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Endoscopic approach to the infratemporal fossa

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KEYWORDS

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V3

Abstract *Introduction:* Multiple surgical approaches have been described to access the infratemporal fossa. One of them is the endoscopic endonasal transpterygoid approach to the infratemporal fossa. The endoscopic endonasal transpterygoid approach is considered the best to access the midline structures such as the nasopharynx, Eustachian tube, sella, and clivus. Through this work, we try to describe the anatomical structures and landmarks of the infratemporal fossa from the endosopic endonasal transpterygoid point of view.

Methods: A cadaveric study was performed on five adult specimens. Endoscopic medial maxillectomy and complete resection of the posterior wall of the maxillary antrum were performed. Extension of the medial maxillectomy anteriorly was done to reach the lateral part of the infratemporal fossa. Endoscopic Denker's or Sturman–Canfield approach was done. Dissection of the pterygopalatine fossa was done with identification of maxillary artery branches, V2 (maxillary nerve) and masticatory muscles. Resection of the lateral pterygoid muscle and drilling the lateral pterygoid plate improve exposure of the infratemporal fossa, including V3 (mandibular nerve), which lies posterior to the lateral pterygoid plate.

Results: A total of ten infratemporal and pterygopalatine fossae (five cadaveric specimens) were dissected endoscopically using a transpterygoid approach. Dissection of different anatomical structures in the infratemporal fossa was done to describe the anatomical structures and landmarks of the infratemporal fossa.

Abbreviations: LPM, lateral pterygoid muscle; ICA, internal carotid artery; IMA, internal maxillary artery; TMJ, tempromandibular joint.

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Conclusions: Endoscopic endonasal transpterygoid approach is considered one of the most useful surgical solutions to manage selected tumors that involve the infratemporal fossa. A good understanding of the endoscopic anatomy of infratemporal fossa allows safe and complete resection of lesions arising or extending to infratemporal fossa.

1. Introduction

The infratemporal fossa is present below the middle cranial fossa floor, posterior to the maxillary sinus, medial to the ramus of the mandible, and lateral to the nasopharynx. The infratemporal surface of the greater wing of the sphenoid bone forms its roof. The lateral pterygoid plate forms its medial wall. The insertion of temporalis muscle into the coronoid process, the mandibular ramus and condylar process of mandible constitute the lateral boundary of the infratemporal fossa.[1–3]

The infratemporal fossa contains the lateral and medial pterygoid muscles, and important neurovascular structures, such as the mandibular nerve (V3) and the internal maxillary artery. Caudally, the infratemporal fossa is occupied by the medial pterygoid muscle, that inserts into the angle of mandible. Posteromedially, the infratemporal fossa contains the carotid sheath (internal carotid artery [ICA], internal jugular vein, and cranial nerves IX–XII) in the poststyloid part of parapharyngeal space.[1–3] Other contents of the infratemporal fossa include the pterygoid venous plexus, maxillary vein, and the branches of mandibular nerve and chorda tympani nerves. Medially, the infratemporal fossa communicates with the pterygopalatine fossa via the pterygomaxillary fissure.[2,3]

Multiple surgical approaches to the infratemporal fossa have been described including lateral preauricular and postauricular approaches, anterior trans-maxillary, and inferior transmandibular approaches.[3] Anterior surgical approaches to the infratemporal fossa include the sublabial transmaxillary approach, Le Fort osteotomies, maxillary swing, and facial translocation.[4] Endoscopic endonasal transpterygoid approaches have been described to manage multiple pathologies in the paramedian and lateral skull base.[5]

Endoscopic endonasal transpterygoid approaches were first described to access the lateral recess of the sphenoid sinus and was then expanded to manage lesions of the middle cranial fossa and infratemporal fossa.[5–7] Understanding the anatomic landmarks of the infratemporal fossa from the endoscopic view is important before doing the endoscopic endonasal transpterygoid approaches.[8–10]

In this work, we studied the anatomy of the infratemporal fossa from the endoscopic view through applying the endoscopic endonasal transpterygoid approach.

2. Materials and methods

We studied five human anatomic specimens, dissecting the infratemporal fossa and pterygopalatine fossa bilaterally, in accordance with institutional protocols. Using a standardized method, all specimens were injected with red and blue silicone, through the internal carotid artery and internal jugular vein, respectively.

Visualization was facilitated by the use 0°, 30°, and 45° rod lens endoscopes coupled to a high definition camera and monitor (Storz Endoscopy, Tuttlingen, Germany). The surgical dissection was performed using paranasal sinus and skull base/neurosurgical endoscopic instruments (Storz), and a high-speed drill with angled hand-piece, and diamond and cutting burrs (Total Performance System, Stryker, Kalamazoo, MI, USA).

Photographs were taken with 0°, 30°, and 45° rod lens endoscopes coupled to an HD camera and monitor (Storz Endoscopy, Tuttlingen, Germany).

3. Results

A total of ten infratemporal and pterygopalatine fossae (five cadaveric specimens) were dissected endoscopically using a transpterygoid approach. Access was obtained after performing an endoscopic medial maxillectomy and the complete resection of the posterior wall of the antrum. The latter was accomplished using Kerrison rongeurs, starting its removal at the anterior aspect of the sphenopalatine foramen, and proceeding in a medial to lateral direction.

The lateral exposure provided by a medial maxillectomy, performing posterior septectomy may enhance this angle of approach. To dissect the most lateral aspect of the infratemporal fossa, however, it is best to extend the medial maxillectomy anteriorly with or without displacing the nasolacrimal duct. To reach the most lateral part of the infratemporal fossa, we remove the pyriform aperture and ascending process of the maxilla (endoscopic Denker's or Sturman–Canfield approach). This is done by making a vertical incision just anterior to the head of the inferior turbinate, directly over the edge of the aperture. Extension of the dissection laterally, following a subperiosteal plane, exposes the entire anterior maxilla till the infraorbital foramen and its corresponding nerve and vessel.

After dissecting the periosteum and the fat of the pterygopalatine fossa, the main branches of the third part of the internal maxillary artery were identified including the infraorbital, descending palatine, vidian, sphenopalatine, and posterior nasal arteries (Fig. 1). All branches were transected to expose the underlying neural structures including the infraorbital, descending palatine, vidian, and pharyngeal nerves.

The infraorbital nerve traversing the infraorbital fissure is dissected, just after arising from the maxillary nerve near the foramen rotundum, and before entering the infraorbital canal. This portion of the infraorbital nerve accurately defines the border between the infratemporal fossa and pterygopalatine fossa.

Wide exposure of the infratemporal fossa requires complete removal of the posterior wall from floor to roof of the maxillary sinus. Removal of bone from the floor and lateral wall of the sphenoid sinus exposes the bone comprising the floor of