Human Anatomy

Lec.11 **Dr Ban Alwash**

The Pterygopalatine Fossa

The pterygopalatine fossa is a bilateral, cone-shaped depression extending deep from the infratemporal fossa all the way to the nasal cavity via the **sphenopalatine foramen.** It is located between the **maxilla, sphenoid and palatine** bones, and communicates with other regions of the skull and facial skeleton via several **canals and foramina**. The pterygopalatine fossa contains the **maxillary nerve, the maxillary artery (third part) and the pterygopalatine parasympathetic ganglion (Fig.1).**

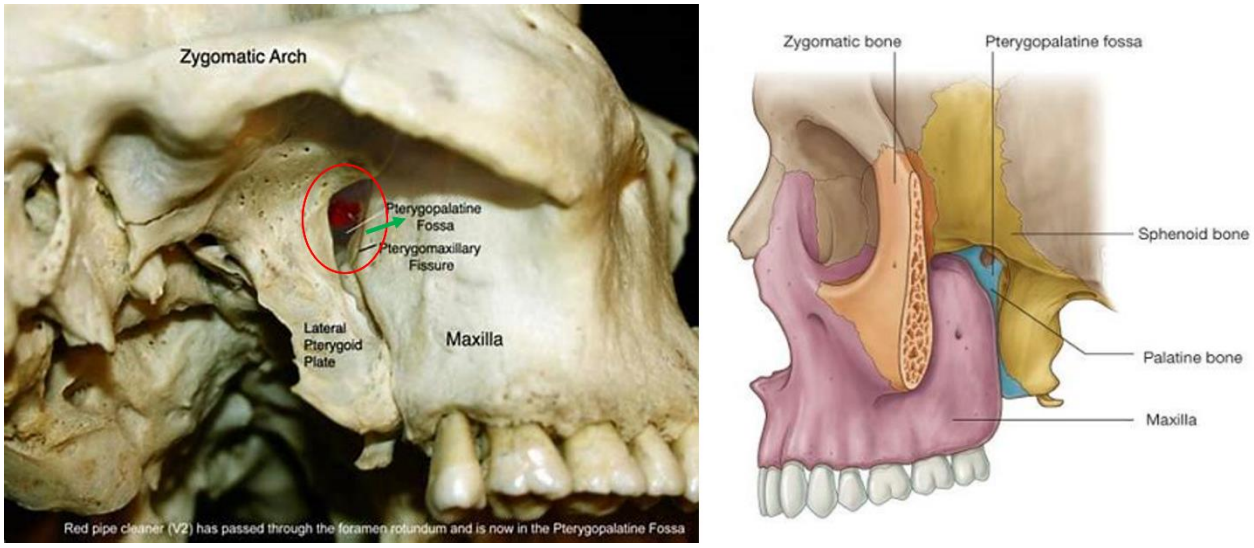


Figure1: The Pterygopalatine Fossa

Borders

- **Anterior:** Posterior wall of the maxilla.
- **Posterior:** Pterygoid process of the sphenoid bone.
- **Superior:** Greater wing of sphenoid.

- **Inferior**: Palatine bone and palatine canals.
- **Medial:** Perpendicular plate of the palatine bone.
- **Lateral:** Pterygomaxillary fissure.

Communications and Opening

1-The pterygomaxillary fissure: transmits the **maxillary artery** from the infratemporal fossa, the posterior **superior alveolar nerve** which is a branch of the maxillary nerve and the **sphenopalatine veins**.

2-The inferior orbital fissure: transmits the **infraorbital and zygomatic branches** of the maxillary nerve, the **orbital branches** of the pterygopalatine ganglion and the **infraorbital vessels**.

3-The foramen rotundum: transmit the **maxillary division** of the trigeminal nerve.

4-The pterygoid canal: It transmits the **greater petrosal and deep petrosal nerves** (which combine to form the nerve of the **pterygoid canal**) and an **accompanying artery** derived from the maxillary artery.

5-The sphenopalatine foramen: This foramen communicates with the lateral wall of the nasal cavity. It transmits the **nasopalatine and posterior superior nasal nerves** (from the pterygopalatine ganglion) and the **sphenopalatine vessels.**

6-The opening of a palatine canal found at the base of the fossa. Lower down, the canal divides into greater and lesser palatine canals. The palatine canal transmits the **greater and lesser palatine nerves**, together with accompanying vessels, and these pass to the hard palate to emerge at the greater and lesser palatine foramina.

7-Pharyngeal canal: courses posteriorly and medially into pharynx, for **pharyngeal artery.**

Arteries

The external carotid artery terminates at approximately the neck of the mandible by bifurcating into the **superficial temporal and maxillary arteries** (Fig.2).

The **superficial temporal artery** is the smaller branch; it runs upward into the temporal fossa.
The **maxillary artery** is the larger branch; it passes forward across the **infratemporal fossa** and then deep, through the **pterygomaxillary fissure**, and into the **pterygopalatine fossa.**

Branches of the Superficial Temporal Artery (Fig.2)

- Transverse facial artery.
- Anterior (frontal) branch.
- Posterior (parietal) branch.

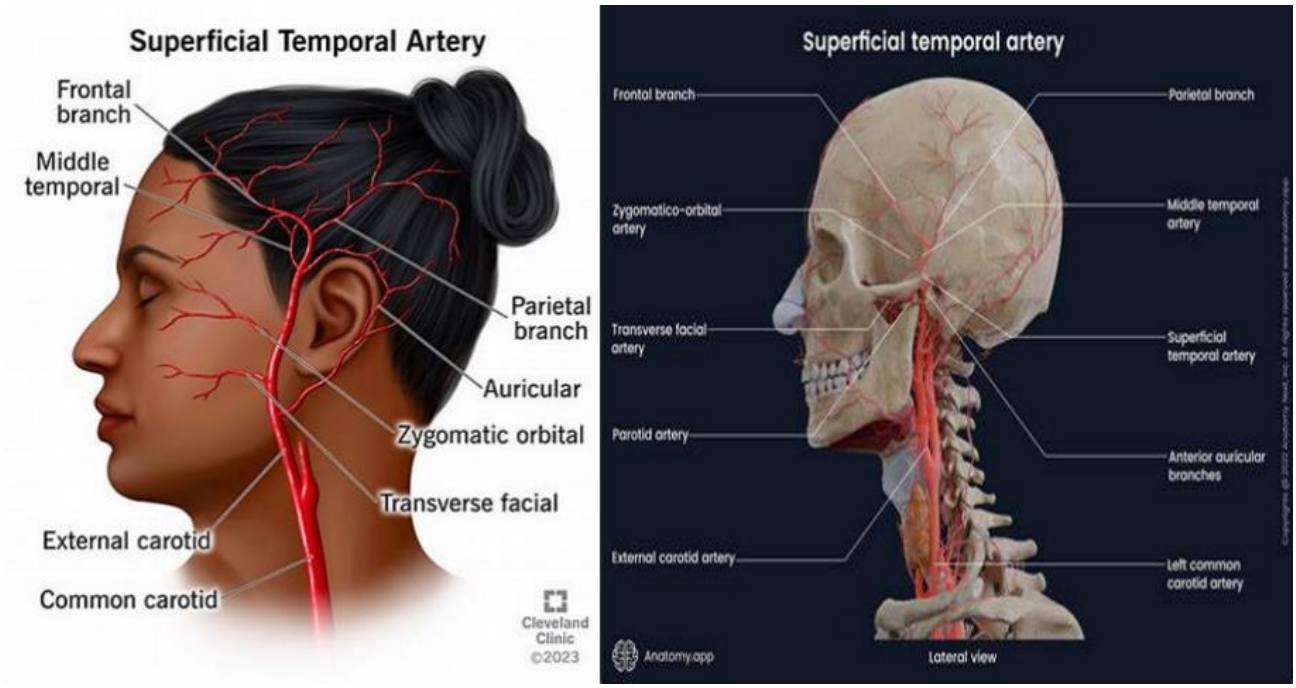


Figure2: Branches of the Superficial Temporal Artery

Branches of the Maxillary Artery (Fig.3)

Branches in the infratemporal fossa include the following:

- Small branches to the external auditory meatus and tympanic membrane.
- Middle meningeal artery.
- Inferior alveolar artery.
- Muscular branches to the muscles of mastication.
- Posterior superior alveolar artery.

Branches in the pterygopalatine fossa include the following:

- Descending palatine artery.
- Pharyngeal branch.
- Artery of the pterygoid canal.
- Infraorbital artery Sphenopalatine artery.

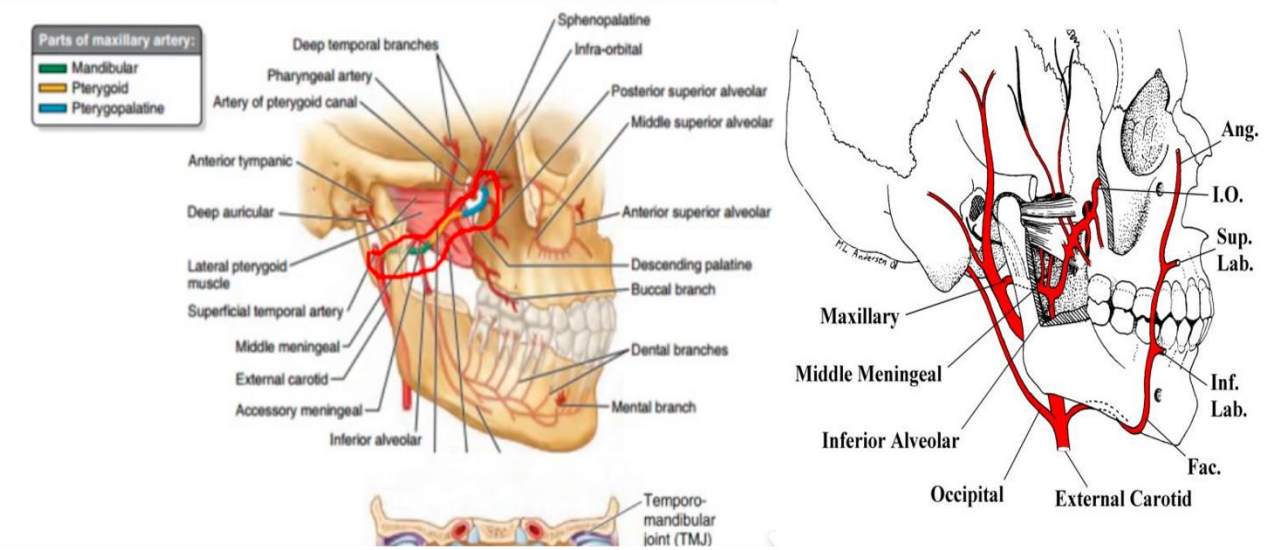


Figure 3: Branches of the Maxillary Artery

Maxillary nerve

The maxillary nerve is one of the branches of the trigeminal nerve, otherwise known as the fifth cranial nerve (CN V) (Fig.4). Supplying sensory innervation to certain parts of the **face**, the **mucosa of the nose**, together with the **teeth**, this nerve allows you to feel that annoying fly landing underneath your eye or that annoying pain caused by your dentist. It runs through the **foramen rotundum** and enters the **pterygopalatine fossa** (Fig.4). From here, it sends numerous sensory branches across a wide distribution in the cranium, midface, nasal cavity, oral cavity, and nasopharynx.

Branches from the main maxillary nerve trunk:

1. Meningeal nerve.
2. Ganglionic branches.
3. Zygomatic nerve.
    - zygomaticotemporal nerve
    - zygomaticofacial nerve.
4. Infraorbital nerve.
    - middle superior alveolar nerve
    - anterior superior alveolar nerve.
5. Posterior superior alveolar nerve.

Branches from the pterygopalatine ganglion (Fig.5):

1. Orbital nerve.
2. Nasopalatine nerve.
3. Posterior superior nasal nerve.
4. Posterior inferior nasal nerve
5. Greater (anterior) palatine nerve.
6. Lesser (posterior) palatine nerve
7. Pharyngeal nerve.

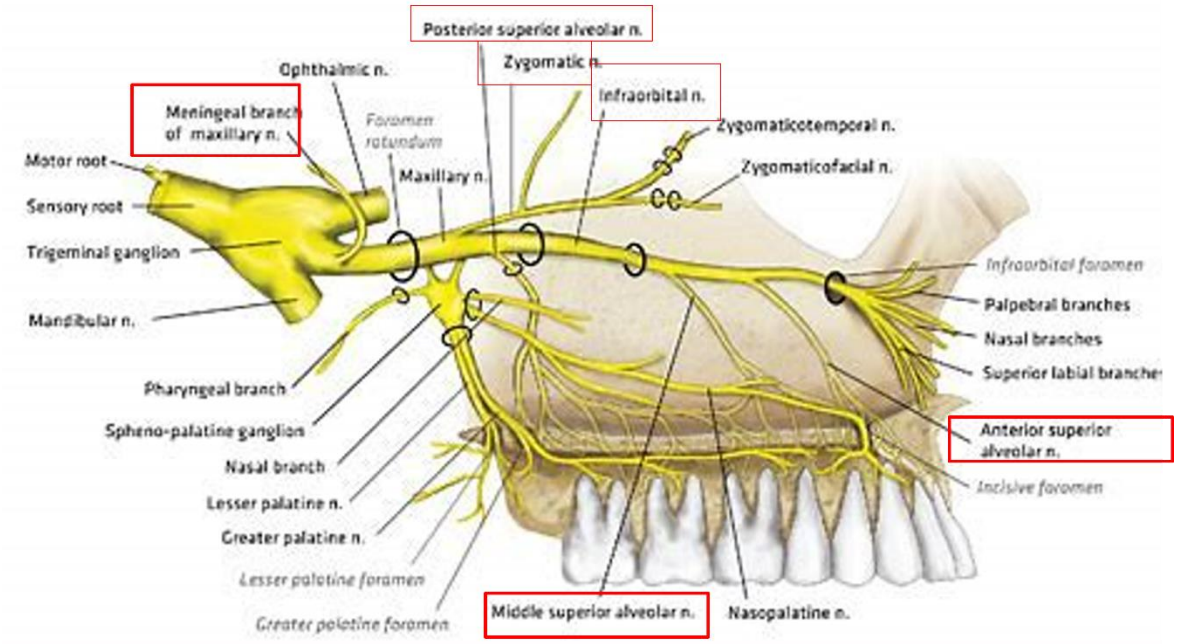


Figure.4: The Maxillary nerve branches

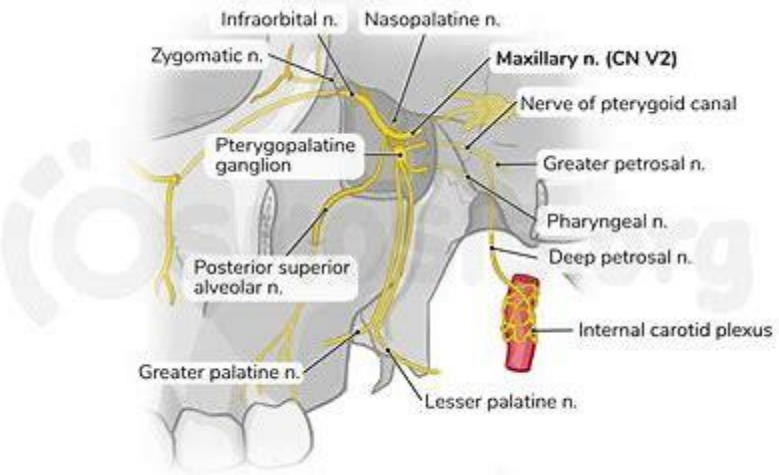


Figure.5: Branches of Maxillary nerve from the pterygopalatine ganglion

The meningeal nerve: This is the only branch from the main trunk of the maxillary nerve that does not originate in the pterygopalatine fossa; it arises within the middle

cranial fossa, before the foramen rotundum. It runs with the middle meningeal artery and innervates the dura mater lining the middle cranial fossa.

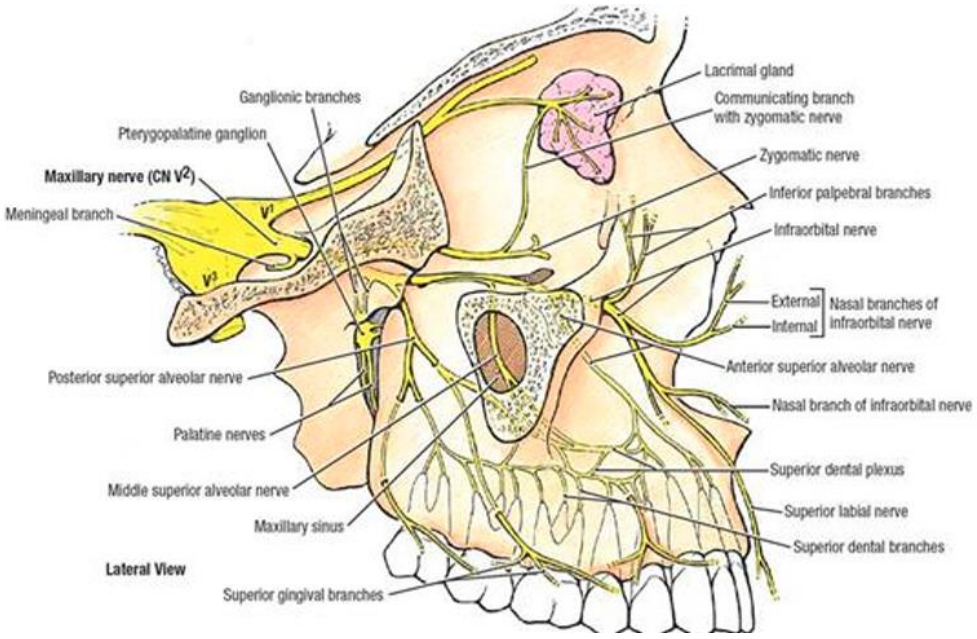
The ganglionic branches: These are usually two in number and connect the maxillary nerve to the pterygopalatine ganglion.

The zygomatic nerve: This leaves the pterygopalatine fossa through the inferior orbital fissure. It passes along the lateral wall of the orbit before dividing into zygomaticotemporal and zygomaticofacial branches. These pass through the zygomatic bone to supply overlying skin. The zygomaticotemporal nerve also gives a branch to the lacrimal nerve, which carries autonomic fibres to the lacrimal gland.

The posterior superior alveolar nerve(s): This is one of three superior alveolar nerves that supply the maxillary teeth. The middle and anterior superior alveolar nerves are branches of the infraorbital nerve. The posterior superior alveolar nerve leaves the pterygopalatine fossa through the pterygomaxillary fissure. Then, it runs onto the tuberosity of the maxilla and eventually pierces the bone to supply the maxillary molar teeth and the maxillary sinus. Before entering the maxilla, the nerve provides a gingival branch which innervates the buccal gingivae around the maxillary molars.

The infraorbital nerve: This can be regarded as the terminal branch of the maxillary nerve proper. It leaves the **pterygopalatine fossa** to enter the orbit at the inferior orbital fissure. Initially lying in a groove in the floor of the orbit (the infraorbital groove), the infraorbital nerve runs into a canal (the infraorbital canal) and passes onto the face at the **infraorbital foramen**. The middle and anterior superior alveolar nerves arise from the infraorbital nerve in the orbit.

The branches of the maxillary nerve that arise with the **pterygopalatine ganglion** contain not only sensory fibres from the maxillary nerve, but also autonomic fibres from the ganglion, which are mainly distributed to glands and blood vessels.



The veins of pterygopalatine fossa

The veins of the pterygopalatine fossa are small and variable. The most consistent is the **sphenopalatine vein**. This vein drains the posterior aspect of the nose and passes into the pterygopalatine fossa through the **sphenopalatine foramen**. It drains into the **pterygoid venous plexus** via the pterygomaxillary fissure. **The inferior ophthalmic vein** in the floor of the orbit provides a connecting branch to the **pterygoid venous plexus**. This vein passes through the inferior orbital fissure in the region of the **pterygopalatine fossa**.

- Pterygopalatine ganglion

This is the **parasympathetic** ganglion that is located on the posterior wall of the pterygopalatine fossa. It is stuck into the slightly extended **anterior foramen of the pterygoid canal**, inferiorly and medially to the body of the **maxillary nerve.**

Preganglionic fibers for this ganglion are (Fig.5):

- **Pterygopalatine nerves** that carry **sensitive fibers** for the ganglion from the **maxillary nerve**.

- **The greater petrosal nerve**: a branch of the **facial nerve**, that carries the parasympathetic fibers that **synapse** within the neurons of the pterygopalatine ganglion.

- **The deep petrosal nerve** that extends from the **internal carotid plexus** and whose fibers just pass through the ganglion **without synapsing** with its neurons.

Before reaching the ganglion, the **greater and deep petrous nerves** unite to form a single nerve body. Both of them penetrate the fibrous membrane of the **foramen lacerum** on the base of the skull . Soon after they leave the cranium, they unite by forming the **pterygoid canal nerve**. This nerve goes through the pterygoid canal from its posterior to anterior foramen. When the nerve leaves the canal, it enters directly to the **pterygopalatine ganglion**, bringing both sympathetic and parasympathetic fibers to it (Fig. 5).

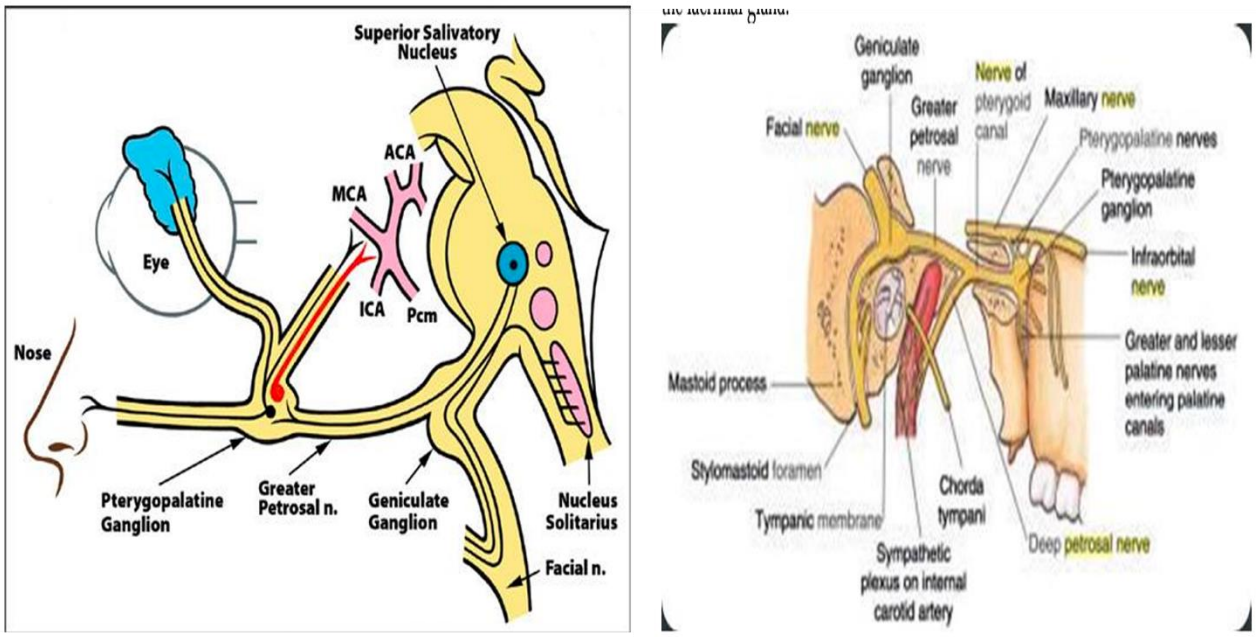


Figure.5: The Pterygopalatine Ganglion

References

- Snell RS. Clinical Anatomy by Regions. 9th edition. Philadelphia, PA: Lippincott Williams & Wilkins, 2012.
- https://teachmeanatomy.info.