Maxillary nerve (V2)

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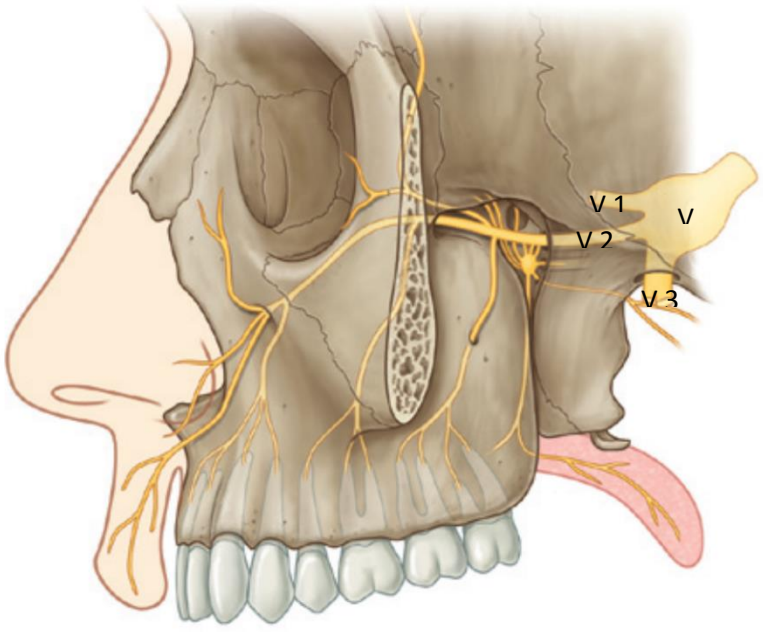
Sensory division of the trigeminal nerve, it supplies:

- ✓ The maxillary teeth and their supporting structures
- ✓ The hard and soft palate
- ✓ The maxillary air sinus
- ✓ Much of the nasal cavity
- ✓ Skin overlying the middle part of the face.

The **maxillary nerve** arises from the **trigeminal ganglion** on the floor of the middle cranial fossa. It passes along the lateral dural wall of the cavernous sinus to exit the cranial cavity at the foramen **rotundum**. It emerges from the foramen rotundum in the upper part of the **pterygopalatine fossa**, where most of the branches are derived.



Branches of maxillary nerve can be classified into those which come directly from the maxillary nerve, and those which are associated with the pterygopalatine parasympathetic ganglion.

- **Branches from the main maxillary nerve trunk:**

1. **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.

2. **The ganglionic branches**:

   These are usually two in number and connect the maxillary nerve to the **pterygopalatine ganglion**.

3. **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**.

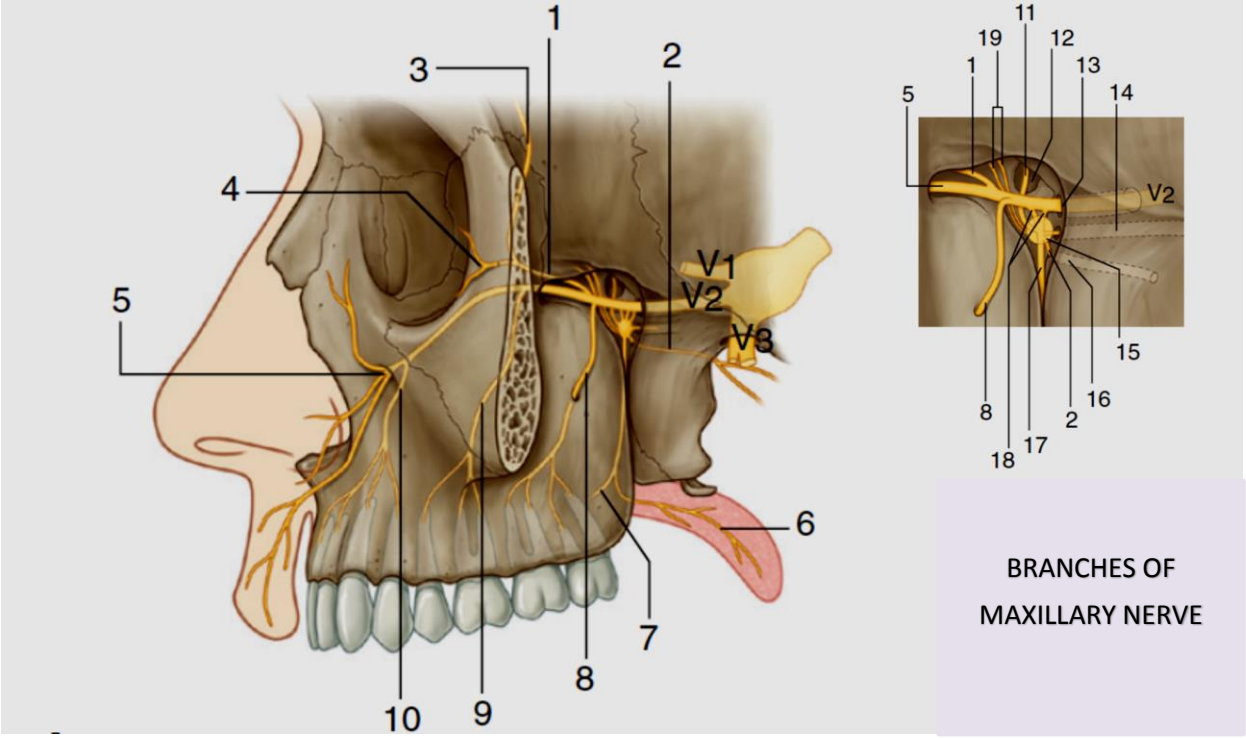
   The zygomaticotemporal nerve also gives a communicating branch to the **lacrimal nerve (a branch of ophthalmic nerve)**, which carries parasympathetic fibers to the **lacrimal gland**.

4. **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.

5. **The posterior superior alveolar nerve(s)**

   This is **one of three** superior alveolar nerves that supply the maxillary teeth. 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.



1. Zygomatic
2. Pharyngeal
3. Zygomaticotemporal
4. Zygomaticofacial
5. Infra-orbital
6. Lesser palatine
7. Greater palatine
8. Posterior superior alveolar
9. Middle superior alveolar
10. Anterior superior alveolar
11. Nasal
12. Sphenopalatine foramen
13. Foramen rotundum
14. Pterygoid canal
15. Pterygopalatine ganglion
16. Palatovaginal canal
17. Palatine
18. Ganglionic branches
19. Orbital branches

- **Branches from the pterygopalatine ganglion:**

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.

1. **The orbital nerve**

   This passes from the pterygopalatine ganglion into the **orbit** through the **inferior orbital fissure**. It supplies **periosteum** and, via **sympathetic fibres**, the **orbitalis muscle**. The orbital nerve can also supply part of the **maxillary sinus** and may pass through the **posterior ethmoidal foramen** to innervate **posterior ethmoidal air cells** and the **sphenoid air sinus**.

2. **The Nasopalatine nerve**

   This nerve runs medially from the pterygopalatine ganglion into the **nasal cavity** through the **sphenopalatine foramen**. It supply the **posteroinferior part** of the nasal septum. It passes through the **incisive canal**, where it usually forms a single nerve with its fellow of the opposite side, and emerges on the **hard palate** at the incisive fossa to supply the oral mucosa around the incisive papilla and palatal gingiva of the anterior teeth.

3. **The posterior superior nasal nerve**

   This nerve enters the back of the **nasal cavity** through the **sphenopalatine foramen**. It divides into lateral and medial branches.

- The **lateral branches** supply the **posterosuperior part of the lateral wall** of the nasal fossa.
- The **medial branches** supply the nasal septum overlying the posterior part of the **perpendicular plate of the ethmoid**.

4. **The posterior inferior nasal nerve**

   This supplies the inferior part of the lateral wall of the nose in the region of the **inferior nasal concha**.

5. **The greater (anterior) palatine nerve**

   This nerves passes downwards from the pterygopalatine ganglion, through the **palatine canal**, and onto the hard palate at the palatine foramen. On the palate, it runs forwards at the interface between the palatine process and the alveolar process of the maxilla to supply much of the mucosa of the **hard palate and palatal gingivae** (except around the incisive papilla).

6. **The lesser (posterior) palatine nerve(s)**

   This passes downwards from the pterygopalatine ganglion initially through the **palatine canal**. It then passes through lesser palatine foramen (or foramina). It runs backwards to **supply the soft palate**.

7. **The pharyngeal branch**

   This originates from the pterygopalatine ganglion and passes through the **palatovaginal canal** to supply the mucosa of the **nasopharynx**.

The pterygopalatine ganglion

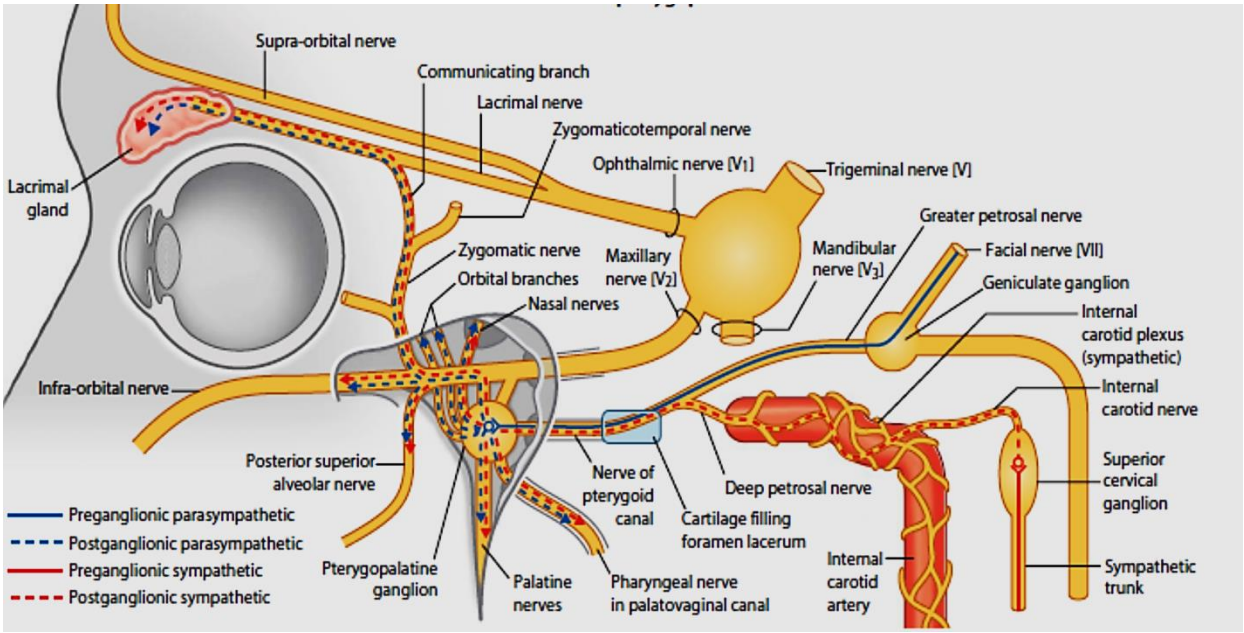
This parasympathetic ganglion is situated below the maxillary nerve in the **pterygopalatine fossa**, connected by two ganglionic branches. It is concerned primarily with supplying the **nose**, **palate**, and **lacrimal gland**.

As with other parasympathetic ganglia in the head, three types of fibres enter the pterygopalatine ganglion: **parasympathetic**, **sympathetic**, and **sensory** fibres. However, only the parasympathetic fibres synapse in the ganglion.

- The **preganglionic parasympathetic** fibres originate from the **superior salivatory nucleus** in the brainstem. The fibres pass with the **nervus intermedius** of the facial nerve. They subsequently emerge as the **greater (superficial) petrosal nerve**. This occurs within the facial canal of the temporal bone, close to the **geniculate ganglion** of the facial nerve. The greater petrosal nerve enters the **pterygoid canal**.

- The **Postganglionic sympathetic** fibres run to the pterygopalatine ganglion by a complex course. From the **superior cervical ganglion**, sympathetic fibres run to the **internal carotid plexus** surrounding the internal carotid artery. From this plexus, a branch called the **deep petrosal nerve** is given off that enters the **pterygoid canal** to reach the pterygopalatine ganglion. The greater petrosal nerve and the deep petrosal nerve join within the pterygoid canal to become the **nerve of the pterygoid canal**.
- The **sensory** fibres to the ganglion run in the ganglionic branches of the maxillary nerve.

The parasympathetic component will be distributed within these nerves to supply the **minor salivary glands**. It is also responsible for supplying the **lacrimal gland**. The fibres pass from the ganglion in one of the ganglionic branches to the maxillary nerve. They then travel with the zygomatic and zygomaticotemporal branches. Within the orbit, they pass from the **zygomaticotemporal nerve** to the **lacrimal nerve (of the ophthalmic nerve)** to reach the lacrimal gland.



The veins of the 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.