

## BACKGROUND

Surgical anatomy of the infratemporal and pterygopalatine fossae are challenging for skull base surgery trainees. To simplify understanding of the infratemporal and pterygopalatine fossae, we provide a resource describing its surgical anatomy, constant surgically relevant relationships, and techniques to identify key structures.

## MATERIAL AND METHODS

- Eight sides of four embalmed, latex injected specimens were dissected
- Endoscopic endonasal sphenoidotomies and medial maxillectomies were performed. The posterior wall of the maxillary sinus was removed in all specimens studied while preserving the periosteum over the anterior surface of the pterygopalatine and infratemporal fossae

### Structures studied

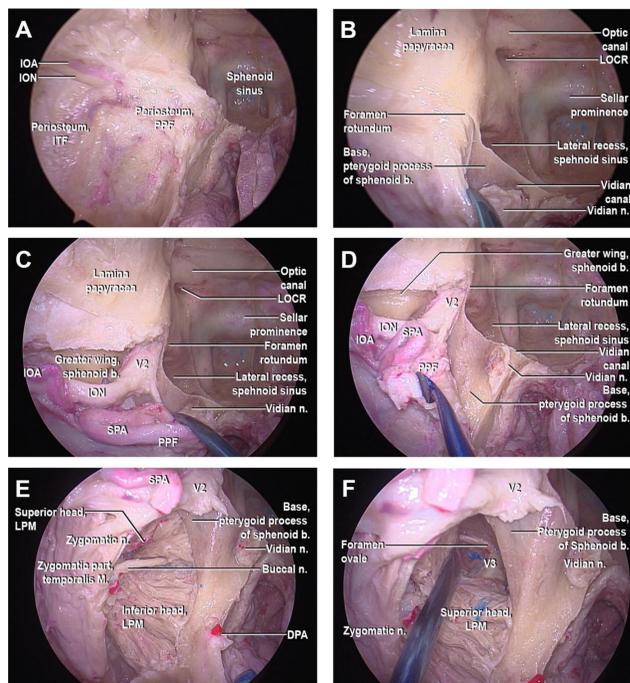
- Muscular structures
  - Lateral pterygoid and temporalis muscles
- Neural structures
  - Maxillary (V2) and mandibular (V3) divisions of the trigeminal nerve
- Arterial structures
  - Maxillary artery and its branches

## RESULTS: NEURAL ANATOMY

- Finding V2
  - In all maxillary sinuses, the infraorbital nerve, accompanied by the infraorbital artery, are clearly visible at the superolateral border
  - To identify V2 the infraorbital nerve can be followed posteromedially until the junction of the sphenoid and maxillary sinuses where V2 exits foramen rotundum. V2 can be seen supplying fibers to the pterygopalatine ganglion
  - In well pneumatized sphenoid sinuses, V2 can be identified by finding and unroofing foramen rotundum at the superior border of the lateral recess of the sphenoid sinus
- Finding V3
  - If drilling of the medial middle fossa is needed, V2 can be tracked posterosuperiorly towards Meckel's cave, which can be followed inferiorly to V3

## NEURAL ANATOMY (CONT.)

- Finding V3 (Cont.)
  - If the infratemporal fossa contents are entered or mobilized laterally, the buccal nerve, a branch of V3, can be identified and followed posteriorly towards foramen ovale
  - If none of these measures are required, V3 can be found by following the superolateral portion of the base of the pterygoid in a subperiosteal plane to identify foramen ovale, and, consequently, V3



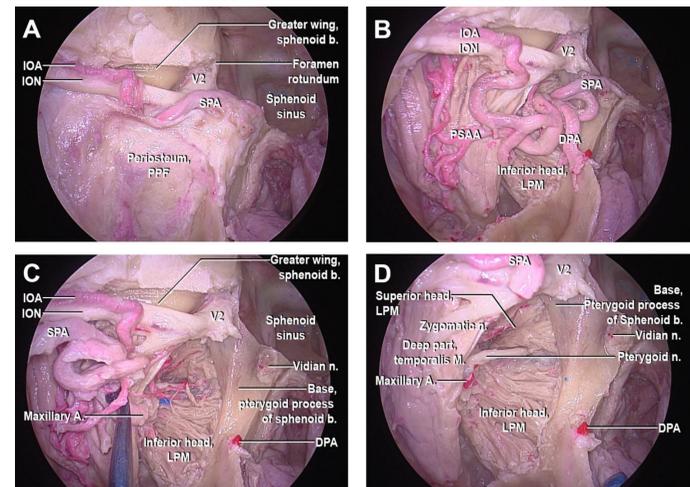
**Figure 1:** Landmarks and steps to identify neural anatomy of the pterygopalatine and infratemporal fossae. A- Once a medial maxillectomy and sphenoidotomy have been performed and the posterior wall of the maxilla has been removed, the infraorbital nerve is always identified along with the infraorbital artery at the superolateral border of the maxillary sinus. As it is a terminal branch of V2, it can be followed back to V2 and, eventually, the Gasserian ganglion. B- Alternative method of identifying V2 at the PPF. Pushing down on the PPF contents in its periosteum usually reveals a point of tethering superiorly, which is V2 as it exits foramen rotundum. Foramen rotundum can also be identified readily in a well pneumatized sphenoid sinus. C- ION and V2 dissected out of their periosteum. D- Lateral mobilization of the pterygopalatine fossa contents reveals the lateral aspect of the pterygoid base – which can be dissected posteriorly to identify V3 exiting foramen ovale. E- Identification of the buccal nerve between the superior and inferior heads of the lateral pterygoid muscle. The buccal nerve can be followed posteriorly to foramen ovale. F- Identification of foramen ovale and V3.

Abbreviations: B = Bone; DPA = Descending palatine artery; IOA = Infraorbital artery; ION = Infraorbital nerve; ITF = Infratemporal fossa; LOCR = Lateral opticocarotid recess; LPM = Lateral pterygoid muscle; N = Nerve; PPF = Pterygopalatine fossa; SPA = Sphenopalatine artery; V2 = Maxillary nerve; V3 = Mandibular nerve.

## RESULTS: ARTERIAL ANATOMY

- Several branches of the maxillary artery are identified after the sphenoidotomy and maxillectomy.
- The infraorbital artery can be identified running with the infraorbital nerve at the superolateral aspect of the maxillary sinus
- The sphenopalatine artery can be identified at the junction of the sphenoid and maxillary sinuses; these can be followed medially and laterally, respectively to identify the maxillary artery in the middle of the pterygopalatine ganglion
- The maxillary artery is always found running between the superior and inferior heads of the lateral pterygoid muscle

## ARTERIAL ANATOMY (CONT.)

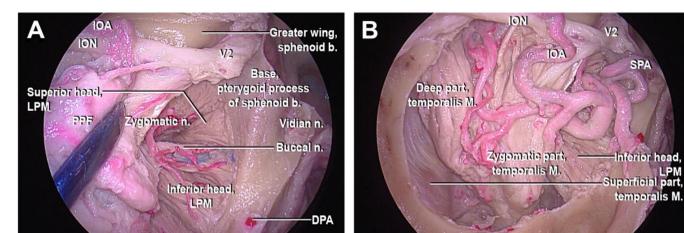


**Figure 2:** Landmarks and steps to identify arterial anatomy of the pterygopalatine and infratemporal fossae. A- Once a medial maxillectomy and sphenoidotomy have been performed and the posterior wall of the maxilla has been removed, the infraorbital artery is readily identified at the superolateral border of the maxillary sinus. The sphenopalatine artery is identified at the junction of the maxillary and sphenoid sinuses. The infraorbital and sphenopalatine arteries can be followed medially and laterally, respectively, to identify the maxillary artery and its branches if the pterygopalatine fossa periosteum is opened. B- Branches of the maxillary artery after dissection of the pterygopalatine fossa. C- Lateral mobilization of the arteries in the pterygopalatine fossa reveals the main trunk of the maxillary artery as it runs between the superior and inferior heads of the lateral pterygoid muscle. D- Stump of the maxillary artery seen running between the superior and inferior heads of the lateral pterygoid muscle after distal branches have been removed.

Abbreviations: B = Bone; DPA = Descending palatine artery; IOA = Infraorbital artery; ION = Infraorbital nerve; LPM = Lateral pterygoid muscle; N = Nerve; PPF = Pterygopalatine fossa; PSSA = Posterior superior alveolar artery; SPA = Sphenopalatine artery; V2 = Maxillary nerve.

## RESULTS: MUSCULAR ANATOMY

- Identifying the temporalis muscle
  - The three parts of the temporalis muscle are always identified readily at the lateral aspect of the infratemporal fossa after the periosteum behind the lateral posterior wall of the maxillary sinus is removed
- Identifying the lateral pterygoid muscles
  - Superior and inferior heads of the lateral pterygoid muscle are identified once the pterygopalatine fossa contents are lateralized or dissected.
  - Superior head of lateral pterygoid muscle is above the maxillary artery and the inferior head of the pterygoid muscle is below the maxillary artery



**Figure 3:** Muscular anatomy of the infratemporal fossa. A- Identification of the superior and inferior heads of the lateral pterygoid muscles after lateral mobilization of the pterygopalatine fossa contents. B- The zygomatic, deep, and lateral parts of the temporalis muscle can be seen lateral to the contents of the pterygopalatine fossa.

Abbreviations: B = Bone; DPA = Descending palatine artery; IOA = Infraorbital artery; ION = Infraorbital nerve; LPM = Lateral pterygoid muscle; N = Nerve; PPF = Pterygopalatine fossa; SPA = Sphenopalatine artery; V2 = Maxillary nerve.

## CONCLUSIONS

Through illustrative dissections, we present a practical guide to aid in understanding the surgical anatomy of the infratemporal and pterygopalatine fossae.

Cadaveric dissection video

