PTERYGOMAXILLARY REGION – ANATOMOTOPOGRAPHIC PARTICULARITIES

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Keywords:

anatomotopography, pterygomaxillary region, inferior alveolar nerve, maxillary artery, lingual nerve **Abstract:** The pterygomaxilary region represents one of the most difficult-to-approach territories, from the anatomical and surgical point of view, due to the crowded relations between the vascular and nervous elements. Many of the regions' anatomical elements can present anatomical variations, with all sorts of tracts and ramifications. This situation will lead to a variety of topographic relations between the nervous and vascular formations of the region.

Cuvinte cheie: anatomotopografie, regiune, pterigomaxilară, nerv alveolar inferior, arteră maxilară, nerv lingual

Rezumat: Regiunea pterigomaxilară reprezintă unul dintre cele mai dificil de abordat teritorii "anatomice și chirurgicale" ale capului, datorită prezenței numeroaselor formațiuni vasculo-nervoase cu raporturi topografice "înghesuite". Mare parte din elementele anatomice ale regiunii pot prezenta variante anatomice, cu traiect și ramificații diferite. Acest fapt va avea ca rezultat modificarea raporturilor topografice ale vaselor și nervilor de la acest nivel. Această situație va conduce la o varietate de raporturi topografice între formațiunile vasculo-nervoase ale regiunii.

INTRODUCTION

The pterygomaxillary region boasts multiple denominations: the deep region of the face, the pterygoid region, the infratemporal region, the zygomatic fossa, the infratemporal fossa. Its location is in the postero-external part of the face, between the exobasis, the maseterine regions, the parotidian region and the pterygopalatine fossa.(13)

The bony infratemporal fossa is bordered by four walls: a lateral wall comprised of the temporal facet of the cheek bone and the internal facet of the mandibular branch; a front wall represented by the infratemporal fossa of the maxilla; a medial wall comprised of the lateral blade of the pterygoid process of the sphenoid bone and the pterygomaxillary fissure and, ultimately, a superior wall formed by the infratemporal facet of the sphenoid bone and the zygomatic hole. The pterygomaxillary region features bone communications with the middle cranial fossa, the pterygopalatine fossa, the mandibulary canal, the maseterine lodge through the mandibulary ditch and with the temporal lodge through the zygomatic hole.

The infratemporal fossa shows a particularly rich and important content, comprising muscular, vascular and nervous elements. From the plethora of muscles present here, mention must be made of the lateral and medial pterygoid muscles, together with the pterygoid fascia. The vascular elements from the infratemporal fossa are very complex, by far the most important being the maxillary artery and its branches, disposed in sections, so that the mandibulary section comprises the anterior artery of the eardrum, the deep auricular artery, the middle meningeal artery and the inferior alveolary artery; the pterygoid section features the pterygoid branches and the deep posterior and anterior temporal branches; the terminal maxillary section gives birth to the buccal and maseteric arteries. The veins collect the sanguine flow of the maxillarv pterygomaxillary region and are composed of a pterygoid plexus

and a superior alveolar plexus. As for the nervous formations of the infratemporal fossa, there are the otic ganglion, the chord of the eardrum and the mandibulary nerve, which gives birth to the buccal nerve, the deep temporal nerves, the masteric nerve, the lateral and medial pterygoid nerves, the auriculotemporal nerve, the lingual nerve and the inferior alveolary nerve.(13)

The pterygoid muscles and the interpterygoid fascia divide the infratemporal fossa in two interstitial spaces. The pterygomandibulary space comprises the pterygoid section of the maxillary artery, the maxillary veins and part of the pterygoid plexus, the inferior alveolar artery, the veins and arteries of the muscles of the jaw, the buccal artery and its homonymous veins, the inferior alveolar nerve, the buccal nerve, the deep temporal nerves and the maseteric nerve. The second interstitial space is the interpterygoid space, located deeper and above the aforementioned. It comprises the mandibulary nerve, the otic ganglion, the middle meningeal artery and the pterygoid plexus section located on the bony platform of the cranial exobasis, together with the venous plexus of foramen ovale.(13)

Local anesthesia can result in neurological complications, which clinicians consider utterly important, perhaps due to the fact that the pterygomaxillary region is located very profoundly.(16) The treatment of neurological complications occurring at this level is till a controversial factor, whereas the evolution of these patients cannot be accurately estimated.(18)

A recent study emphasizes that supraomohyoid neck dissection for oral squamous cell carcinoma is an appropriate treatment if metastases are present at this level.(15)

The more the knowledge regarding topographical relations between the elements of the infratemporal region, the lingual nerve and inferior alveolary nerve, the buccal nerve and the dental arches is, the better the surgeon is able to avoid

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unexpected complications, according to a study published in 2008.(17)

This is a valuable study, for both doctors and students, aiming to do extensive research in the neural and vascular formations of the human head. At the same time, it is able to display how minute variations in the trajectories of such elements may influence and change the surgical procedures, in case of pathology at this level.

PURPOSE

The purpose of the current research is to sensitize both young and experienced practitioners about the complexity of the human body and to prove how a few, small anatomical elements can have a big impact in daily practice.

METHODS

The current study involves a number of seven human bodies on which I have researched the topographical relations between the vascular and nervous elements of the infratemporal fossa in addition to measurements that I took between the anatomical marks, as they are widely used in today's medical practice, and the anatomical elements of the pterygomaxillary region. The bodies were prepared in solutions containing formaldehyde, alcohol, water, glycerine, phenol, substances whose aim is to preserve and keep the anatomical elements in good condition, for proper studying and dissection.

Known for its profound situation, the pterygomaxillary region could be dissected after the careful examination of the regions covering it. Furthermore, I have initially defined, on the respective didactic material, the superficial anatomo-topographic areas of the head and neck. The delimitation was done by using an eyeliner pencil, followed by incisions on the skin and dissection.

RESULTS AND DISCUSSIONS

During the dissection, I highlighted the topographic relations between the nerves and vessels of the above-mentioned topic, at the same time observing their particular anatomical varieties.





- 1. External carotid;
- 2. Superficial temporal artery;
- 3. Maxillary artery;
- 4. Meningeal middle artery;
- 5. Anastomotic branch;
- 6. Auriculotemporal nerve;
- 7. Buccal nerve;
- 8. Posterior deep temporal artery;
- 9. Anterior deep temporal artery;
- 10. Masseteric artery;
- 11. Spheno-palatine;
- 12. Lingual nerve;
- 13. Buccal;

- 14. Inferior alveolar;
- 15. Alveolar.

In the case of the first subject, I noticed the inferior alveolar nerve was the most sizeable terminal branch of the trigeminal nerve, right between the two pterygoidian muscles. Behind and lateral to it, relations with the lingual nerve were also marked out, criss-crossing the maxillary artery and the eardrum's chord.

A particular case was represented by the inferior alveolar nerve of the second body, which apparently gets born from two separate roots, both laterally from the maxillary artery.

Particular to the third subject was that the inferior alveolar nerve had been noticed to feature anterior relations with the inferior alveolar artery, close to the mandible hole. It was initially located in front of the artery and then above it.

As for the fourth subject, the inferior alveolar artery is accompanied by a branch from the inferior alveolar nerve, which attaches to the artery right after its emerging point from the maxillary artery.

The fifth didactic material featured an inferior alveolar nerve sporting anastomotic branches with the lingual nerve, while the case of the sixth body was highlighted by an anastomosis with the eardrum's chord nerve.

The lingual nerve, in the seventh situation, was the biggest branch born from the mandibulary nerve.

In the cases of two subjects, the lingual nerve also gives birth to branches which innervate the internal pterygoid muscle. In both the cases, the lingual and the inferior alveolar nerves were found internally in comparison with the maxillary artery.

The inferior alveolar nerve, in all cases, had featured a winding trajectory, before entering the mandibular hole.

To be able to shape up a morphometric study of the inferior alveolar nerve and the lingual nerve, I have considered the following parameters:

A – the distance between the nerve and the front margin of the mandibular branch corresponding to a horizontal plane 1 centimetre superior to the ocluzal plane of the inferior molars;

B – the distance between he nerve and the front margin of the mandibular branch, at the same level with a plane located 1.5 cm superiorly the ocluzal plane of the inferior molars;

C – the distance between the nerve and the temporal crest, at the same level with a plane parallel to the ocluzal plane located 1 cm superiorly to the inferior oclusal plane;

D – the distance between the nerve and the temporal crest at the level of a plane paralel to the oclusal plane located at 1.5 cm superiorly to te inferior ocluzal plane;

E – the distance between the inferior margin of the mandibular branch, at the same level with a vertical plane located at 1.5 cm anterior to the posterior margin of the mandible;

F – on a horizontal plane, the distance between the nerve and half the distance between the long root of the zigoma and the mandibular angle;

 $G\,-$ the distance between the inferior alveolar nerve and the lingual nerve, 1 centimetre superiorly to the ocluzal plane of the inferior molars.

| Table no. 1. Morphometric study | parameters in cm |
|---------------------------------|------------------|
|---------------------------------|------------------|

| No. | N. | А | В | С | D | E | F | G |
|-----|-----------|-----|-----|-----|-----|-----|-----|-----|
| 1 | Inf. Alv. | 1,7 | 2,5 | 1,4 | 1,9 | 1,9 | 1,4 | 1,6 |
| | Ling. | 0,8 | 0,4 | 0,6 | 2,6 | 0,6 | 1,7 | |

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| 2 | Inf Alv | 16 | 22 | 1.2 | 1.0 | 2.2 | 12 | 15 |
|----------|------------|-----|-----|-----|-----|-----|-----|-----|
| <u> </u> | IIII. AIV. | 1,0 | 2,5 | 1,2 | 1,9 | 2,2 | 1,5 | 1,3 |
| | Ling. | 1,7 | 0,9 | 1,4 | 3,1 | 1,2 | 2 | |
| 3 | Inf. Alv. | 1,9 | 2,5 | 1,4 | 2 | 2,1 | 1,3 | 1,3 |
| | Ling. | 1,9 | 0,9 | 1,4 | 2,9 | 1,1 | 1,9 | |
| 4 | Inf. Alv. | 1,4 | 2,1 | 1,1 | 1,7 | 1,8 | 1,1 | 1,2 |
| | Ling. | 1,1 | 0,6 | 0,9 | 2,4 | 0,8 | 1,4 | |
| 5 | Inf. Alv. | 1,7 | 2,6 | 1,3 | 2 | 2 | 1,3 | 1,2 |
| | Ling. | 1,4 | 0,9 | 1,2 | 2,7 | 1,4 | 1,9 | |
| 6 | Inf. Alv. | 1,7 | 2,5 | 1,4 | 1,8 | 2,1 | 1,6 | 1,5 |
| | Ling. | 1,7 | 0,7 | 1,5 | 2,9 | 1,1 | 1,8 | |
| 7 | Inf. Alv. | 1,5 | 2,2 | 1,4 | 1,7 | 1,9 | 1,3 | 1,5 |

CONCLUSIONS

- 1. In one of the cases, medially of the lateral pterygoid muscle, Ifound, in the following order, the maxillary artery, the lingual nerve and the inferior alveolary nerve.
- 2. The inferior alveolar nerve can be the most voluminous terminal branch of the trigeminal nerve, while being located between the two pterygoid muscles.
- 3. The inferior alveolar nerve can get born from two roots. In one of the cases that I have studied, they were located behind and in front of the lingual nerve.
- 4. The eardrum's chord nerve is connected, in all cases to the lingual nerve. Furthermore, it may present an anastomotic branch with the inferior alveolar nerve, as one of the cases had shown.
- 5. I one of the bodies, the auriculo-temporal nerve was born from a single root found behind the meningeal middle artery.
- 6. The pterigomeningeal artery, in one case, was born from a common trunk with the inferior alveolary artery.
- 7. In 43% of the cases, the maxillary artery has had a deep situation, in relation with the lingual and alveolar nerves, either laterally or medially. I have not though noticed any situations in which the inferior alveolar nerve and the lingual nerve cover the maxillary artery.
- 8. The deep situation of the infratemporal region, the richness of vascular and neural elements at this level, the relatively high number of anatomical varieties, make this region pretty difficult in medical approach.
- 9. The inferior alveolar nerve features, in some cases, communicating branches with the lingual nerve, while the mylohoyd nerve can give birth to small branches innervating the wisdom tooth on the lower dental arch.
- 10. Our morphometric results do not differ significantly to the data found in literature, highlighting the topographical relations between the nerves of the infratemporal region and the marks used to locate them.

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