

SPECIFIC FEATURES OF THE FACIAL NERVE WITHIN THE FACIAL CANAL

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The course of the facial nerve and its topography within the facial canal is well known. Nevertheless, there are undescribed anatomical peculiarities of the facial nerve along its passage through the facial canal. The purpose of our study was to highlight the peculiarities of the facial nerve within the mastoid segment of the facial canal and to determine its exit angle from the temporal bone. Among the revealed specific features of the mastoid segment of the facial nerve, worth to be mentioned that in one case, thin branches with plexiform connections between them were determined. In 92.6% of cases, the exit angle of the mastoid segment of the facial canal was obtuse, in 3.7% it was acute and in 3.7% a right angle was established.

Keywords: facial nerve, facial canal, mastoid segment, peculiarities

ОСОБЕННОСТИ ЛИЦЕВОГО НЕРВА В ПРЕДЕЛАХ ЛИЦЕВОГО КАНАЛА

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Ход лицевого нерва и его топография в пределах лицевого канала хорошо известны. Тем не менее имеются не описанные анатомические особенности лицевого нерва на пути его прохождения через лицевой канал. Целью нашего исследования было выявить особенности лицевого нерва в пределах сосцевидного сегмента лицевого канала и определить угол выхода данного сегмента из височной кости. Среди выявленных особенностей сосцевидного сегмента лицевого нерва, следует отметить, что в одном случае были выявлены тонкие ветви, отходящие от ствола нерва, связанных между собой в виде сплетений. В 92,6% случаев угол выхода сосцевидного сегмента лицевого канала из височной кости был тупым, в 3,7% – острым и в 3,7% – прямым.

Ключевые слова: лицевой нерв, лицевой канал, сосцевидный сегмент, особенности

Introduction. The specific features of the facial nerve morphology such as passage through a bony canal, superficial location of its extracranial branches, multiple variants of its branching pattern and various connections are the conditions that make this nerve very susceptible to harmful factors and injury.

The rate of injures depends a lot on morphological variation of the facial nerve trunk, that usually has a deeper location than its extracranial branches. At the same time, as reported by Babuci A. et al. (2022) [1], the course of the facial nerve trunk on the premandibular segment of the facial nerve is variable, and knowledge about its variants is of high clinical significance in order to avoid the facial nerve injures.

The course of the facial nerve may depend on its exit angle from the mastoid segment of the facial canal and on the diameters of the stylomastoid foramen that are variable [2].

The aim of study. The purpose of our study was to reveal the specific features of the facial nerve within the mastoid segment of the facial canal and to determine the exit angle of that segment from the temporal bone.

Material and methods. The intratemporal course of the facial nerve was studied on a series of cases (5 adults, 8 fetuses and 5 newborn formalized samples) at the Department of anatomy and clinical anatomy of Nicolae Testemitanu State University of Medicine and Pharmacy of the Republic of Moldova. By anatomical dissection, each segment of the facial nerve within the *Fallopian* canal was thoroughly examined. The mastoid segment of the facial canal was studied additionally on 81 temporal bones and on 5 of that bones the facial canal was opened by a sagittal cross-section. The anatomical samples of those 5 opened canals were compared with 5 high resolution computed tomography images, taken from a private clinic medical records, with an informed patient consent. The course of the facial nerve was outlined on both anatomical samples and computed tomography slides in order to examine the relationships of the facial nerve within the *Fallopian* canal.

Results and discussion. According to our previous results [2], the course of the mastoid segment of the facial canal was variable and its exit angle varied from an acute to an obtuse one. The mastoid segment appeared enlarged both on the bone samples and on the computed tomography images (Figure 1).

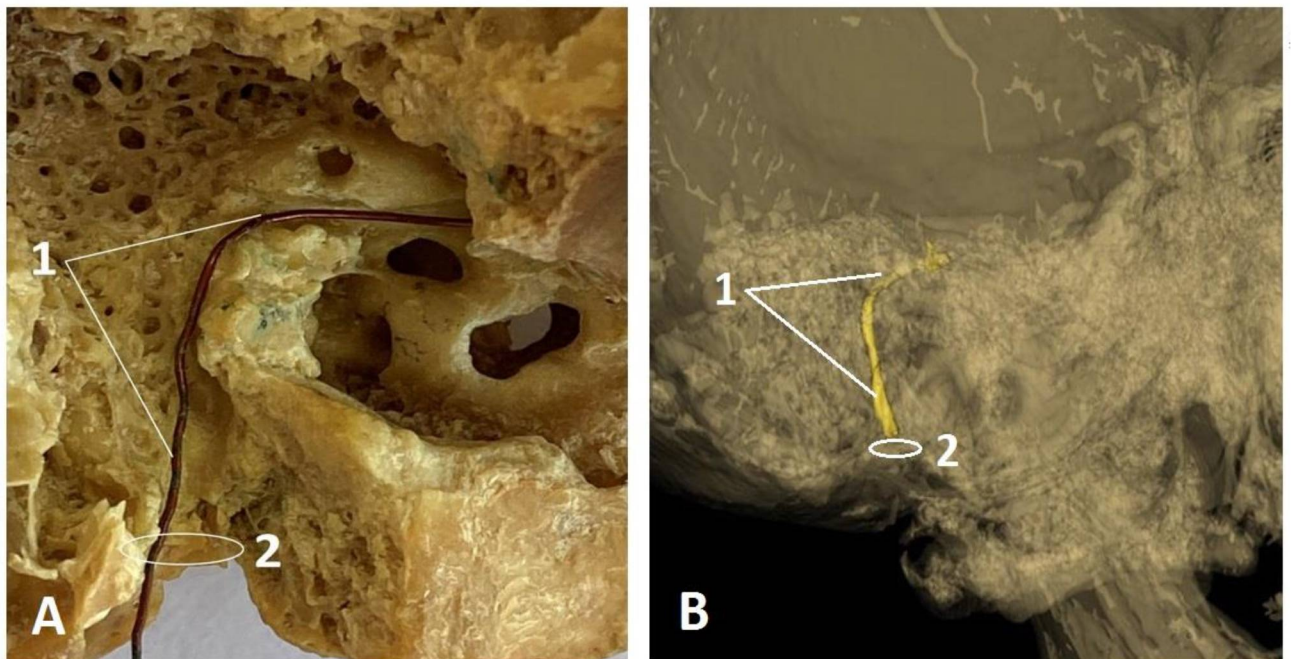


Figure 1. The intratemporal course of the facial canal and facial nerve.
A – cross-section through the temporal bone; B – high resolution computed tomography on alive person. 1 – facial nerve; 2 – stylomastoid foramen

On the dissected temporal bones, the mastoid segment of the facial canal was the widest one, and its exit angle reported to the posterior margin of the stylomastoid foramen was obtuse in three cases of the five dissected bones (Figure 1. A).

The course of the mastoid segment of the facial canal on a high resolution computed tomography and its exit angle were acute in all the examined patients (Figure 1. B).

On the intact temporal bones the mean value of the mastoid segment exit angle was $113.2 \pm 21.41^\circ$, with a variation from 84° to 168° , $p=0.967$. The data of the right and left mastoid segments exit angles are given in table 1.

Table 1.
The exit angle from the temporal bone of the mastoid segment

Variable's parameters	Right bones	Left bones
Mean value \pm SD	$113.3 \pm 23.16^\circ$	$113.1 \pm 19.76^\circ$
Maximal value	168°	160°
Minimal value	84°	90°

In newborns, all the segments of the facial nerve and of its canal were well distinguished (Figure 2. A), and the trajectory of the facial nerve within *Fallopian* canal had many similarities with the course of the facial nerve in adults (Figure 2. B).

The mastoid segment of the facial canal was relatively wider in the newborns and the space between its walls and the facial nerve was obviously distinguished (Figure 2. A).

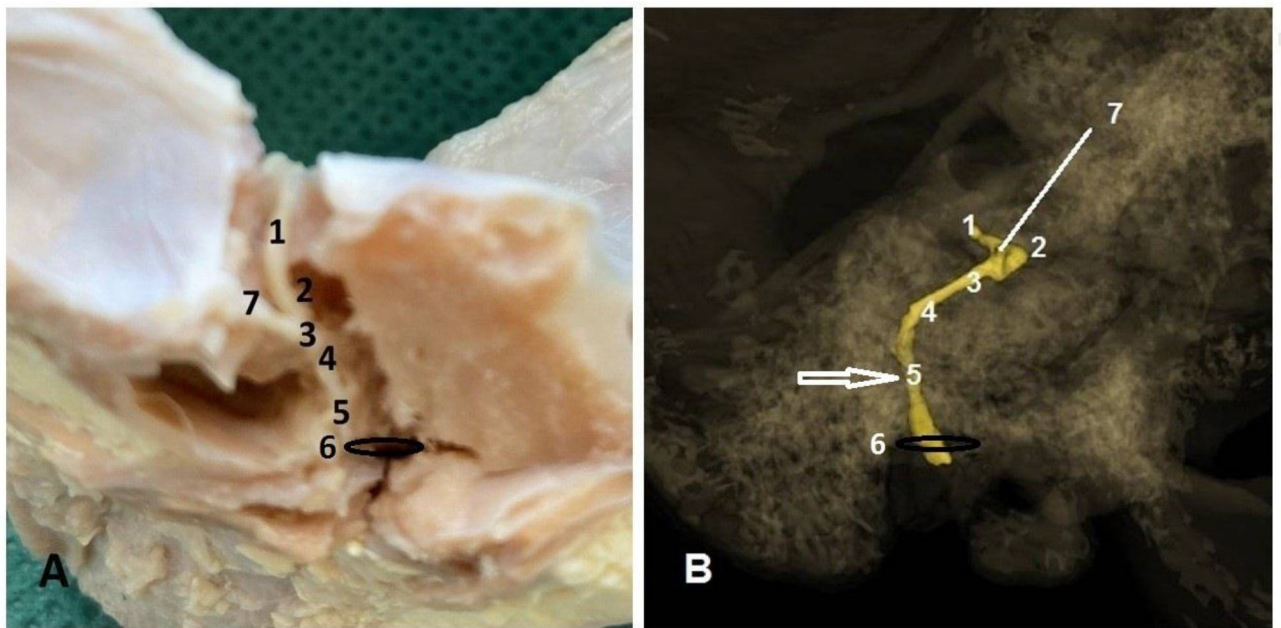


Figure 2. The course of the facial nerve within the facial canal.
A – intratemporal course of the facial nerve in a newborn; B – high resolution computed tomography of an adult. 1 – mental segment of the facial nerve;

2 – knee of the facial nerve; 3 – labyrinthine segment; 4 – tympanic segment;
5 – mastoid segment; 6 – stylomastoid foramen; 7 – greater petrosal nerve.

In one patient on the computed tomography image a narrowing of the mastoid segment of the facial nerve was highlighted (Figure 2. B).

Another individual peculiarity was established in a dissected facial canal of an adult hemihead, in which a few branches that derived from the facial nerve trunk and a few connections between those branches were present (Figure 3. A).

In the majority of the dissected facial canals, the mastoid segment of the facial nerve was the widest one without branching (Figure 3. B).

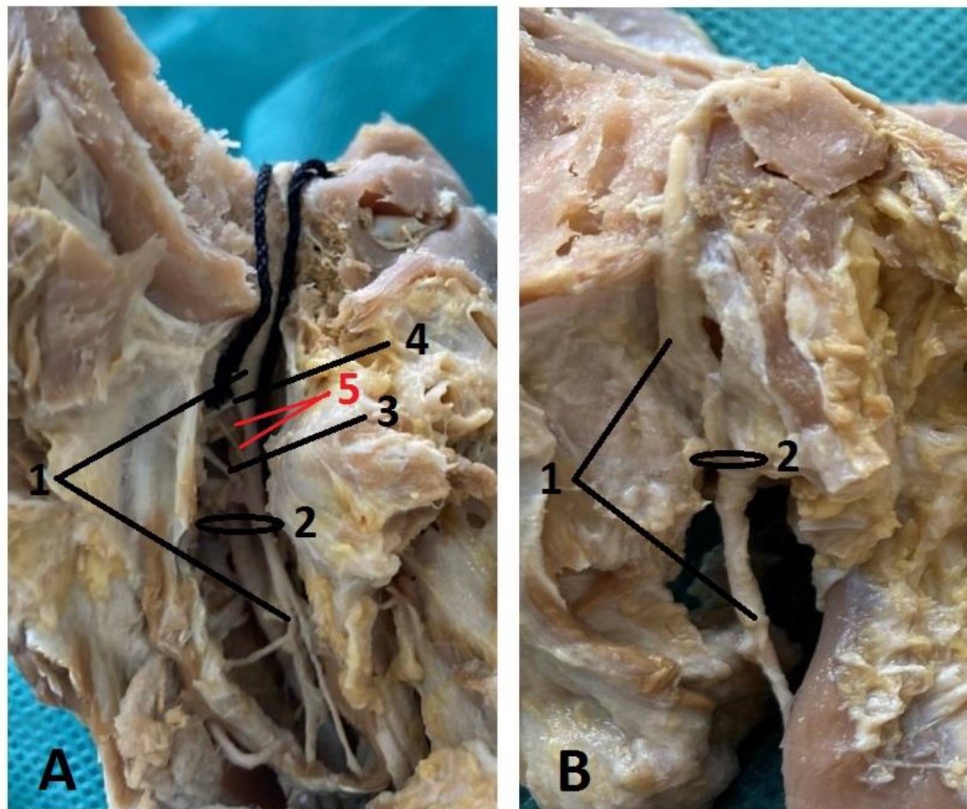


Figure 3. The mastoid segment of the facial nerve in adults. A – intramastoid branching and connections of the facial nerve; B – the facial nerve trunk without branches and connections. 1 – facial nerve; 2 – stylomastoid foramen; 3 – chorda tympani; 4 – nerve to stapedius muscle; 5 – intramastoid branching and connections of the facial nerve

Using computed tomography Merati M. et al. (2021) [3], carried out a study on the mastoid segment of the facial nerve and as a result, a range of variations of the angle between the mastoid segment and the inferior wall of the external acoustic meatus were established.

According to Celik O. et al. (2017) [4], the mean value of the facial canal diameter in the labyrinthine segment was 1.23 mm, in the tympanic segment – 1.39 mm, in the mastoid segment – 1.61 mm, and the largest diameter, with a mean of 2.66 mm, was characteristic for its outlet orifice.

The variability of the longitudinal and transverse diameters of the stylomastoid foramen depending on the body side, with a statistically significant difference for both diameters ($p < 0.05$), was established by Ashkar L. Y. et al. (2023) [2].

Conclusions

1. The intratemporal course of the mastoid segment of the facial nerve in the newborn mainly was similar to that of an adult.
2. In 92.6% of the examined temporal bones, the exit angle of the mastoid segment of the facial canal was obtuse.
3. In some individuals may be present narrowing of the facial nerve trunk, or additional branches and connections of the facial nerve within the mastoid segment.
4. Taking into consideration the emphasized peculiarities, ahead of surgery, a precautionous and meticulous examination of the mastoid segment of the facial nerve should be taken.

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