Beyond Traditional Boundaries: A Skull Base Morphometric Cadaveric Study of the Novel Contralateral Nasofrontal Trephination Approach to the Lateral Recess of the Sphenoid Sinus

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Background

- The lateral recess (LR) of the sphenoid is a pneumatized cavity that extends beyond a line drawn from the foramen rotundum to the vidian canal.
- Traditional endoscopic endonasal approaches to the LR like the transpterygoid approach (TPA) are commonly employed but can



involve significant morbidity due to extensive dissection and manipulation of critical structures.

 This study introduces and evaluates the feasibility, anatomical aspects, and limitations of a novel Contralateral Nasofrontal Trephination (CNT) technique, aimed at reducing morbidity and improving surgical outcomes.

Methods and Materials

- Twenty fresh cadaveric specimens (25 LRs due to asymmetrical pneumatization) were dissected. Each specimen underwent bilateral spheno-ethmoidectomies with full exposure to the LR of the sphenoid. The vidian canal was exposed and the vidian nerve was preserved. Subsequently, a nasofrontal incision and trephination were performed on the contralateral side.
- Quantitative measures of the area of exposure (AoE) and volume of surgical freedom (VSF) were obtained for each port, and statistical analyses were performed using the Shapiro-Wilk test and paired ttests, with a significance level of 5%.



Figure 3. Endoscopic view through the nostril.

(A)Initial view upon scope entry through the nostril, showing an extensively dissected nasal cavity, with a dissector entering through the CNT port and reaching the contralateral LR.
 (B)Close-up view of the left LR with an angled scope. Note how the CNT port provides an optimal

trajectory to reach even the lateralmost aspect of the contralateral LR.

Results

Area of Exposure (AoE):

- CNT approach: 314.03 ± 40.74 mm².
- EEA: 276.27 ± 40.76 mm².
- CNT provided a significantly larger AoE (p < 0.001).

Volume of Surgical Freedom (VSF):

- EEA: 2191.39 ± 23.75 cc.
- CNT approach: 1664.32 ± 65.15 cc.
- EEA offered significantly greater VSF (p < 0.001).



Figure 1. Step-by-step dissection showing the contralateral trephination. The skin incision is just medial to the eyebrow (A). Bone exposure should show the sutures joining the Frontal Bone, Nasal Bone and Frontal process of the Maxilla (B). Drilling should begin at the union of these bones and directed medially and inferiorly (C), in order to expose the fronto-ethmoidal recess.



Figure 4. Illustrative charts presenting the results of the study. Box-plots comparing the AoE (A) and VSF (B) between the CNT approach and the EEA. Raincloud plots comparing the AoE (C) and VSF (D) between the CNT approach and the EEA.

Conclusions

 By avoiding extensive dissection near the Vidian Canal and pterygopalatine fossa, the CNT approach is likely to mitigate the risk of complications such as hypoesthesia, dry eye, and other sensory

Figure 2. Endoscopic view through the CNT port.
(A) Initial view upon scope entry through the CNT port, highlighting the Anterior Ethmoidal Artery (AEA) along the roof of the anterior ethmoidal cells, posterior to the fronto-ethmoidal recess.
(B) Exposed sphenoid sinus via the CNT port, demonstrating full visualization of the contralateral LR and accessibility for instrument insertion through the nostril to reach it.



- This dual-port strategy, using the CNT for either the endoscope or instruments while utilizing the nostrils for additional instruments or the endoscope, maximizes the advantages of both approaches.
- The reduced VSF may impact the CNT's suitability for more complex surgical procedures requiring extensive dissection. Despite this, for focal pathologies such as bone defects associated with CSF leaks and encephaloceles, the CNT approach offers good maneuverability.