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COMPARATIVE ANATOMY

An unusual course and entrapment of the lingual nerve in the infratemporal fossa

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Abstract: The infratemporal fossa is one of the most difficult regions of skull base to access surgically. The presence of the ossified pterygospinous and pterygoalar ligaments makes it more critical and difficult to access, with an occasional entrapment of structures like the mandibular nerve (MN) and its branches. During a routine dissection of an adult male cadaver, an unusual course of the lingual nerve (LN) was found with an entrapment of the nerve between the ossified pterygospinous ligament and the medial pterygoid muscle. Furthermore, all the three branches of the posterior division of the mandibular nerve communicated with each other by two anastomosing branches. The clinical significance of the present variations has been discussed *(Fig. 1, Ref. 23)*. Full Text (Free, PDF) *www.bmj.sk*.
Key words: pterygospinous ligament, lingual nerve, entrapment, nerve communication, clinical significance.

The infratemporal region is situated below the middle cranial fossa of the skull and intervenes between the pharynx and ramus of the mandible. The region contains the pterygoid muscles, pterygoid venous plexus, maxillary artery, MN, and its branches. Pterygospinous bony bridge and pterygospinous foramen are the occasional findings in this region (1). The exposition of the variations in this region is highly difficult due to limited area of work (2).

Complete and incomplete Pterygospinous and Pterygoalar bony bridges and foramen have been reported in the literature (3–10). Nerve entrapment caused by the pterygospinous and pterygoalar ligaments has been reported (5, 9, 11). The communication between the branches of the LN, inferior alveolar nerve (IAN) and auriculo-temporal nerve (ATN) has been reported in literature (2, 5, 12–16). In the present case, the LN ran below the ossified pterygospinous ligament and had a connection with the IAN. The IAN had a connection with the ATN, too. The clinical and anthropological significance of the present variation is discussed.

Case report

During a routine dissection of a 54-year-old male cadaver, after the resection of the ramus of mandible, zygomatic arch,

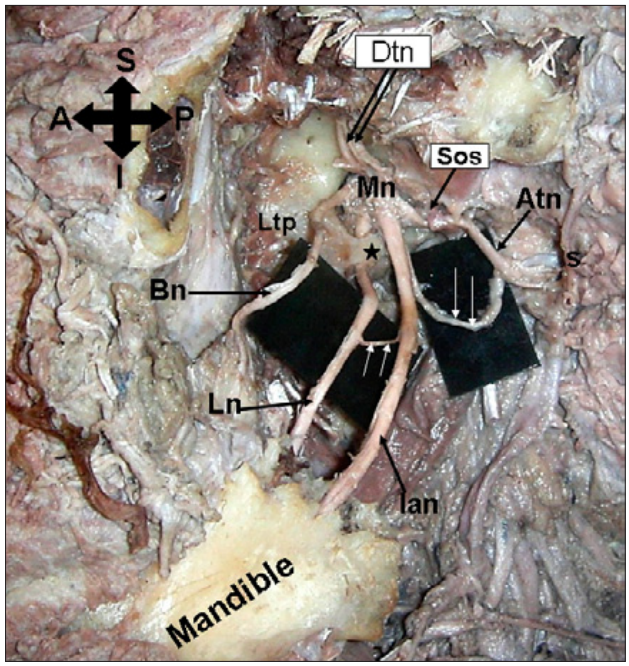

Fig. 1. Lateral View of the left infratemporal fossa after resection of ramus of mandible, the zygomatic arch, lateral pterygoid muscle and branches of maxillary artery. Note the communication between inferior alveolar nerve and auriculo-temporal nerve (vertical downward arrows), communication between inferior alveolar nerve and lingual nerve (vertical upward arrows) and the lingual nerve was coming out below the Pterygospinous bar (asterisk). Atn – Auriculo temporal nerve; Bn – Buccal nerve; Dtn – Deep temporal nerves; Ian – Inferior alveolar nerve; Ltp – Lateral pterygoid plate; Ln – Lingual nerve; Mn – Mandibular nerve; S – Superficial temporal artery; Sos – Spine of sphenoid.

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lateral pterygoid muscle and branches of maxillary artery, we observed an ossified pterygospinous ligament in the left infratemporal fossa. The LN ran between the ossified ligament and medial pterygoid muscle and seems to be compressed between them; moreover, the LN had a distal communication with the IAN, and the latter with ATN (Fig. 1). The nerve mobility was severely affected by these communications. The width of the Pterygospinous bar was 4.5 mm and the length (antero-posterior) was 11 mm. The infratemporal fossa on the right side didn't show such variation.

Discussion

The cranial base is not only a region for the insertion of masticatory muscles, neck muscles, and related fascial structures, but also for its foramina which provide the means by which vessels and nerves enter or leave the cranial cavity. There are many osseous variations that are important not only in anatomy and anthropology, but also in clinical practice (3, 17). The pterygospinous ligament formed by the pterygoid fascia, which runs between the spine of the sphenoid and the lateral pterygoid plate. Ossification of the pterygospinous ligament forms a bony bridge (Civinini's bar) that connects the spine of the sphenoid with the inferior surface of the greater wing, to create the pterygospinous foramen (Civinini's foramen), medial to the foramen ovale (1, 3, 5, 17).

Peker et al (2002) found the pterygospinous osseous bridges in 5.5 % of Anatolian dry skulls. In addition to this, they found a nerve entrapped in the pterygoalar ligament on the left side of a cadaver. The course of the MN branches was obviously affected by the ligament (9). Peuker et al (2001) described the LN entrapment due to the ossified pterygospinous ligament that might lead to lingual numbness and pain associated with the speech impairment. They suggested that the mobility of the nerve was restricted by a distal connection with the IAN and LN. They also showed that it was accompanied by an anatomical variation of the ATN involving the latter looping around the maxillary and the middle meningeal arteries (5). During contractions of the pterygoid muscles, in cases of the extremely large lateral laminae, the MN fixed between the oval and mandibular foramina cannot avoid tension and compression. The result is a possible pain, especially during chewing, which may finally create a trigeminal neuralgia. Similar symptoms could be provoked by the foramina pterygospinale, replacing the foramen ovale (18). Variable ossified structures at the posterior border of lateral pterygoid plate should be kept in mind while applying conductive anaesthesia on the mandibular nerve using the lateral subzygomatic route (19).

The pterygospinous bony bar and foramen is particularly important due to its phylogenetic and clinical significance. In lemurs, the pterygospinous bony bar passes medial to the foramen ovale. On the other hand, in the typical pithecoid condition, the pterygospinous bar is complete and it passes lateral to the foramen ovale. In man and the anthropoids, the pterygospinous bar is usually incomplete. When it is present in a varying degree of completion, it gives rise to foramen pterygospinous (20). The existence of a wide pterygospinous bar was noted in all skulls of herbivora, rodentia, carnivore, and old world monkeys, but never in those of the new world monkeys. It is likely that, in human, this pterygospinous bar represents a phylogenetic remnant (21). In radiology, calcification and ossification of the pterygospinous ligament may appear as a bifurcated ovale foramen in the axial projection of the skull and this ossification may impede the anesthesia of the trigeminal ganglion (22).

Kim et al (2004) mentioned an interesting case of a nerve communication. IAN was divided into two branches, and the posterior branch was partially entrapped by the lateral pterygoid muscle. In addition, a communication between the ATN and the IAN, and a communication between the IAN and the LN was observed. According to them, the distribution and communication pattern of the LN, are useful in clinical applications and surgical procedures (16). Gulekon et al (2005) described a connecting nerve branch between the ATN and IAN in four specimens (14). Clinically, the ATN, due to its relations with the adjacent structures, is a highly significant nerve structure. Variations in the anatomy of the ATN are of great importance in the regional anesthesia applications to the ATN and the temporomandibular joint (11, 23).

The failures in surgical interventions and applications of an anesthetic agent, despite adhering to the routine procedures, may be due to the nerve communication that occasionally exists between the posterior divisions of the MN. In the presented variation, not only the area supplied by the LN will be affected but also the mobility of the three nerves will be markedly restricted due to their distal communication and the symptoms may aggravate during the contraction of the pterygoid muscles. The presented variation may add some knowledge to the cranial base anatomy and in understanding the complex clinical neuralgias affecting this region.

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