razors (certificate for the rationalization proposal No. 1782 dated March 20, 1996), fatty tissue was removed, the node was revealed and its ligaments were dissected.

The preparation of the node was carried out in the above-mentioned manner with the following changes. The head of the dead body was previously fixed using a special device (certificate for rationalization proposal No. 1785 dated March 20, 1996). 71 spesimens were obtained by the preparation method. The dimensions of the node were measured using a millimeter ruler. Photography of the prepared SMNs was carried out using a digital camera. The work was carried out in accordance with the requirements of the "Instructions on conducting a forensic medical examination" (order of the Ministry of Health of Ukraine No. 6 dated from 17.01.1995), in accordance with the requirements and norms, the standard regulation on ethics of the Ministry of Health of Ukraine No. 690 dated from 23.09.2009, "The procedure for removing biological objects from the dead, whose bodies are subject to forensic medical examination and patho-anatomical examination, for scientific purposes" (2018).

Research results and their discussion.

The submandibular node, as a rule, is located near the posterior edge of the maxillohyoid muscle, directly under the lingual nerve, at the point of transition of the dead person from a vertical to a horizontal position. The bend of the lingual nerve, formed in this case and turned by the convexity back and down, separates the node from the palatine tonsil located above and the mucous membrane of the floor of the oral cavity. The submandibular salivary gland is located below the node. Behind the node there is the internal pterygoid muscle. A branch from the facial artery to the palatine tonsil passes between the SMN and the muscle. On the medial side, the node is adjacent to the hyoid muscle. On the lateral side, it contacts the posterior bundles of the maxillohyoid muscle and, due to loose connective tissue, it is separated from the medial surface of the lower jaw.

In addition to the location described above – we call it the average or typical – there were also other positions of the node. At a high position, the node is located directly next to the lingual nerve. At a low position, the node is localized near the upper pole of the submandibular gland. One of the extreme manifestations of the lowest location of the node is its finding in the depth of the submandibular gland. We call the posterior form of the node position such the position in which the node is distant from the maxillohyoid muscle and is adjacent

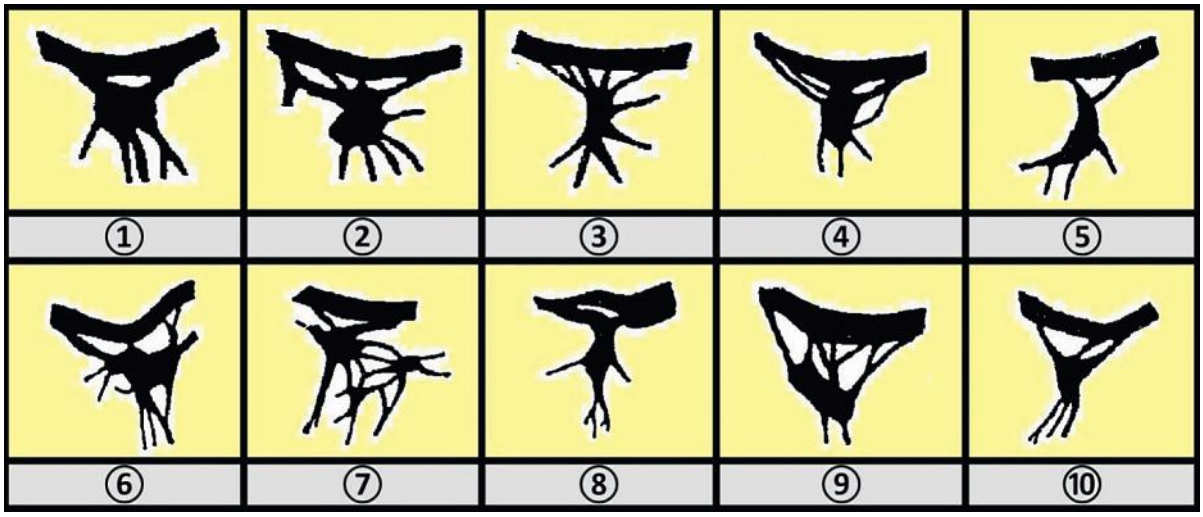

Figure 1 – External structure of the submandibular vegetative node according to forms: 1 – round; 2 – pear-shaped; 3 – star-shaped; 4 – block-shaped; 5 – semilunar; 6 – polygonal; 7 – plexiform (reticulated); 8 – oval; 9 – cylindrical; 10 – triangular.

to the internal pterygoid muscle. In the front position, the node is adjacent to the posterior edge of the maxillohyoid muscle or is covered by this muscle and is 2-4 mm in front of its posterior wing.

In most cases, the SMN had an oval, cylindrical or triangular shape. At the same time, other forms were also found out: round, pear-shaped, star-shaped, block-shaped, semilunar or plexiform **(fig. 1)**.

In the presence of various forms of the SMN in all cases, it was flattened in the sagittal plane. Its oval shape was observed in 52.11% of cases **(table, fig. 2)**. At the same time, the long axis, which was passed through the node, was parallel to the arch of the lingual nerve in 35% of cases, in all the other cases it was perpendicular or close to it. The back (or upper) pole of the node is rounded and wider; lower (front) – narrower.

The cylindrical shape of the node was found out in 14.1% of cases **(table)**. The long axis of the node always ran in a vertical direction or close to it. The upper and lower poles of a rounded node have the same size. We determined the triangular shape in 12.68% of cases **(table)**. At the same time, the apex of the node is always directed downwards, the base – towards the arch of the lingual nerve.

Bilateral form of asymmetry was observed in three objects. In the first case, the triangular shape of the node on the left was combined with the oval one on the right, in the second case – oval on the left with a crescent on the right, in the third – cylindrical on the left with a star on the right.

The size of the node on our preparations was from 1.0×1.5×0.5 to 4×5×2 mm. The dimensions of nodes of different shapes are presented in **table.**

Branches to the lingual nerve go from the SMN. They consist of short nerve trunks of different thickness, which depart from the front-upper side of the node, go forward and up and enter the trunk of the lingual nerve. Their length is on average 5-8 mm, very rarely, when the node is located at the back, it increases to 12 mm. At a high position of the node, this branch does not form separate trunks. The number of trunks of this branch varies from 2 to 5, most often it consists of two or three trunks. Sometimes there are connecting branches between nerve trunks.

The so-called nerve-nodal chain is located between the SMN and the hypoglossal nodes. Branches to the nerve nodal chain as well go from the front edge of the SMN in the form of thin nerve trunks.

The connection of the SMN with the hypoglossal nerve is carried out with the help of an independent trunk, which departs from the front edge of the node and is directed downward and forward to the peripheral end of the hypoglossal nerve. At the same time, the trunk is adjacent to the lateral surface of the duct of the spinal cord. The length of this stem is 14-17 mm, the thickness is 0.3-0.4 mm.

Branches from the SMN to the submandibular salivary gland are the main ones. In the number of 1-7, these branches go from the lower side of the node, go down and enter the gates of the salivary gland; at the same time, they pass laterally from its excretory duct. At the gate of the gland, due to the distribution of some trunks, their total number increases. In round and oval forms of the node, the number of these trunks is greater than in cylindrical and triangular forms, while in the latter cases the trunks run parallel, and in the former cases they are arranged in a fan shape.

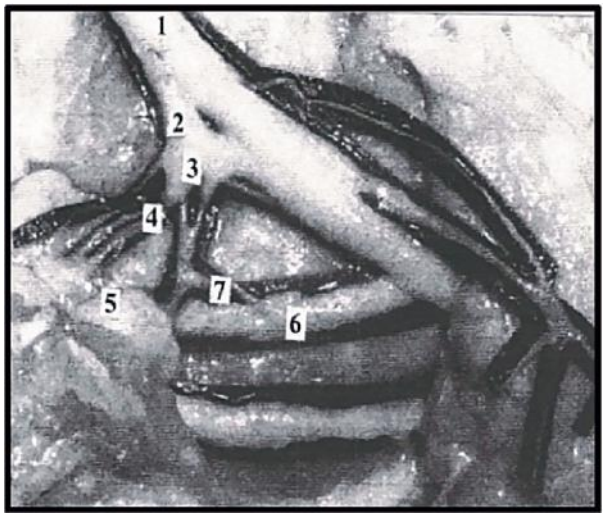

Figure 2 – The oval shape of the PNSC at its high position. Designation: 1 – lingual nerve, 2 – connections between the lingual nerve and the node, 3 – submandibular vegetative node, 4 – branches from the node to the submandibular salivary gland, 5 – submandibular salivary gland, 6 – hypoglossal nerve, 7 – ligaments between the mandibular vegetative node and hypoglossal nerve.

Table – Frequency of distribution and sizes of different forms of PLD

No.	Node form	Frequency of distribution		Sizes		
		Quantity in units	%	Length (mm)	Wides (mm)	Thick-ness (mm)
1.	Oval	37	52.11	3,4±0,1	2,9±0,1	1,8±0,2
2.	Cylindrical	10	14.10	4,1±0,05	1,9±0,2	1,9±0,2
3.	Triangular	9	12,68	3,9±0,1	1,7±0,1	1,5±0,1
4.	Round	2	2,82	3,2	3,2	1,3
5.	Pear-shaped	3	4,21	4,8	2,7	1,6
6.	Starry	3	4,21	2,9	2,4	1,2
7.	Block-shaped	2	2,82	3,6	2,7	1.4
8.	Semilunal	2	2,82	4,4	2,9	1,7
9.	Polygonal	2	2,82	3,7	3,1	1,5
10.	Reticulated	1	1,41	2,1	1,0	1,1

The pharyngeal branch of the SMN is presented by a single trunk, which bifurcates away from the node. The pharyngeal branch departs from the upper-posterior side of the node between its two roots and goes up and back. At the same time, it lies on the lateral surface of the stylohyoid muscle, and a little higher it is covered by the internal pterygoid muscle.

From one to three trunks go from the upper lateral surface of the node to the mucous membrane of the floor of the oral cavity. These trunks are directed upwards, in their course they cross the lingual nerve and reach the mucous membrane with a trunk that, moving away from the node, divides into two or three branches.

Branches to the palatine tonsil go from the upper side of the SMN in the form of thin trunks and are directed upwards and backwards. At the same time, they cross the lingual nerve from the bottom up and back from its lateral side and reach the palatine tonsil or the tissues surrounding it.

Conclusions.

Topographically, there are five positions of the SMN: middle, or typical, upper, lower, posterior, and anterior. The individual variability of the topography of the SMN is determined by the typical features of the structure of the head (skull) and face. For individuals with a brachycephalic form of the cerebral part of the head and a chameprosopic form of the face, the posterior position of the node, when it adjoins the posterior edge of the medial pterygoid muscle, is characteristic. The forward position of the node, when it is near the edge of the maxillohyoid muscle, is observed in individuals with dolichocephaly and leptoprosopia. The average position is determined in persons with a mesomorphic structure of the cerebral part of the head and a mesoprosopic shape of the face.

The variant of the external structure of the node that occurs most often is oval (52.11%). Cylindrical (14.1%) and triangular (12.68%) node shapes are much less common. The rest of the seven described (round, pear-shaped, star-shaped, block-shaped, semilunar, polygonal, reticulated) are rare and together make up 21.11% of the studied forms of the node.

The extreme types of the structure of the SMN are compact oval and diffuse (reticulated). They are characterized by a certain external form, frequency of occurrence, features of structural organization. The oval shape of the node (52.11%) is characteristic of individuals with a dolichocephalic form of the cerebral part of the head and leptoprosopia, and the mesh-like shape (1.41%) is characteristic of individuals with chameprosopia and brachycephaly.

The SMN has branched connections. Adduct roots are distinguished: tympanic-lingual and sympathetic. The tympanic-lingual roots approach the back-upper side of the node, and the sympathetic roots lie deep in the submandibular salivary gland on the branches of the facial artery. Efferent roots include the branches of the submandibular salivary gland, the lingual nerve and the sublingual vegetative node, the sublingual nerve, the palatine tonsil, the mucous membrane of the floor of the oral cavity and the oropharynx.

Prospects for further research.

The obtained data on the established topographic-anatomical features of the structure of the SMN in the elderly and senile people can be used in practical health care (neurology, maxillofacial surgery, etc.) to optimize the provision of conservative and surgical care in various pathological conditions of the specified node.

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ТИПІЗОВАНА ТОПОГРАФО-АНАТОМІЧНА ХАРАКТЕРИСТИКА БУДОВИ ПІДНИЖНЬОЩЕЛЕПНОГО ВЕГЕТАТИВНОГО ВУЗЛА У ОСІБ ПОХИЛОГО ТА СТАРЕЧОГО ВІКУ

Рожнов В. Г., Проніна О. М., Білаш С. М., Білаш В. П., Сербін С. І., Дубина С. О., Ткаченко О. Т.

Резюме. *Метою нашого дослідження* було встановлення топографії та зовнішньої будови піднижньощелепного вегетативного вузла (ПНЩВ) у осіб похилого і старечого віку.

Об'єкт і методи дослідження. Для досягнення поставленої мети ми використовували такі методи досліджень: визначення форми голови (черепа) та лиця, анатомічне препарування ПНЩВ після косметичного доступу до нього. Перед препаруванням ексцизували тканинний комплекс розмірами 7×7 см, включно з піднижньощелепною слинною залозою. Препарування вузла і його зв'язків здійснювали під бінокулярною лупою. Розміри вузла вимірювали за допомогою міліметрової лінійки. Фотографування відпрепарованих ПНЩВ здійснювалося за допомогою цифрової фотокамери.

Результати дослідження та їх обговорення. За результатами дослідження нами були визначені основні топографічні положення ПНЩВ; визначені варіанти зовнішньої будови ПНЩВ за частотою зустрічаємості та їх розміри; встановлені крайні типи будови ПНЩВ та показано при яких формах голови та лиця вони зустрічаються; уточнена топографія розгалужених зв'язків ПНЩВ – привідних корінців: барабанно-язикових, симпатичних та вивідних.

Висновки. Топографічно визначено п'ять положень ПНЩВ: середнє, або типове, верхнє, нижнє, заднє та переднє. Варіантом зовнішньої будови вузла, що зустрічається найчастіше є овальний (52,11%). Значно рідше зустрічаються циліндрична (14,1%) та трикутна (12,68%) форми вузла.

Крайніми типам будови ПНЩВ є компактний овальний та дифузний (сіткоподібний.). ПНЩВ має розгалужені зв'язки. Виділяють привідні корінці: барабанно-язикові та симпатичні. До вивідних корінців відносяться гілки ПЩЗ, язикового нерва та під'язикового вегетативного вузла, під'язикового нерва, піднебінного мигдалика, слизової оболонки дна ротової порожнини та ротоглотки.

Виявлена залежність топографоанатомічної мінливості ПНЩВ людини від форми черепа допоможе клініцистам обгрунтовувати вибір способу блокади вузла при різноманітних патологічних станах.

Ключові слова: людина, піднижньощелепний вегетативний вузол (ганглій), топографо-анатомічна будова, похилий та старечий вік.

TYPICAL TOPOGRAPHIC-ANATOMICAL CHARACTERISTICS OF THE STRUCTURE OF THE SUBMANDIBULAR VEGETATIVE NODE IN ELDERLY AND OLD PEOPLE

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Abstract. *The aim of our study* was to determine the topography and external structure of the submandibular autonomic node (SMN) in the elderly and senile people.

Object and research methods. To achieve the goal, we used the following research methods: determination of the shape of the head (skull) and face, anatomical preparation of the cranial nerve after cosmetic access to it. Before dissection, a tissue complex 7×7 cm was excised, including the submandibular salivary gland. The node and its connections were dissected under a binocular magnifying glass. The dimensions of the node were measured using a millimeter ruler. Photography of the prepared SMNs was carried out using a digital camera.

Research results and their discussion. Based on the results of the research, we determined the main topographical locations of the SMNs; determined variants of the external structure of SMNs by frequency of occurrence and their sizes; the extreme types of the structure of SMNs are established and it is shown in which forms of the head and face they occur; the topography of the branched connections of the SMNs – adductor roots: tympanic-lingual, sympathic and efferent roots has been clarified.

Conclusions. Topographically, there are five positions of the SMN: middle, or typical, upper, lower, posterior, and anterior. The variant of the external structure of the node that occurs most often is oval (52.11%). Cylindrical (14.1%) and triangular (12.68%) node shapes are much less common.

The extreme types of the structure of the SMN are compact oval and diffuse (reticulated). The SMN has branched connections. Adduct roots are distinguished: tympanic-lingual and sympathetic. Efferent roots include the branches of the submandibular salivary gland, the lingual nerve and the sublingual vegetative node, the sublingual nerve, the palatine tonsil, the mucous membrane of the floor of the oral cavity and the oropharynx.

The revealed dependence of the topographic-anatomical variability of the human SMNs on the shape of the skull will help clinicians to justify the choice of the node blockade method in various pathological conditions.

Key words: man, submandibular vegetative node (ganglion), topographic-anatomical structure, elderly and old age.

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Conflict of interest:
The authors declare no conflict of interest.

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Received 27.08.2023
Accepted 02.02.2024