Analysis of Maneuverability at the Petroclival Region: A Cadaveric Anatomical Study of the Transcochlear and Endoscopic Endonasal Transclival Approach

Alejandra Rodas, Leonardo Tariciotti, Youssef Zohdy, Roberto Soriano, Edoardo Porto, Jackson R Vuncannon, Juan M Revuelta-Barbero, Biren K Patel, Emily Barrow, Tomas Garzon-Muvdi, Gustravo Pradilla, C. Arturo Solares

INTRODUCTION

The petroclival region and cerebellopontine angle represent areas of anatomical complexity at the skull base. An adequate access route must be prioritized, limiting the potential injury of critical neurovascular structures. The transcochlear approach is a lateral corridor that offers suitable exposure and control of structures such as the petrous internal carotid artery. However, this procedure must be carefully indicated due to the functional losses it entails, including hearing loss and, possibly, facial nerve paralysis. The endoscopic endonasal approach, on the other hand, presents the advantage of limiting brain retraction and improving time of recovery.

METHOD

Four embalmed human cadaveric specimens were used for anatomical dissection. The petroclival region was exposed through the transcochlear (Fig. 1A-C) and endocopic endonasal transclival approaches (Fig. 1D). Through imaging-based navigation, stereotactic annotation points were collected. The corridor's volume was assessed for both the endoscopic and lateral approach. The area of exposure at the ventral aspect of the pons was measured, along with a differentiation of the areas lateral and medial to cranial nerve VI. The length of cranial nerves VI, IX, and X, and basilar artery was determined. Angles of attack were collected for critical neurovascular structures on each of the exposed surgical fields.

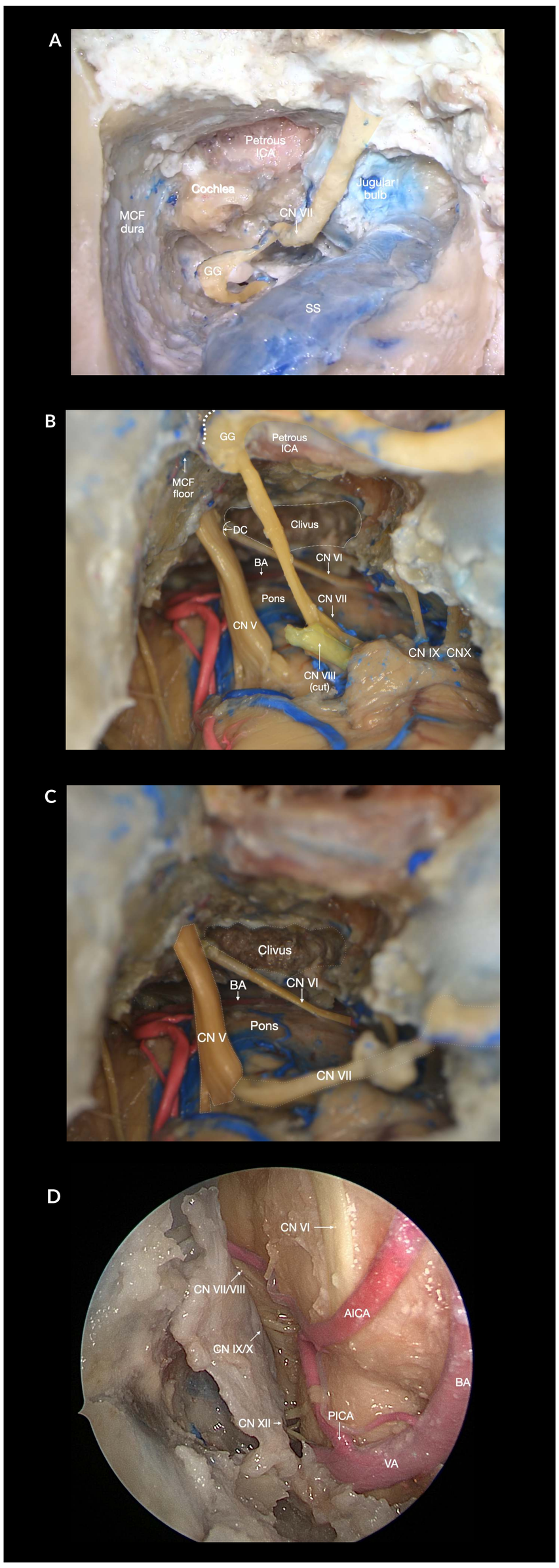

Figure 1. Dissection of (A-C) Transcochlear and (D) Transclival Approach

RESULTS

The endoscopic transclival corridor provided greater anteromedial exposure in relation to cranial nerve VI, improving maneuverability for lesions crossing the midline. The transcochlear approach provided greater exposure posterolateral to cranial nerve VI, in addition to exposure of the cerebellopontine angle. Maneuverability around cranial nerve VI at Dorello's canal was improved through the lateral corridor given its direct trajectory for instrumentation and visualization. Maneuverability around cranial nerves IX and X was also favored by the transcochlear approach.

Transclival Approach	
Measurement	**Mean (SD)**
Distances (mm)	
BA	20.0 (3.16)
CN IX and X	6.9 (1.47)
CN VI	18.34 (4.53)
Areas (mm2)	
Exposed pons medial to CN VI and lateral to BA	133.56 (31.85)
Exposed pons lateral to CN VI	119.98 (28.17)
Angles of Attack (°)	
Upper Point BA Vertical	6.74 (2.04)
Upper Point BA Horizontal	4.17 (0.66)
DC Vertical	5.09 (2.15)
DC Horizontal	5.88 (0.73)
CN IX and X Vertical	6.18 (1.24)
CN IX and X Horizontal	5.57 (0.71)

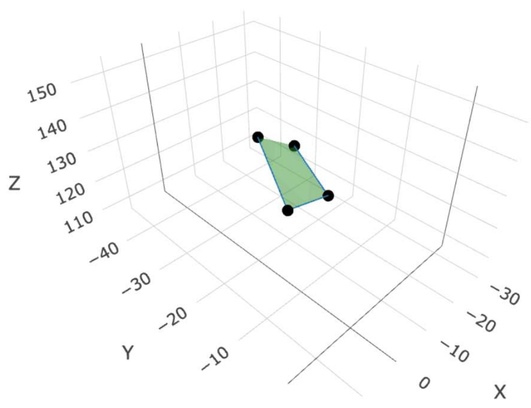

Figure 2. Transclival: Area lateral to CN VI

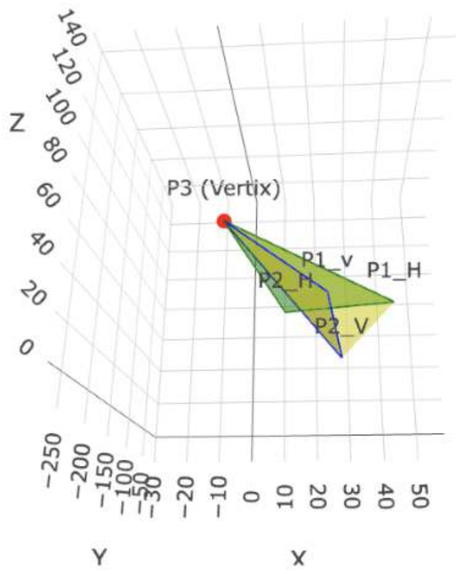

Figure 3. Transclival: Angles of Attack for Dorello's canal

Transcochlear Approach	
Measurement	**Mean (SD)**
Distances (mm)	
BA	10.36 (0.27)
CN IX and X	7.34 (1.12)
Petrous ICA	10.18 (1.28)
CN VI	11.35 (2.41)
Areas (mm2)	
Clivus	47.82 (13.7)
Exposed pons medial to CN VI and lateral to BA	70.97 (25.29)
Exposed pons lateral to CN VI	126.85 (43.14)
Angles of Attack (°)	
Upper Point BA Vertical	26.54 (0.21)
Upper Point BA Horizontal	21.35 (3.62)
DC Vertical	29.94 (4.86)
DC Horizontal	24.23 (0.32)
CN IX and X Vertical	60.05 (0.06)
CN IX and X Horizontal	38.98 (4.61)

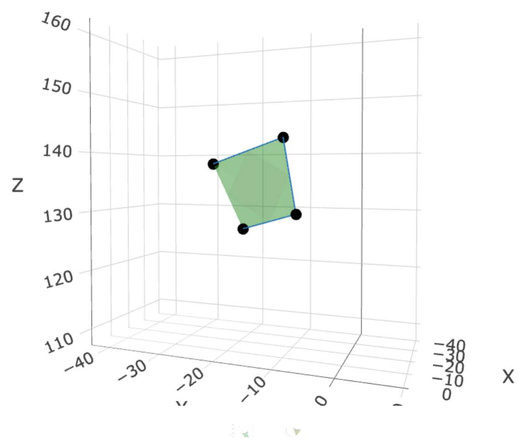

Figure 4. Transcochlear: Area lateral to CN VI

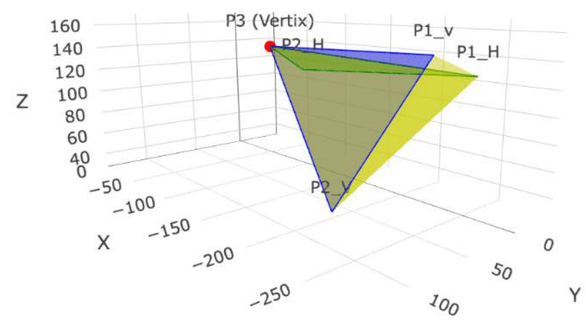

Figure 5. Transcochelar: Angles of Attack for Dorello's canal

CONCLUSION

The endoscopic endonasal approach provides adequate exposure anteromedial to cranial nerve VI, with significantly less bone drilling and anatomy distortion. Lateral corridors should be considered when lesions have considerable posterolateral extension. The transcochlear approach provides adequate exposure laterally, with additional control of the petrous carotid, yet it completely abolishes hearing function and patient selection should be carefully planned.