

# PTERYGOPALATINE FOSSA

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## *Outline*

- **Anatomical Structure and Boundaries**
- **Foramina and Communications with other spaces and cavities**
- **Contents**
- **Pterygopalatine Ganglion**
- **Especial emphasis on certain arteries and nerves related to the fossa e.g. maxillary artery and maxillary nerve**
- **Venous Drainage**

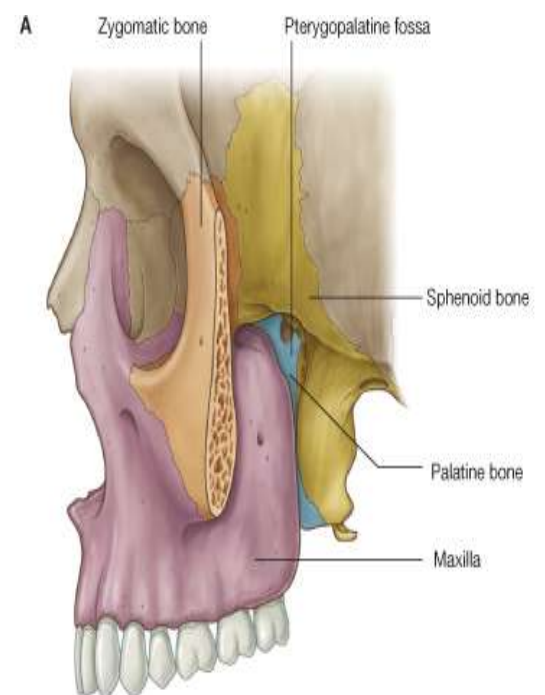
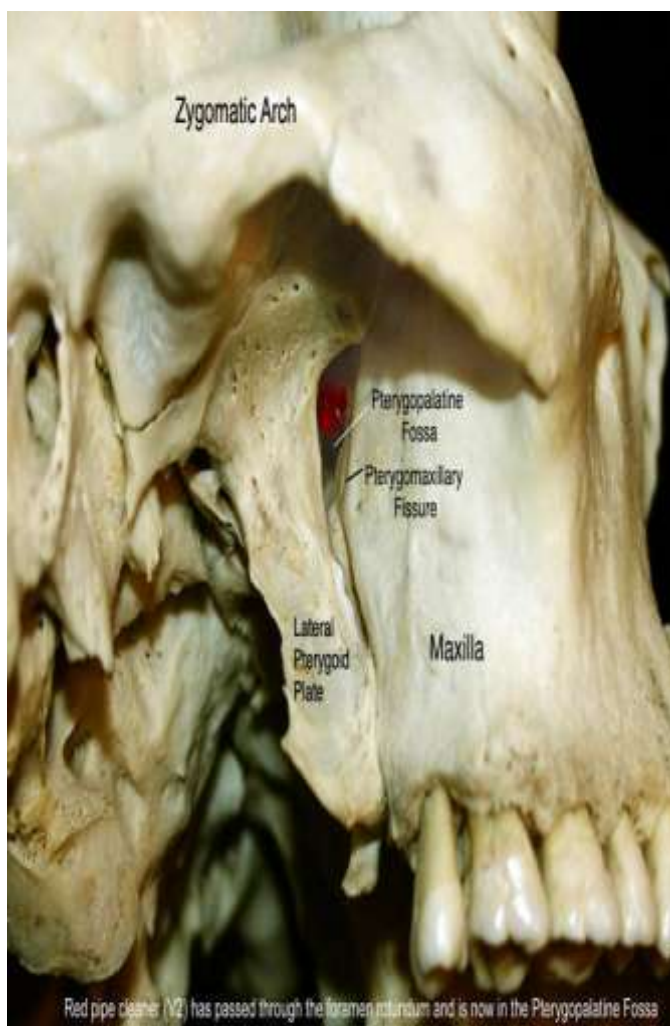
## Anatomical Structure and Boundaries

The pterygopalatine fossa is an **inverted tear drop** shaped space.

The fossa lies between bones:

- Maxillary bone forms its **anterior** wall
- The lateral surface of the palatine bone forms the **medial** wall
- The sphenoid bone (particularly the pterygoid plate) forms the **roof** and **posterior** wall

Since the fossa lies between the Pterygoid plate (sphenoid) and Palatine bone = Pterygopalatine Fossa, which can also be named **Sphenopalatine fossa**



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The blue bone in the picture above is the palatine bone

## Foramina and Communications with other spaces and cavities

### *Foramina and Fissures, and their Communications*

#### 1) **Foramen Rotundum** (Large foramen in sphenoid bone)

Communication: with Middle Cranial Fossa

#### 2) **Pterygoid Canal** (foramen in sphenoid bone): Below and medial to Foramen Rotundum and at the roof of the **Foramen Lacerum** (which is covered by hyaline cartilage)

Communication: with Middle Cranial Fossa

#### 3) **Sphenopalatine foramen** (foramen in palatine bone)

Communication: Nasal Cavity

#### 4) **Palatovaginal Canal**

Communication: Nasopharynx

#### 5) **Palatine Canal** (open as greater and lesser palatine foramina in the oral cavity)

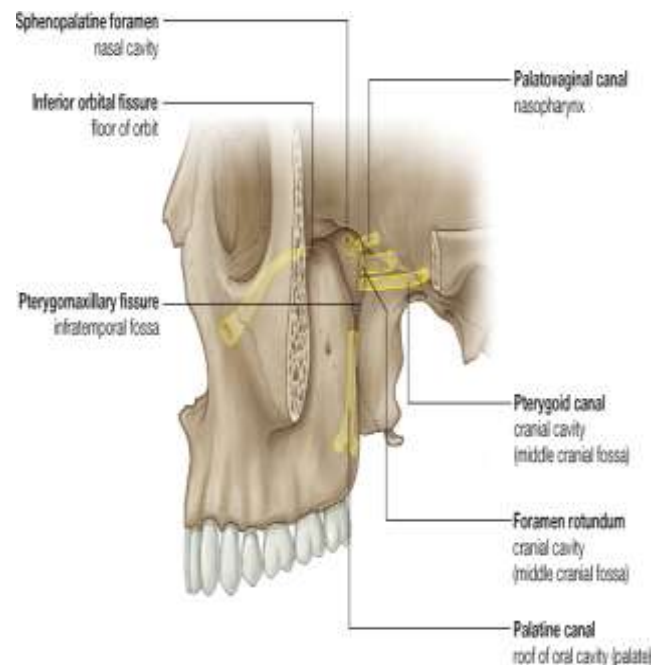
Communication: Oral Cavity

#### 6) **Pterygomaxillary Fissure**

Communication: Infratemporal Fossa

#### 7) **Inferior Orbital Fissure**

Communication: Orbital Cavity

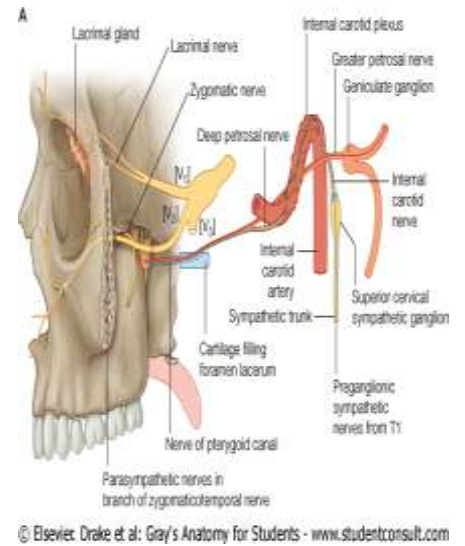


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## Contents: it is what makes the Pterygopalatine fossa

### important

- 1) Maxillary Nerve
- 2) Terminal part (3rd part) of maxillary artery
- 3) Nerve of Pterygoid Canal (also called Vidian nerve)
- 4) Pterygopalatine Ganglion
- 5) Veins
- 6) Lymphatics (distributed with blood vessels and nerves)



### Nerve of Pterygoid Canal (Vidian Nerve)

Passes from the middle cranial fossa to the pterygopalatine fossa through the pterygoid canal.

Composed of parasympathetic fibers and sympathetic fibers (check diagram above)

#### Sympathetic fibers:

- Originate from T1 (first spinal thoracic nerve) then **synapse** with the superior cervical sympathetic ganglia.

*Remember:* There are 3 cervical sympathetic ganglia: superior, middle and inferior cervical sympathetic ganglia.

-Now **postganglionic** sympathetic nerve fibers from the superior cervical sympathetic ganglia travel around and along the **internal carotid artery** and then some bundle together to form the **deep petrosal nerve** (sympathetic)

#### Parasympathetic fibers:

- Originate from facial nerve, from superior salivary nucleus of **facial nerve**, and emerge as **greater petrosal nerve** (also known as greater superficial petrosal nerve) which is **preganglionic**

**==Fibers of the postganglionic deep petrosal nerve (sympathetic) and preganglionic greater petrosal nerve (parasympathetic) form together the Nerve of Pterygoid Canal**

-The postganglionic deep petrosal nerve fibers (**sympathetic**) travel along the Nerve of Pterygoid Canal and only **pass** through the pterygopalatine ganglion (no synapse, already postganglionic) then divides to be distributed along the branches of the pterygopalatine ganglion and along the maxillary nerve to **blood vessels** mainly (vasoconstriction).

- The preganglionic greater petrosal nerve fibers (**parasympathetic**) travel along the Nerve of Pterygoid Canal and **synapse** in the pterygopalatine ganglion and emerge as **postganglionic** fibers to be distributed along the branches of the pterygopalatine ganglion and along the maxillary nerve to nose, pharynx, orbit, oral cavity = secretomotor function to **glands**

## Pterygopalatine Ganglion

Just like the submandibular ganglia, the pterygopalatine ganglion is a **parasympathetic ganglion** where preganglionic parasympathetic fibers synapse in and emerge as postganglionic fibers.

-The **Nerve of Pterygoid Canal** joins the ganglia (carrying sympathetic and parasympathetic fibers) and the Maxillary nerve gives off "**twigs**" (around 2 twigs) **sensory** to the ganglion, so the nerve branches leaving the ganglion will contain sensory (originally from maxillary nerve), sympathetic and parasympathetic fibers.

*Remember: The pterygopalatine ganglion also gives parasympathetic and sympathetic fibers to the maxillary nerve.*

### *The nerve branches of the pterygopalatine ganglion:*

1) **Orbital Branches:** pass through *inferior orbital fissure* to the **orbit**

- supply periosteum of orbit and lacrimal gland as well as ethmoidal and sphenoidal air sinuses

2) **Palatine Branches:** pass through *palatine canal* to **oral cavity**

- Divided to greater and lesser palatine nerves which pass through greater and lesser palatine foramina respectively

- Lesser palatine nerve supplies the soft palate

-Greater palatine nerve supplies hard palate then pass upward and supply nasal cavity

3) **Pharyngeal Branches:** pass through the *palatovaginal canal* to the **nasopharynx**

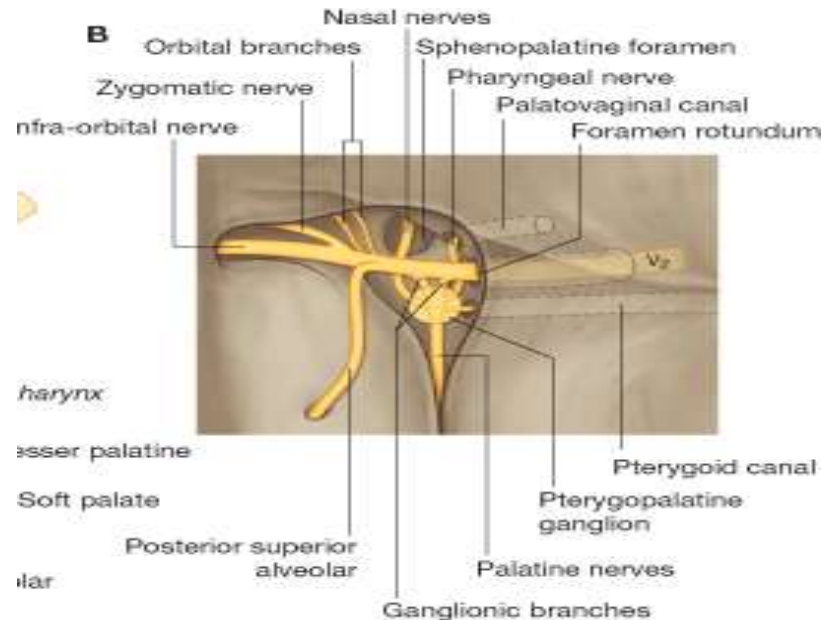
-supplies the nasopharynx especially the glands there

4) **Nasal Branches:** pass through *sphenopalatine foramen* to **nasal cavity**

- 7 or 8 small nerves

- most important ones are the short sphenopalatine and long sphenopalatine nerves (which is also called nasopalatine nerve)

Check diagram below for the pterygopalatine branches



*Revision:- Nasal Cavity( mentioned in previous lectures) in this lecture:*

The nasal cavity is divided into lateral and medial walls, and the lateral wall is divided into 4 quadrants: upper anterior, upper posterior, inferior anterior, inferior posterior

-Major nerve and blood supply of nasal cavity is from pterygopalatine fossa through sphenopalatine foramen as from the maxillary artery and maxillary nerve

- 4 main nervous supply to the nasal cavity\*:

-Long sphenopalatine nerve, also known as **nasopalatine nerve** (mainly to medial wall/**septum** of nasal cavity and is its major nervous supply)

- Short sphenopalatine nerve

- Greater and lesser palatine nerves

- Anterior and Posterior ethmoidal nerves from ophthalmic nerve

*Epistaxis (Nose-Bleed)*

There is an area on the nasal septum (upper 2/3 and lower 1/3 meeting) called **Kiesselbach's area** that is site of anastomosis and potential bleeding. Anastomosis mainly involves the **nasopalatine artery** and superior labial branch of **facial artery**, and if we are to name one major responsible for epistaxis then it is the superior labial branch of facial artery.

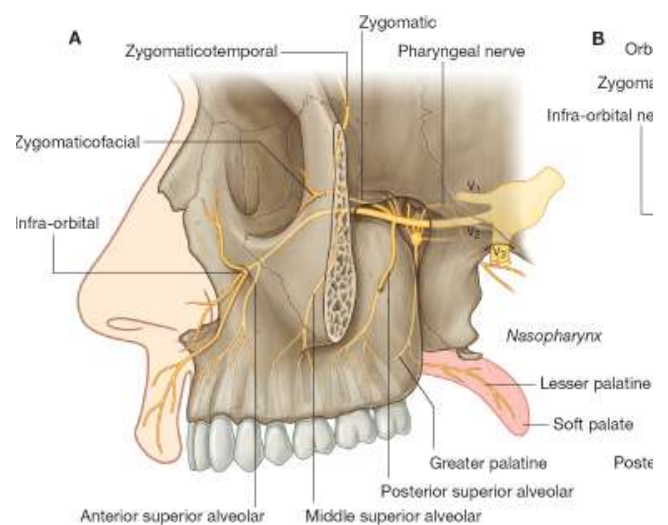
## Especial emphasis on certain arteries and nerves related to the fossa

### Maxillary Nerve

- It is originally a pure sensory nerve
- It supplies all the upper teeth, sinuses such as maxillary sinus, and the maxilla (skin over it as well)

#### ***Its course:***

- It is a branch of the trigeminal ganglia in middle cranial fossa
- In the **middle cranial fossa**, the maxillary nerve gives off a branch called **meningeal branch** then the maxillary nerve enters the pterygopalatine fossa through foramen rotundum
- In the **pterygopalatine fossa**, it gives "**twigs**" sensory to the pterygopalatine ganglia
- The maxillary nerve then descends down along the pterygomaxillary fissure to the infratemporal fossa.
- In the **infratemporal fossa**, the maxillary nerve gives off a sensory branch called **posterior superior alveolar nerve** which supplies the upper molars and the maxillary air sinus. (Gray's and the slides say that post. sup. alveolar nerve branches off the maxillary nerve in pterygopalatine fossa then enters the infratemporal fossa)
- The maxillary nerve then ascends and enters the **inferior orbital fissure** and just as it enters, it gives off a branch called **zygomatic branch** (branched off maxillary



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in the pterygopalatine fossa). The zygomatic branch divides into **zygomaticofacial** and **zygomaticotemporal** nerve branches.

The zygomaticofacial supplies the skin of the zygoma (refers to zygomatic bone) while the zygomaticotemporal nerve which contains **parasympathetic** postganglionic nerve fibers reaches the temporal region where it gives the major supply of parasympathetic fibers to the **lacrimal nerve** (branch of ophthalmic nerve) which innervates the lacrimal gland.

- Then, the maxillary nerve enters the orbital cavity through inferior orbital fissure, it continues along the **floor** of the orbit in the *infraorbital canal*. Some references name the nerve now as **infraorbital nerve**, while other references name it infraorbital nerve only when it comes out the orbit through the infraorbital foramen; both terminologies are acceptable.

- The infraorbital/ maxillary nerve in the orbital floor gives off **middle** superior alveolar and **anterior** superior alveolar nerves.

*Remember:* the **posterior** superior alveolar nerve was a branch of the maxillary nerve in the infratemporal fossa

The **middle** superior alveolar nerve supplies **premolars**, while the **anterior** superior alveolar nerve supplies **canines, incisors**, and ascends to the nasal cavity (gives sensory to the nose)

- At last the nerve emerges from the infraorbital foramen, and the infraorbital nerve then divides to 3 terminal branches:

- 1) **Palpebral branch:** supply skin of lower eyelid
- 2) **Nasal branch:** supply skin of nose
- 3) **Superior labial:** supply upper lip

## Maxillary Artery

- External carotid artery divides in the parotid gland to maxillary artery and superficial temporal artery



- The lateral pterygoid muscle divides the maxillary artery into three:
  - 1st part: before the muscle
  - 2nd part: related to the muscle either superficial or deep to it
  - 3rd part: after the muscle (terminal part in infratemporal and pterygopalatine fossa)

## **First Part**

5 branches and all of them pass through foramina or fissures:

1) **Auditory Artery\***: to external auditory canal (however, after checking external references, it is the **deep auricular artery** not auditory artery)

2) **Tympanic Artery**: to tympanic membrane in the ear

-so first 2 branches related to the ear

3) **Inferior Alveolar Artery**:

Note: the inferior alveolar nerve originates from mandibular nerve while the inferior alveolar artery originates from maxillary artery, and both of them enter mandibular foramen

- The Inferior Alveolar Artery gives incisive branches to the lower teeth and then exits through the mental foramen as mental artery

- The Inferior Alveolar Artery before entering the mandibular canal gives off a branch called **mylohyoid artery** at the mylohyoid groove on the mandible which supplies the mylohyoid muscle

4) **Middle meningeal Artery**

- Pass through foramen spinosum to middle cranial fossa

- Forms a groove on the skull on the inside, and is liable to rupture by trauma causing extradural intracranial hemorrhage/ hematoma

5) **Accessory Middle meningeal artery**

Both ascend upwards deep to the lateral pterygoid

## **Second Part**

5 branches: 4 of them are related to mastication and 1 buccal artery:

- 1) **Masseteric Artery:** to masseter muscle
- 2) **Deep Temporal Artery:** to temporalis muscle
- 3) **Medial Pterygoid Artery:** to medial pterygoid muscle
- 4) **Lateral Pterygoid Artery:** to lateral pterygoid muscle
- 5) **Buccal Artery:** to buccinator region

The maxillary artery then enters the infratemporal fossa and ascends upwards along the pterygomaxillary fissure (opposite in direction to the maxillary nerve) toward the pterygopalatine fossa and then it enters the inferior orbital fissure to the orbital cavity and ends as Infraorbital Artery (just like the nerve).

**Third Part (terminal part):** the part that reaches the pterygopalatine fossa, Important in blood supply of the nose and pharynx:

### 1) **Sphenopalatine Arteries**

-Divides to long and short sphenopalatine with long sphenopalatine (nasopalatine) supplying mainly the nasal septum and a part of lateral wall. The short sphenopalatine artery supplies the upper posterior quadrant of lateral wall (just like the nerve)

### 2) **Pharyngeal Artery** (passes through palatovaginal canal to nasopharynx)

### 3) **Palatine Artery**

-Divides to greater and lesser palatine, however unlike the nerve, the lesser palatine to soft palate is very small and not important. Also, greater palatine artery passes through greater palatine foramen to supply the hard

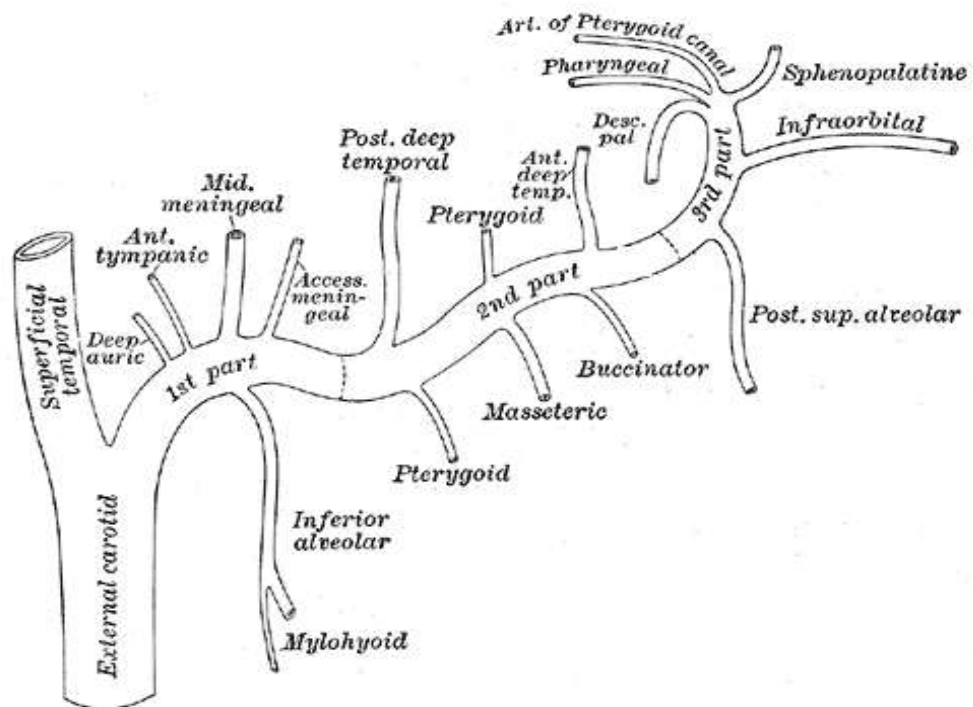
palate then passes through incisive foramen from oral cavity to reach the nasal cavity.

#### 4) Posterior Superior Alveolar Artery

- This branch is given off as the maxillary artery ascends the pterygomaxillary fissure, supplies molars and maxillary air sinuses.

5) **Infraorbital Artery**: gives middle superior alveolar and anterior superior alveolar arteries in the orbital floor and terminates as palpebral, nasal, and superior labial arteries (like the nerve)

6) **Artery of Pterygoid Canal**: pass through pterygoid canal towards roof of foramen lacerum and terminate in **nasopharynx**

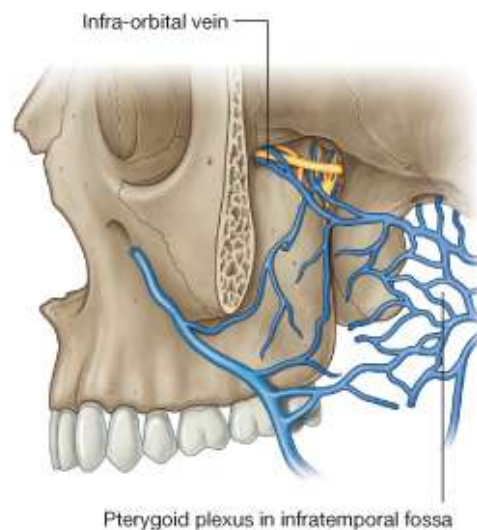


**Branches of the maxillary artery**  
Gray's Anatomy 1918

The diagram above summarizes the maxillary artery branches

## Venous Drainage

- The veins follow opposite direction to the arteries.
- The collection of veins is around the lateral pterygoid muscle and is called the **pterygoid plexus of veins** present in the infratemporal fossa.
- The pterygoid plexus of veins drains the pterygopalatine fossa and ganglion
- The pterygoid plexus of veins end up as **maxillary vein** which joins the superficial temporal vein in the parotid gland to form retromandibular vein
- The pterygoid plexus communicates with the cavernous sinus through **emissionary veins** and communicates with the facial vein anteriorly as well. Thus any pus cells in the facial vein may reach the pterygoid plexus and may reach the cavernous sinus which is dangerous.
- The facial vein drains in the internal jugular vein



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Good luck 😊