Human Anatomy

Lec.8 **د.فراس عبد الرحمن**

Mandibular nerve

The mandibular nerve (**CN V3**) is the inferior and largest division of the trigeminal nerve (**Fig. 1A**). It is formed by the union of sensory fibers from the sensory ganglion and the motor root of CN V in the **foramen ovale** in the greater wing of the sphenoid, through which the trunk of CN V3 emerges from the cranium to enter the infratemporal fossa. It then divides into a small anterior and a large posterior division. The mandibular nerve has three major cutaneous branches (auriculotemporal, buccal, and mental nerves); it also supplies motor fibers to the muscles of mastication (**Fig. 1B**). It is the only division of CN V that carries motor fibers.

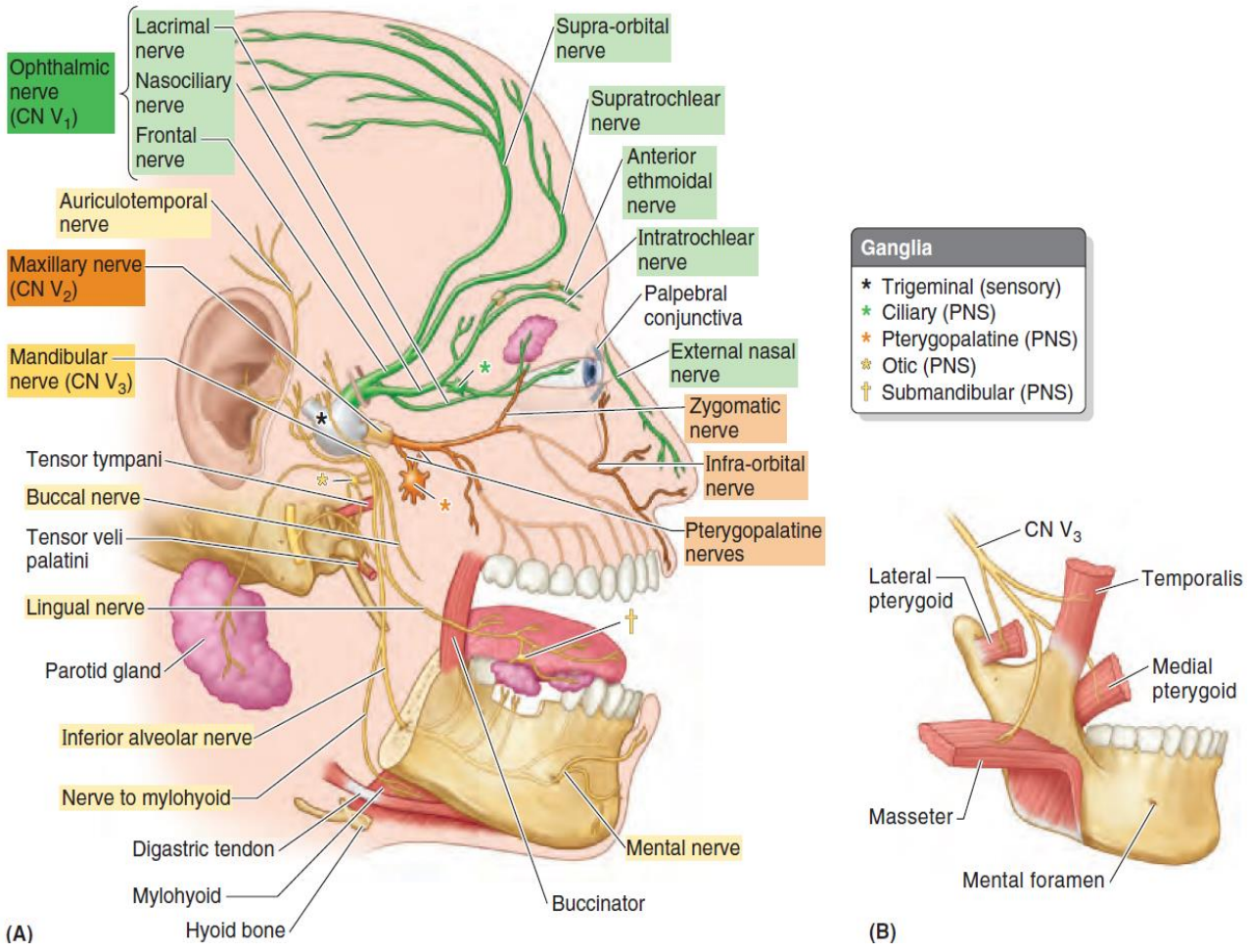

FIGURE 1: Distribution of trigeminal nerve (CN V). **A.** The three divisions of CN V arise from the trigeminal ganglion. **B.** Branches of the mandibular nerve (CN V3) pass to the muscles of mastication.

Branches of the Mandibular Nerve (See Table 1)

- **The Main Trunk**
  - ✓ **Meningeal branch (recurrent branch, nervus spinosus),** it runs back into the middle cranial fossa through the foramen spinosum. It supplies the dura mater and the mucous lining of the mastoid air cells.
  - ✓ **Nerve to the medial pterygoid muscle,** which supplies not only the medial pterygoid, but also the tensor tympani and tensor veli palatini muscles.

- **The Anterior Division**
  - ✓ **Masseteric nerve** to the masseter muscle (**Figs. 1B & 2**) and TMJ.
  - ✓ **Deep temporal nerves** to the temporalis muscle (**Fig. 2**) and TMJ.
  - ✓ **Nerve to the lateral pterygoid muscle (Fig. 1B)**
  - ✓ **Buccal nerve** to the skin and the mucous membrane of the cheek (**Fig. 2**). The buccal nerve does not supply the buccinator muscle (which is supplied by the facial nerve), and it is the **only sensory branch** of the anterior division of the mandibular nerve.

- **The Posterior Division**
  - ✓ **Auriculotemporal nerve,** which supplies the skin of the auricle, the external auditory meatus, the temporomandibular joint, and the scalp (**Fig. 1A**). This nerve also conveys postganglionic parasympathetic secretomotor fibers from the otic ganglion to the parotid salivary gland.
  - ✓ **Lingual nerve,** which descends in front of and medial to the inferior alveolar nerve and enters the mouth. It then runs forward on the side of the tongue and crosses the submandibular duct. In its course, it is joined by the **chorda tympani nerve** (**Fig. 2**), and it supplies the mucous membrane of the anterior two thirds of the tongue and the floor of the mouth. It also gives off preganglionic parasympathetic secretomotor fibers to the submandibular ganglion.
  - ✓ **Inferior alveolar nerve**, which enters the mandibular canal to supply the teeth of the lower jaw and emerges through the mental foramen (**mental nerve**) to supply the skin of the chin. Before entering the canal, it gives off the **mylohyoid nerve**, which supplies the mylohyoid muscle and the anterior belly of the digastric muscle (**Fig. 2**).
  - ✓ **Communicating branch,** which frequently runs from the inferior alveolar nerve to the lingual nerve.

  The branches of the posterior division of the mandibular nerve are sensory except the **nerve to the mylohyoid muscle**.

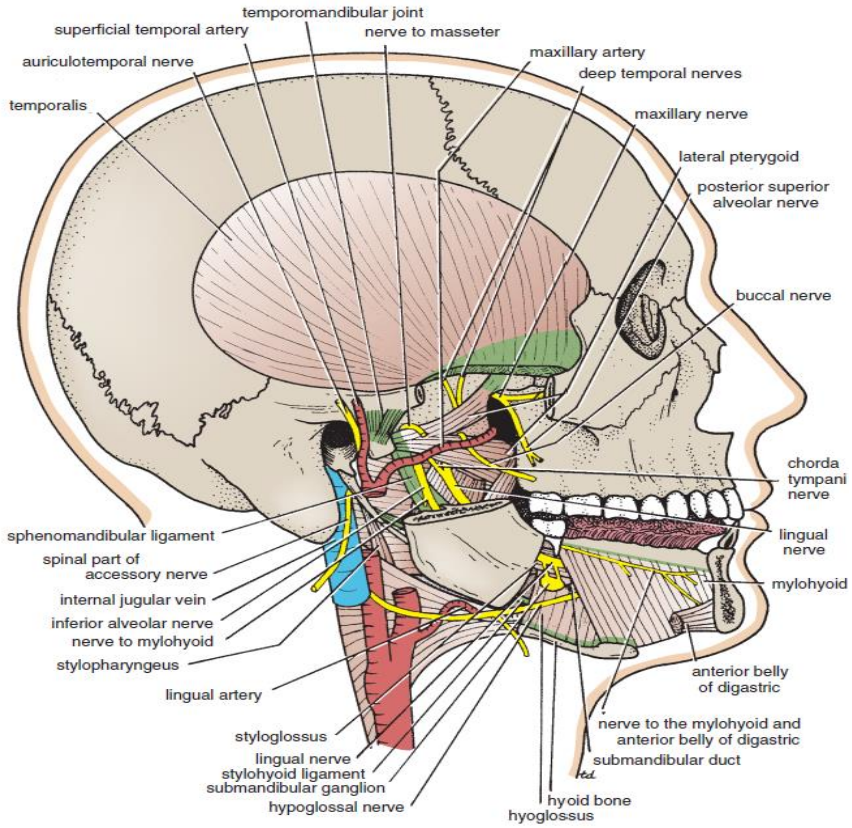

FIGURE 2: Infratemporal and submandibular regions.

Otic Ganglion

The otic ganglion (**Fig. 3**) is a parasympathetic ganglion that is located medial to the mandibular nerve just below the skull, and it is adherent to the nerve to the medial pterygoid muscle. The preganglionic fibers originate in the glossopharyngeal nerve, and they reach the ganglion via the lesser petrosal nerve. The postganglionic secretomotor fibers reach the parotid salivary gland via the auriculotemporal nerve.

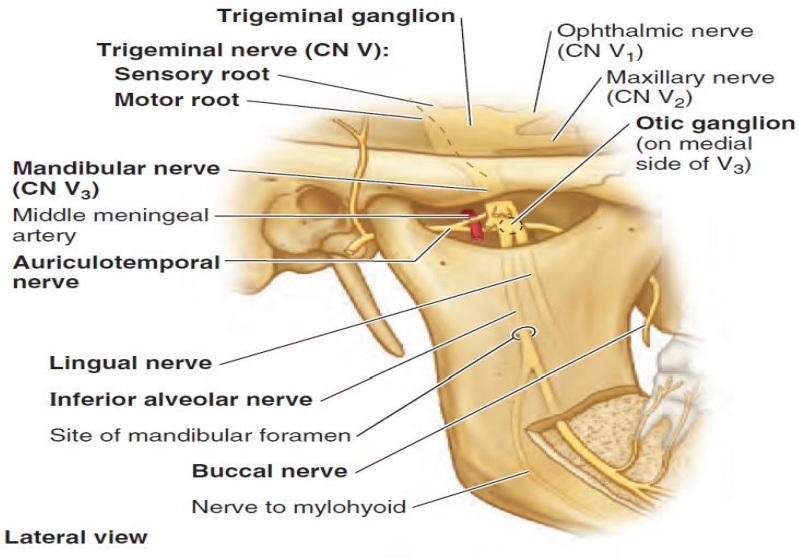

FIGURE 3: Nerves of infratemporal fossa.

TABLE 1. Summary of divisions of trigeminal nerve (CN V).

Divisions/Distributions	Branches
Ophthalmic nerve (CN V_1) Sensory only Passes through superior orbital fissure into orbit Supplies cornea; superior conjunctiva; mucosa of anterosuperior nasal cavity; frontal, ethmoidal, and sphenoidal sinuses; anterior and supratentorial dura mater; skin of dorsum of external nose; superior eyelid; forehead; and anterior scalp	Tentorial nerve (a meningeal branch) Lacrimal nerve Communicating branch from zygomatic nerve Frontal nerve Supra-orbital nerve Supratrochlear nerve Nasociliary nerve Sensory root of ciliary ganglion Short ciliary nerves Long ciliary nerves Anterior and posterior ethmoidal nerves Infratrochlear nerves
Maxillary nerve (CN V_2) Sensory only Passes through foramen rotundum to enter pterygopalatine fossa Supplies dura mater of anterior part of middle cranial fossa; conjunctiva of inferior eyelid; mucosa of postero-inferior nasal cavity, maxillary sinus, palate and anterior part of superior oral vestibule; maxillary teeth; and skin of lateral external nose, inferior eyelid, anterior cheek, and upper lip	Meningeal branch Zygomatic nerve Zygomaticofacial branch Zygomaticotemporal branch Communicating branch to lacrimal nerve Ganglionic branches to (sensory root of) pterygopalatine ganglion Posterior superior alveolar branches Infra-orbital nerve Anterior and middle superior alveolar branches Superior labial branches Inferior palpebral branches External nasal branches Greater palatine nerves Posterior inferior lateral nasal nerves Lesser palatine nerves Posterior superior lateral nasal branches Nasopalatine nerve Pharyngeal nerve
Mandibular nerve (CN V_3) Sensory and motor Passes through foramen ovale into infratemporal fossa Supplies sensory innervation to mucosa of anterior two thirds of tongue, floor of mouth, and posterior and anterior inferior oral vestibule; mandibular teeth; and skin of lower lip, buccal, parotid, and temporal regions of face; and external ear (auricle, upper external acoustic meatus, and tympanic membrane) Supplies motor innervation to 4 muscles of mastication, mylohyoid, anterior belly of digastric, tensor veli palatini, and tensor tympani	*Somatic (general) sensory branches* Meningeal branch (nervus spinosum) Buccal nerve Auriculotemporal nerve Lingual nerve Inferior alveolar nerve Inferior dental plexus Mental nerve *Somatic (branchial) motor branches* Masseteric nerve Deep temporal nerves Nerves to medial and lateral pterygoid Nerve to mylohyoid (and anterior belly of digastric) Nerve to tensor veli palatini Nerve to tensor tympani

Clinical Notes

- **Injury to the lingual nerve**

  The lingual nerve passes forward into the submandibular region from the infratemporal fossa by running beneath the origin of the superior constrictor muscle, which is attached to the posterior border of the mylohyoid line on the mandible. Here, it is closely related to the **last molar tooth** and is liable to be damaged in cases of clumsy extraction of an impacted third molar.

- **Lesions of mandibular division of trigeminal nerve** will cause unilateral paralysis of muscles of mastication followed by atrophy; results in a **sunken-in** appearance along ramus of mandible and above the zygomatic arch.

References

1. Snell RS: Clinical anatomy by regions. Lippincott Williams & Wilkins, 2011.

2. Keith LM: Clinically Oriented Anatomy, 7th edition. Wolters Kluwer, 2014.