The Infralabyrinthine Route to the Petrous Apex: A Comparison of the Extradural Infralabyrinthine and Retrosigmoid Intradural Inframeatal Approaches

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Introduction

The extradural infralabyrinthine approach (ILA) is often preferred in patients with lesions of the petrous apex (PA) and serviceable hearing. Recently, the retrosigmoid intradural inframeatal approach (RIIA) was described as a viable alternative with successful results. Since the ILA and the RIIA share the same surgical corridor, we compare both techniques anatomically.

Methods

Three adult cadaveric heads (4 sides) underwent RIIA and ILA approaches to study the neurovascular structures and surgical landmarks. Dimension of the surgical window, area of exposure, angle of view, and depth of field were measured and compared The ILA surgical window was defined as the quadrangular area limited by the presigmoid posterior fossa dura posteriorly, the vertical segment of the facial nerve anteriorly, the bony posterior semicircular canal superiorly, and the jugular bulb inferiorly (Figure 1).

Figure 1A. Infralabyrinthine Approach.

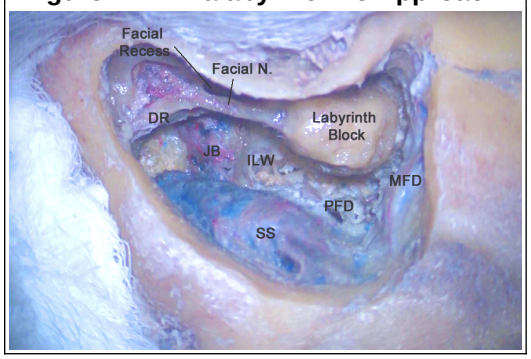
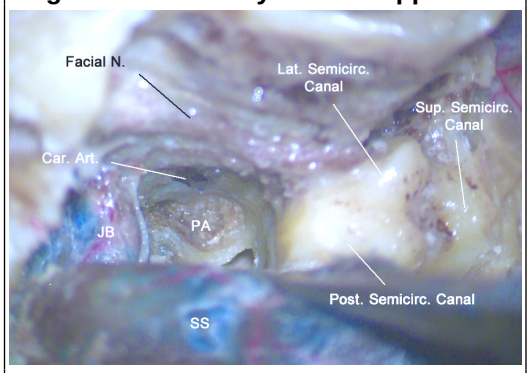


Figure 1B. Infralabyrinthine Approach.



Left side following complete mastoidectomy. DR, digastric ridge; ILW, infralabyrinthine window; JB, jugular bulb; MFD, middle fossa dura; PA, petrous apex; PFD, posterior fossa dura; SS, sigmoid sinus.

The RIIA surgical window was defined as the quadrangular area limited by the presigmoid posterior fossa dura anteriorly, the IAC superiorly, CN IX inferiorly, and the most medial inframeatal bone opening posteriorly (Figure 2).

Figure 2A. Retrosigmoid Intradural Inframeatal Approach.

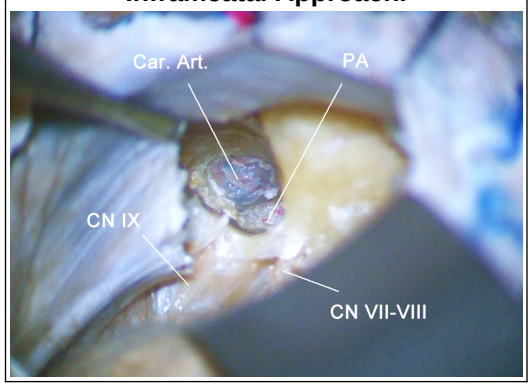
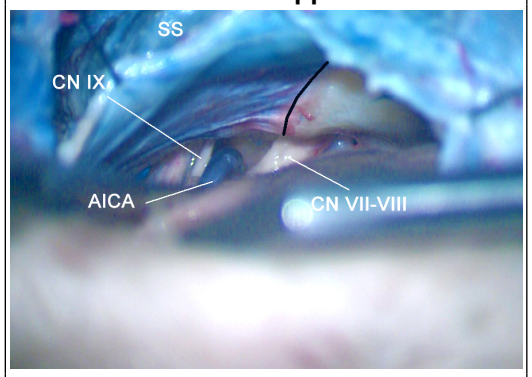


Figure 2B. Retrosigmoid Intradural Inframeatal Approach.

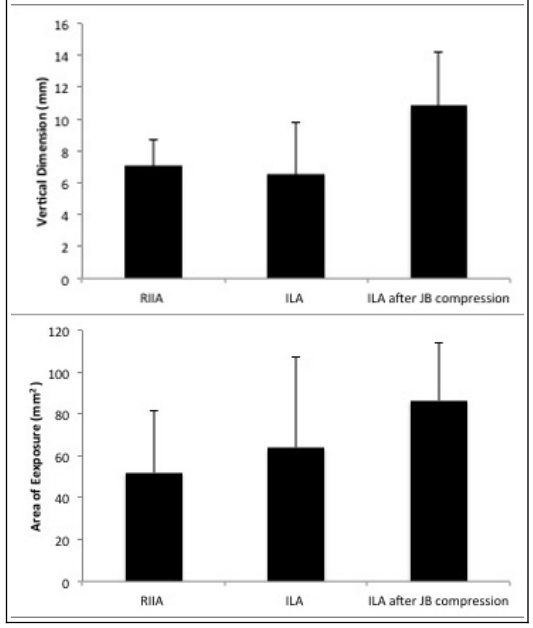


Left side. The lower and middle neurovascular complexes. AICA, anterior inferior cerebellar arterty; Car. Art.; posterior vertical segment of the internal carotid artery; JB, jugular bulb; PA, petrous apex; SS, sigmoid sinus.

Results

The average vertical dimensions for the ILA and RIIA were 6.56 and 7.07 mm, respectively; and the average areas of exposure were 63.77 and 51.95 mm2, respectively (Figure 3). Horizontal dimensions were similar in both approaches. After detachment and slight retraction of the jugular bulb, the vertical dimensions of the ILA further increased to 10.86 mm (range: 7.49–14.23 mm) and the area of exposure increased to 86.40 mm2 (range: 58.81–114 mm2). The depth of surgical field at the petrous apex in the RIIA (mean: 48 mm) was deeper than that of the ILA (mean: 41.7 mm), and the angle of view was directed toward internal carotid artery.

Figure 3. Comparison of ILA and RIIA Window Dimensions.



Conclusion

The extradural ILA provides a larger area of exposure compared to the RIIA in normal anatomical specimens. The RIIA provides access to the PA via a 15% deeper corridor compared to the ILA. Additionally, the surgical field of the ILA is directed to the PA whereas the RIIA is directed to the posterior vertical ICA. The ILA to the petrous apex is a time-consuming and technically demanding approach but the RIIA requires cerebellar retraction and places the endolymphatic sac at risk of injury.