Endoscopic Access to the Middle Fossa: A Cadaveric Comparative Analysis Between Lateral Transorbital and Endonasal Transpterygoid Endoscopic Approaches

Sergio Augusto Barbosa de Farias, MD[1,2]; Aysu Iyigun Kabakci, MD[2]; Gabriel Vargas Rosales, MD[2,3]; Elena Rosellini, MD[2,4]; Cezar Kabbach Calaça Prigenzi[2]; Cleiton Formentin, MD, PhD[1]; Enrico Ghizoni, MD, PhD[1]; Joao Paulo Almeida, MD, PhD[2]
[1]Departament of Neurosurgery, State University of Campinas, Campinas, São Paulo, Brazil; [2]Department of Neurosurgery, Neurosciences Institute, Indiana University, Indianapolis, IN, US; [3]Department of Neurosurgery, Universidad Militar Nueva Granada, Hospital Militar Central, Colombia; [4]Department of Neurosurgery

INTRODUCTION:

Endoscopic approaches have advanced in recent years for skull base lesions, offering expanded access to laterally located pathologies, such as those in the middle fossa. However, this region remains challenging. While the endoscopic endonasal transpterygoid approach allows access to the middle fossa, it is associated with potential risks to pterygopalatine fossa structures, such as dry eye syndrome (Vidian nerve injury) and facial numbness (V2 injury). Therefore, alternative approaches, such as the lateral transorbital endoscopic approach, were introduced to access lateral skull base regions, bypassing these vital structures.

The primary objective of this study is to analyze two endoscopic pathways, the transpterygoid and the lateral transorbital approach for accessing the middle fossa. Through this comparison, we aim to delineate the distinct anatomical characteristics, surgical extension capabilities, and clinical applications of both acess routes.

METHODS:

Five formalin flushed silicon injected alcohol preserved (70%) cadaveric head specimen were dissected endoscopically for both approaches, and images were captured via rigid endoscopes, coupled to an endoscopic tower with a screen. This work involved a descriptive, qualitative anatomical study conducted through cadaveric dissection. Both approaches were performed on the same side of all cadaveric specimen to ensure a direct comparative analysis under identical anatomical conditions.

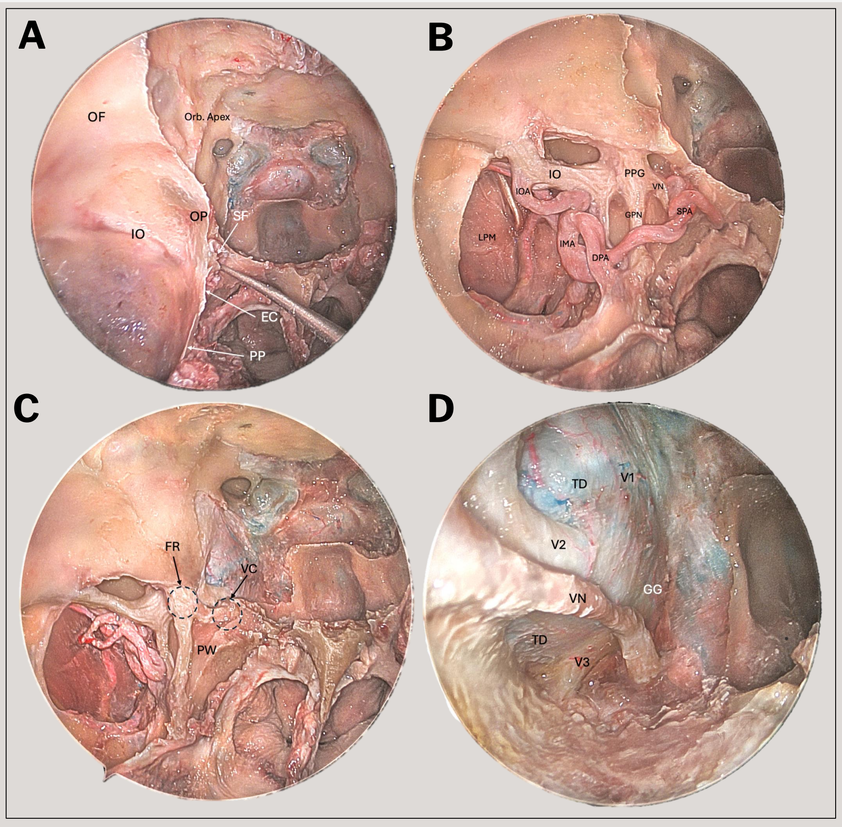

Figure 1. Endoscopic Endonasal Transpterygoid Approach: Step-by-step dissection from the wide maxillary antrostomy and pterygoid process drilling to the full exposure of the middle cranial fossa base.

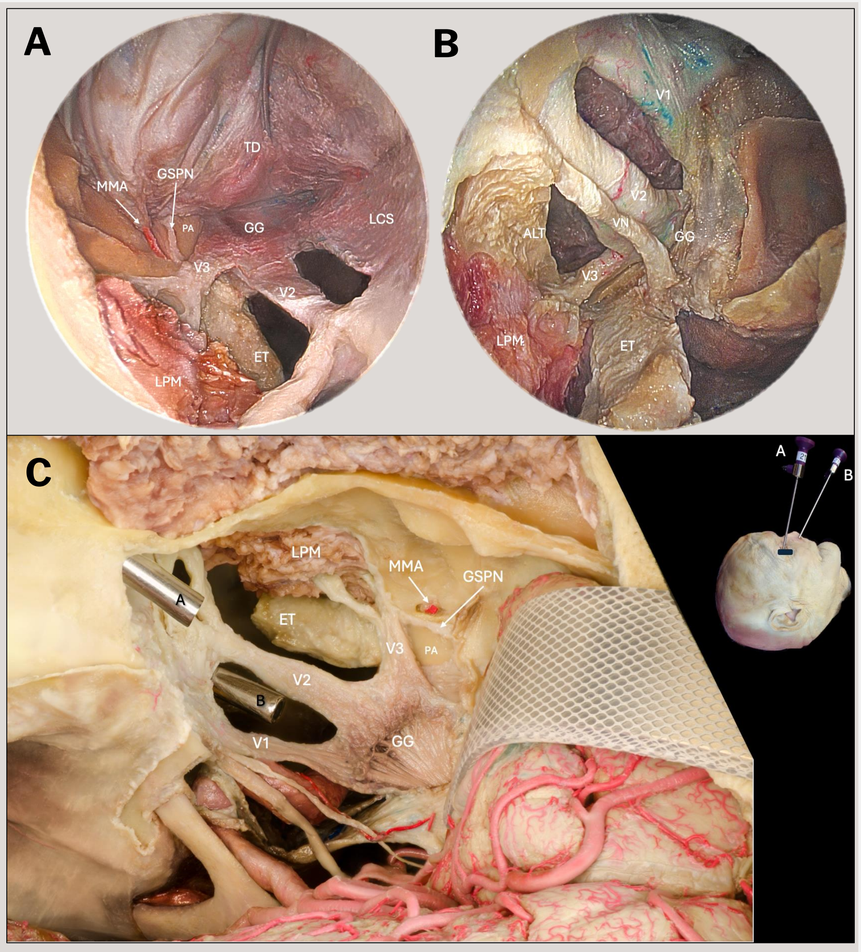

Figure 3. Comparative middle fossa exposure via Lateral Endoscopic Transorbital (A) and Endoscopic Endonasal Transpterygoid (B) approaches, demonstrating the convergence of both surgical corridors in a superior microsurgical view (C).

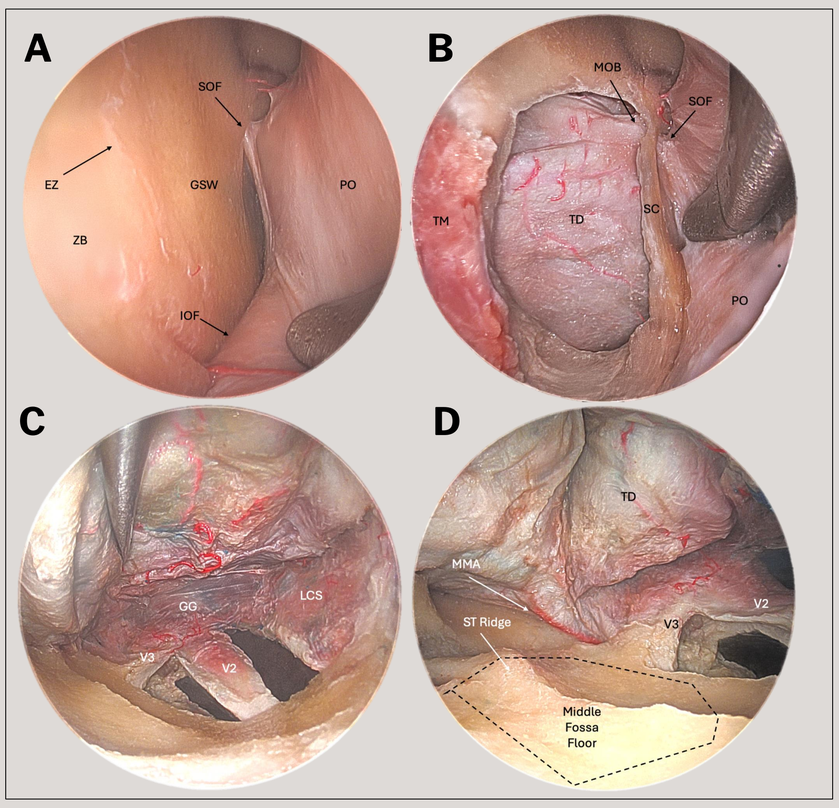

Figure 2. Lateral Endoscopic Transorbital Approach: Step-by-step dissection from the superior eyelid incision and greater sphenoid wing drilling to the full exposure of the middle cranial fossa floor.

RESULTS:

1. ANATOMICAL RATIONALE & SURGICAL LIMITS

Transpterygoid Approach: Requires traversing the pterygopalatine fossa, exposing the Vidian nerve, V2, and sphenopalatine artery to risk.

Lateral Transorbital Approach: Provides a direct lateral corridor that remains lateral to the cavernous sinus, effectively sparing pterygopalatine structures.

The Boundary: The lateral wall of the Cavernous Sinus defines the safe medial limit.

2. ANGLE OF ATTACK & INDICATION

Transorbital Advantage: Offers a superior trajectory for lesions located lateral to the Cavernous Sinus.

Transpterygoid Advantage: Ideal for lesions extending from the middle fossa to medial regions, including the parasellar area, sellar region, and sphenoid lateral recess.

3. THE COMBINED APPROACH (MULTI-PORTAL)

Synergy: The Transorbital corridor acts as an auxiliary port for lateral visualization and dissection.

Vascular Control: Complements the Endonasal route, which provides superior proximal vascular control for complex, extensive tumors.

CONCLUSIONS:

Both the Endoscopic Transorbital and Endoscopic Transpterygoid approaches are feasible, minimally invasive corridors to the middle cranial fossa. However, the Lateral Endoscopic Transorbital Approach emerges as a valuable alternative, offering a direct route that effectively preserves the critical neurovascular structures of the pterygopalatine fossa inherent to the transpterygoid path.

REFERENCES:

Scan Me

Abbreviations:
DPA = Descending Palatine Artery; EC = Ethmoidal Crest; ET = Eustachian Tube; EZ = Sphenozygomatic Suture; FR = Foramen Rotundum; GG = Gasserian Ganglion; GPN = Greater Palatine Nerve; GSPN = Greater Superficial Petrosal Nerve; GSW = Greater Sphenoid Wing; IMA = Internal Maxillary Artery; IO = Infraorbital Nerve; IOA = Infraorbital Artery; IOF = Inferior Orbital Fissure; LCS = Lateral Wall of Cavernous Sinus; LPM = Lateral Pterygoid Muscle; MMA = Middle Meningeal Artery; MOB = Meningo-Orbital Band; OF = Orbital Floor; OP = Orbital Process of the Palatine Bone; Orb. Apex = Orbital Apex (Sphenoid Bone); PA = Petrous Apex; PO = Periorbita; PP = Perpendicular Plate of Palatine Bone; PPG = Pterygopalatine Ganglion; PW = Pterygoid Wedge; SC = Sagittal Crest; SF = Sphenopalatine Foramen; SOF = Superior Orbital Fissure; SPA = Sphenopalatine Artery; ST Ridge = Subtemporal Ridge; TD = Temporal Dura; TM = Temporal Muscle; VC = Vidian Canal; VN = Vidian Nerve; ZB = Zygomatic Bone.

Contact:
Sérgio Augusto Barbosa de Farias
Adress: Department of Neurology and Neurosurgery School of Medical Sciences (FCM) – University of Campinas (UNICAMP) Rua Vital Brasil, 251 – Cidade Universitária Campinas, São Paulo, Brazil. Zip Code: 13083-888
Email: sergioabfarias@gmail.com
Phone: +55 (92) 982684135