THE MANDIBULAR NERVE, ITS COURSE, ANATOMICAL VARIATIONS AND PTERYGOMANDIBULAR SPACE. - A SYSTEMATIC REVIEW.

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ABSTRACT Knowledge of mandibular nerve and its branches is important when performing dental and surgical procedures of mandible. So, this systematic review article revealed all details of mandibular nerve course and also important anatomical variations. Mandibular nerve during its course go through the pterygomandibular space and this space is important for inferior alveolar nerve block anaesthesia, so all details of pterygomandibular structure are also included in this review.

KEYWORDS : Mandibular Nerve, Pterygomandibular Space, Inferior Alveolar Nerve, Trigeminal Nerve, Trigeminal Ganglion.

INTRODUCTION

The trigeminal nerve (TN) exits the brain on the lateral surface of pons, entering the trigeminal ganglion (TGG) after few millimeters, followed by an extensive series of divisions¹. Mandibular nerve (MN) is the largest of the three divisions of trigeminal nerve. MN also contains motor or efferent fibers to innervate the muscles that are attached to mandible. Most of these fibers travel directly to their target tissues. Some sensory axons enter the mandible to innervate the teeth and emerge from the mental foramen to innervate the skin of the lower jaw¹.

Anatomy

Largest branch of trigeminal nerve is mandibular nerve. It leaves the skull through the foramen ovale (FO) and enters the infratemporal fossa (ITF) and medial to the lateral pterygoid (LPt); it divides into a smaller anterior trunk and a larger posterior trunk. The anterior trunk passes between the roof of infratemporal fossa and the lateral pterygoid and the posterior trunk descends medially to the lateral pterygoid which might entrap the nerve¹.

Near the cavernous sinus three divisions of trigeminal nerve emerge from the convexity directed antero-laterally of ganglion. Ophthalmic division and maxillary divisions are sensory and mandibular division is mixed. Small motor root of trigeminal nerve is attached to pons. It passes under the ganglion and joins the mandibular nerve at the foramen ovale².

Pons is a part of hind brain and brain stem. Trigeminal ganglion lies on the trigeminal impression on the anterior surface of the petrous temporal bone near its apex. It occupies a special space of dura mater, called the trigeminal or Meckel's cave which is recess of duramater present in relation to the attached margin of the tentorium². The trigeminal cave extends from the posterior cranial fossa into posteromedial portion of the middle cranial fossa at the skull base³.

The main nerve trunk MN gives two branches, namely (a) the nerve to medial pterygoid muscle (Motor) and (b) a meningeal branch (Sensory) which goes back to the cranium through foramen spinosum; this branch is also called as nervous spinosus⁴. Nerve to medial pterygoid supplies the medial pterygoid muscle. This nerve gives a branch which supplies the tensor veli palatini, and tensor tympani muscle. Meningeal branch enters the skull with the middle meningeal artery and supplies the duramater of middle cranial fossa².

The anterior division of mandibular nerve (Mixed) has mainly motor branches and motor nerves of this division comprise the nerve to temporalis muscle, nerve to lateral pterygoid muscle and nerve to masseter muscle. The buccal nerve is the sensory branch of the anterior division (also known as the long buccal nerve and buccinators nerve). The buccal nerve does not supply the buccinators muscle, but this muscle gets its innervations from facial nerve⁵. It emerges from beneath the temporo-buccinator band (part of fascia) on to the lateral surface of the buccinator muscle adjacent to the retromolar triangle,

and this site is generally used for buccal nerve block⁵.

Deep temporal nerves usually are two nerves, anterior and posterior. They pass between the skull and the LPt, and enter the deep surface of temporalis².

The nerve to LPt enters the deep surface of the muscle and may arise separately from the anterior division or with the buccal nerve¹.

The masseteric nerve passes laterally above the LPt, on the skull base, anterior to the temporomandibular joint (TMJ) and posterior to the tendon of the temporalis; it crosses the posterior part of mandibular coronoid notch with the masseteric artery, ramifies on, and enters the deep surface of masseter¹. It also supplies TMJ².

The posterior division (Mixed) of MN is mainly sensory. The branches of posterior division are the lingual nerve (LN), inferior alveolar nerve (IAN) and auriculotemporal nerve (ATN).

The ATN usually has 2 roots, arising from the posterior division of mandibular nerve. It then runs laterally behind the TMJ to emerge deep in the upper part of parotid gland. The nerve carries somatosensory and secretomotor fibres of the mandibular nerve and glossopharyngeal nerve (GPhN)¹. It also supplies the TMJ.

The inferior alveolar nerve normally descends medial to the LPt. In mandibular canal it runs downwards and forwards, generally below the apices of the teeth until below the first and second premolars where it divides into the terminal incisive and mental branches⁶. When the motor component of the nerve leaves for its final destination, the sensory fibres reunite⁷.

Mylohyoid nerve continues its course forward on the lower surface of the mylohyoid muscle and enter the mandible through small foramina on either side of the midline. In some individuals, it is thought to contribute to the innervation of central incisors and periodontal ligament⁸.

The LN is the smallest sensory branch of the posterior trunk of the MN. Below the foramen ovale, it is united closely with inferior alveolar nerve. Separating from the inferior alveolar nerve, usually 5-10mm below the cranial base, it begins its course from the ITF near the otic ganglion⁹. LN runs between the tensor veli palatini and the LPt where it is joined by the chorda tympani (CT) (branch of the facial nerve)¹⁰. The CT carrying taste fibres for the anterior two-thirds of tongue and parasympathetic fibres to the submandibular and sublingual salivary glands¹¹. Farther anteriorly, the lingual nerve lies close to the posterior part of the sublingual gland and then medially spiraling under the submandibular duct and divides into a variable number of branches, entering the substance of the tongue. The nerve lays on first styloglossus and then on the lateral surface of the hyoglossus and genioglossus, before dividing into terminal branches which supply the overlying lingual mucosa¹². The lingual nerve supplies general

sensation from the mucosa of the floor of the mouth, the lingual gingiva and mucosa of the anterior two thirds (presulcal part) of the tongue, being slightly overlapped by lingual fibres of the GPhN¹³. The nerve transfers neural sensory fibres for general sensitivity (pressure, temperature, pain, touch) and gustatory fibres for taste sensation to the anterior part of the tongue through the CT nerve. CT nerve also carries preganglionic parasympathetic fibres providing secretomotor innervation to the submandibular, sublingual and minor salivary glands of the oral cavity¹⁰. The medial and lateral branches bear anastomotic connections with the hypoglossal nerve in the tongue body¹¹.

Communications exist between the inferior alveolar nerve and auriculotemporal nerve and also between the mylohyoid and lingual nerves. These above rare anatomical variations may help to explain why some local anaesthetic techniques often fail¹.

General Anatomy of the Pterygomandibular space (PtMS): The PtMS is a small fascial lined cleft containing mostly loose areolar connective tissue¹⁴. It is bounded medially and inferiorly by the medial pterygoid muscle¹⁵, and laterally by the medial surface of the mandibular ramus. Particular importance to local anaesthesia, the PtMS contains the IAN artery and vein, the LN, the nerve to mylohyoid, the sphenomandibular ligament and fascia¹⁶.

CONCLUSION

A detailed knowledge of mandibular nerve course, its anatomical variations and pterygomandibular space is gold standard for accurate inferior alveolar nerve block anaesthesia and avoid complications like failure of anaesthesia, haematoma, trismus and ocular complications.

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