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SPECIFIC FEATURES OF THE PAROTID PLEXUS

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Abstract. *Considering the high incidence of the facial nerve impairments and lack of its peripheral branches' previsualization methods, the knowledge acquired by anatomical dissection, can provide insightful data about the extracranial part of the facial nerve. The purpose of our study was to highlight the individual morphological specific features of the parotid plexus. Our study was conducted on 55 embalmed hemiheads: 39 males and 16 females – 29 left samples (21 males/8 females), and 26 right samples (18 males/8 females), on which the branching pattern, connections and variations were determined. The obtained data were statistically processed. Seven branching patterns of the facial nerve were revealed. The parotid plexus branches are subjected to a high degree of individual variability and formation of multiple intraplexual connections that should be taken into consideration, in parotid ablation and other surgical interventions.*

Keywords: *parotid plexus, facial nerve, branching pattern, connections*

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ОСОБЕННОСТИ ОКОЛОУШНОГО СПЛЕТЕНИЯ

Аннотация. *Учитывая высокую частоту поражения лицевого нерва и отсутствие методов превизуализации его периферических ветвей, знания, полученные в результате анатомической диссекции и хирургических вмешательств, имеют важное клиническое значение. Целью нашего исследования было выявить индивидуальные морфологические особенности околоушного сплетения. Исследование проведено на 55 бальзамированных препаратах: 39 мужчин и 16 женщин – 29 левых препаратов (21 мужчина/8 женщин) и 26 правых препаратов (18 мужчин/8 женщин), на которых выявлены варианты ветвления и связи околоушного сплетения, с последующей статистической обработкой полученных данных. Выявлено 7 типов ветвления ЛН. Ветви околоушного сплетения подвержены высокой степени индивидуальной изменчивости, образуя множественные связи, что следует учитывать при абляции околоушной железы и других хирургических вмешательствах.*

Ключевые слова: *околоушное сплетение, лицевой нерв, типы ветвления, связи*

Introduction. Historical development of the Homo sapiens is unimaginable without articulated speech, but the body language and especially facial expression, even in the 21st century, plays a significant role in peoples' communication. A modern man spends a lot of time, money and efforts for his education, but at the same time, people are very much concerned about their physical appearance. We believe that along with genetics, physical and psychical activity of a personality, his appearance as well depends a lot on anatomical structures and their relationships within the human body.

A wide range of exogenous and endogenous factors can cause facial nerve impairments, among which are the viral and bacterial infections, craniofacial trauma, somatic diseases and metabolic disorders, parotid tumors, inflammatory diseases of the middle ear, parotid ablation, iatrogenic injures in maxillofacial and aesthetic surgery [1, 2, 3]. The facial nerve is involved in pathology of many cranial nerves, but mainly its impairments are diagnosed in vestibular schwannomas.

Considering the impact of the facial nerve impairments on the peoples' life quality, by anatomical dissection, were highlighted the variations and individual specific features of the parotid plexus, in order to decrease the iatrogenic lesions in head and neck surgery

Material and methods. Our study was conducted at the Department of Anatomy and Clinical Anatomy of *Nicolae Testemitanu* State University of Medicine and Pharmacy of the Republic of Moldova. According to international requirements regarding research on human cadavers the project was approved by the Ethics Committee of our University. In the current study 55 adult cadaveric hemiheads were dissected. The dissection was conducted on 55 embalmed hemiheads: 39 males and 16 females, among which were 29 left hemiheads (21 males/8 females), and 26 right hemiheads (18 males/8 females). Taking into consideration that in facial surgery there is a high risk of iatrogenic lesions of the peripheral branches of the facial nerve, both anterograde and retrograde dissection were tested. In the majority of cases – (94.5%) the incision of the skin was started from the midsagittal plan of the forehead, continuing on the face around the eye, nose and lips towards the midline of the chin, and then the preparation of the skin was continued towards the retromandibular fossa, where the facial nerve trunk (FNT) was identified. In 5.5% of cases, the incision of the skin was performed in front and around the auricle towards the anterior midsagittal plan. It should be noted that in our study, preponderantly the anterograde dissection of the facial nerve was applied.

For the identification of the FNT a range of bony and soft landmarks were used. The intertragic notch, mastoid process, ramus and angle of the mandible, anterior margin of the sternocleidomastoid muscle at its point of insertion, and the bifurcation angle of the FNT were used as landmarks [1]. The obtained data were statistically analyzed via Excel "Descriptive statistics" from "Tool – Data Analysis".

Results and discussion. On its exit from the facial canal in 70.9% the facial nerve trunk divided into two primary branches the temporofacial and cervicofacial one. In 27.3% a diffuse type, characterized by tri-; quadri- and pentafurcation, was revealed. In a case (1.8%) a double trunk was highlighted (Figure 1).

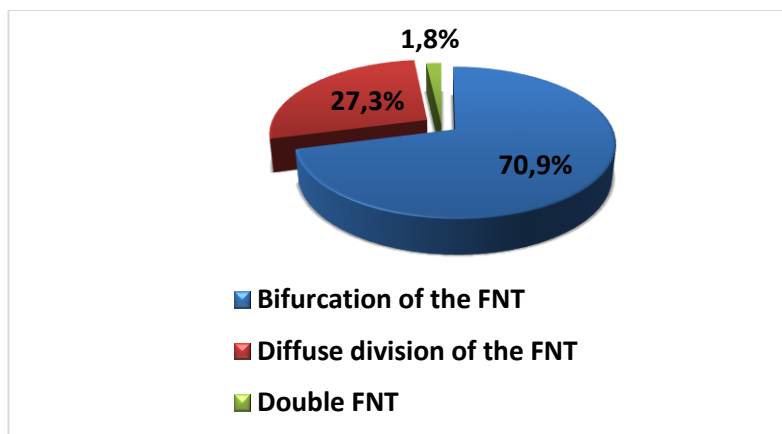


Fig.1. Primary divisions of the facial nerve trunk.

The number of secondary divisions varied from 1 to 8 branches. The highest number of PP branches was characteristic of BB, and the lowest number was revealed for TB and ZB. A case of multiple cervical branches was marked out in this study (Figure 2).

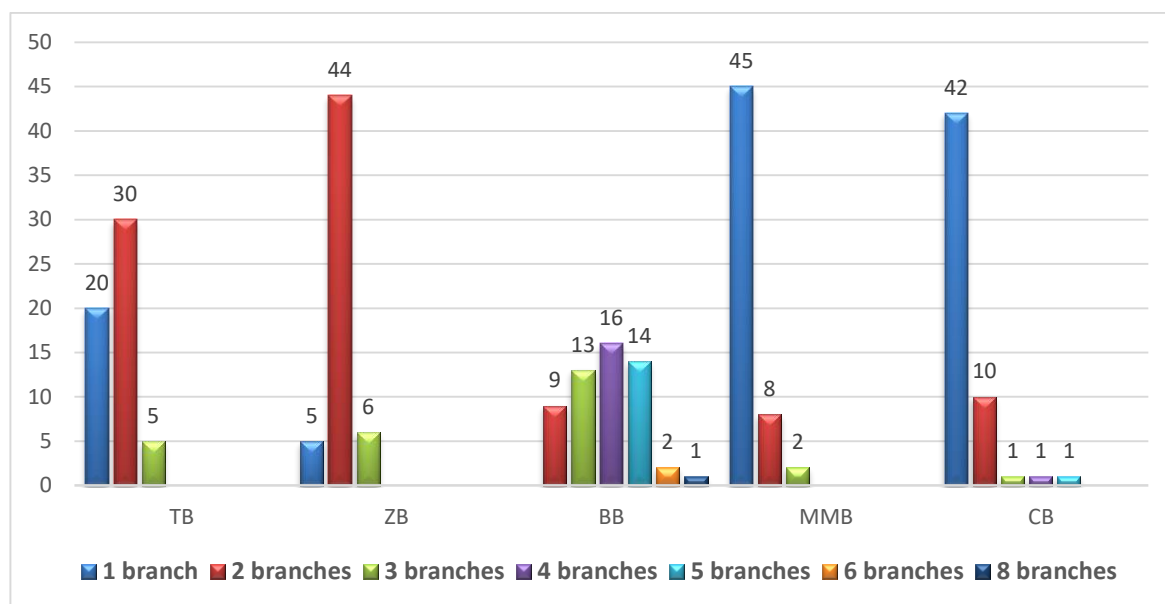


Fig.2. Numerical variation of the parotid plexus branches. TB – temporal branches, ZB – zygomatic branches, BB – buccal branches, MMB – marginal mandibular branch, CB – cervical branch.

The anatomico-topographical peculiarities of the parotid plexus increase its susceptibility to injuries in craniofacial trauma, and at the same time its variation is the main cause of iatrogenic lesions in facial surgery. According to Yokoyama et al. [2], the "facial nerve stretching during surgery has a significant serious effect on postoperative facial palsy" and removing the mastoid process in parotid ablation might be applied as a solution for functional preservation of the facial nerve. Preparation of the facial nerve on embalmed cadavers gave the investigator a possibility to experiment various ways of surgical access to the facial nerve trunk and to mark out the most suitable landmarks for easy and safety way of the facial nerve trunk identification. Considering our expertise in facial nerve dissection the most safety way for motor branches preservation was the anterograde dissection. A range of numerical variations of the facial nerve motor branches and of their connections, represented by small and wide loops, triangular, oval and plexiform connections were marked out in our study. Those connections varied both depending on gender and laterality. Individual variability was characterized by different branching patterns and very different intraplexual connections of the parotid plexus, even in the same individuals (Figure 3).

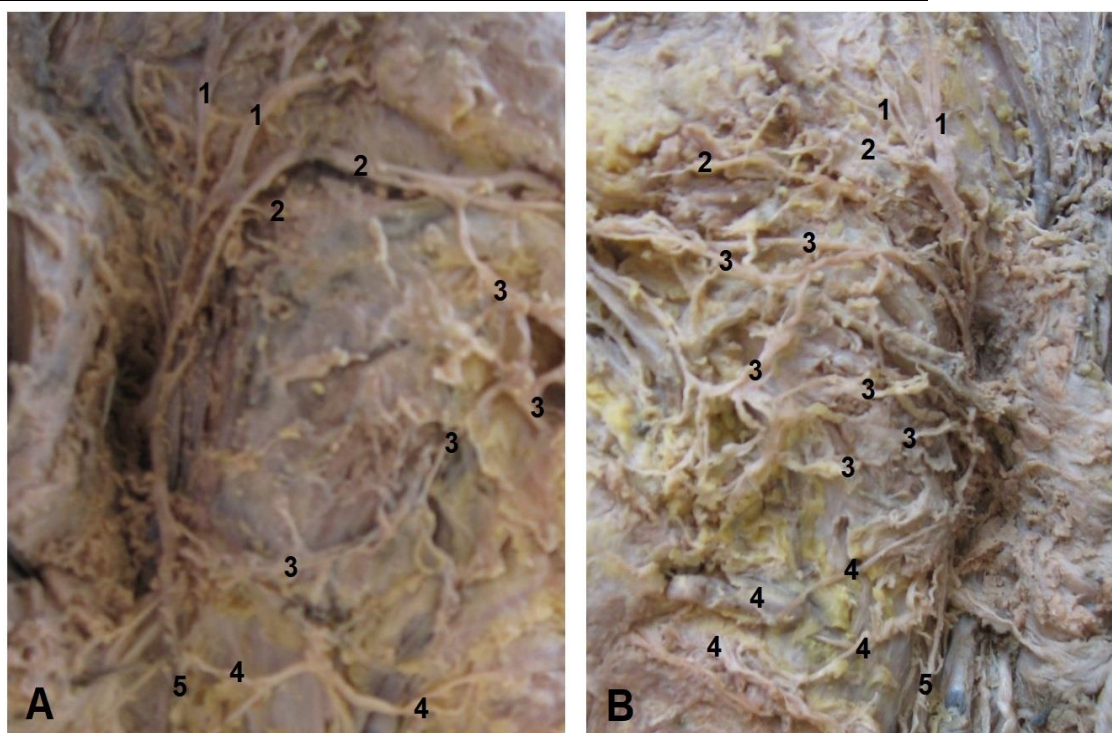


Fig. 3. Variability of the parotid plexus branching pattern and of its connections in the same individual (A – right side; B – left side).

It should be noted, that due to high range of the parotid plexus variations, there is a high risk of iatrogenic injures. Unfortunately, surgeons cannot predict the real course, divisions and connections of the facial nerve, but being aware of possible variations they can avoid, or at least decrease the risk of those injures.

In our study each classical branching pattern after Davis [4], had an atypical pattern, more or less corresponding to the classical one. The most sensitive to iatrogenic injury are the TB, RMM and CB, the last ones predominantly appearing as solitary braches [3, 4].

Considering that for some patients, the reconstructive surgery of the facial nerve is the only hope to improve their life quality, any details about variability of the facial nerve divisions, connections and topographic peculiarities might be insightful for facial surgeons.

Conclusions. The parotid plexus branches are quite variable in terms of their number and topography, and also a wide range of variable and multiple connections are characteristic of it. Considering the high level of variability of the parotid plexus branches, we would recommend the facial surgeons to use anterograde dissection of the facial nerve and to be aware of the high risk of iatrogenic injures, when using retrograde dissection.

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