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MEDICINE

Anatomical Insights into the Inferior Compartment of the Cavernous Sinus: A Detailed Reappraisal in Endoscopic Endonasal Surgery

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OBJECTIVE

The inferior compartment of the cavernous sinus (CS) plays a critical role in endoscopic endonasal surgery, serving as the “safest entry zone” for accessing the CS and as a pivotal hub for navigating to other compartments. This study aims to delineate the anatomical landmarks of this compartment and explore the surgical implications involved in tumor resection.

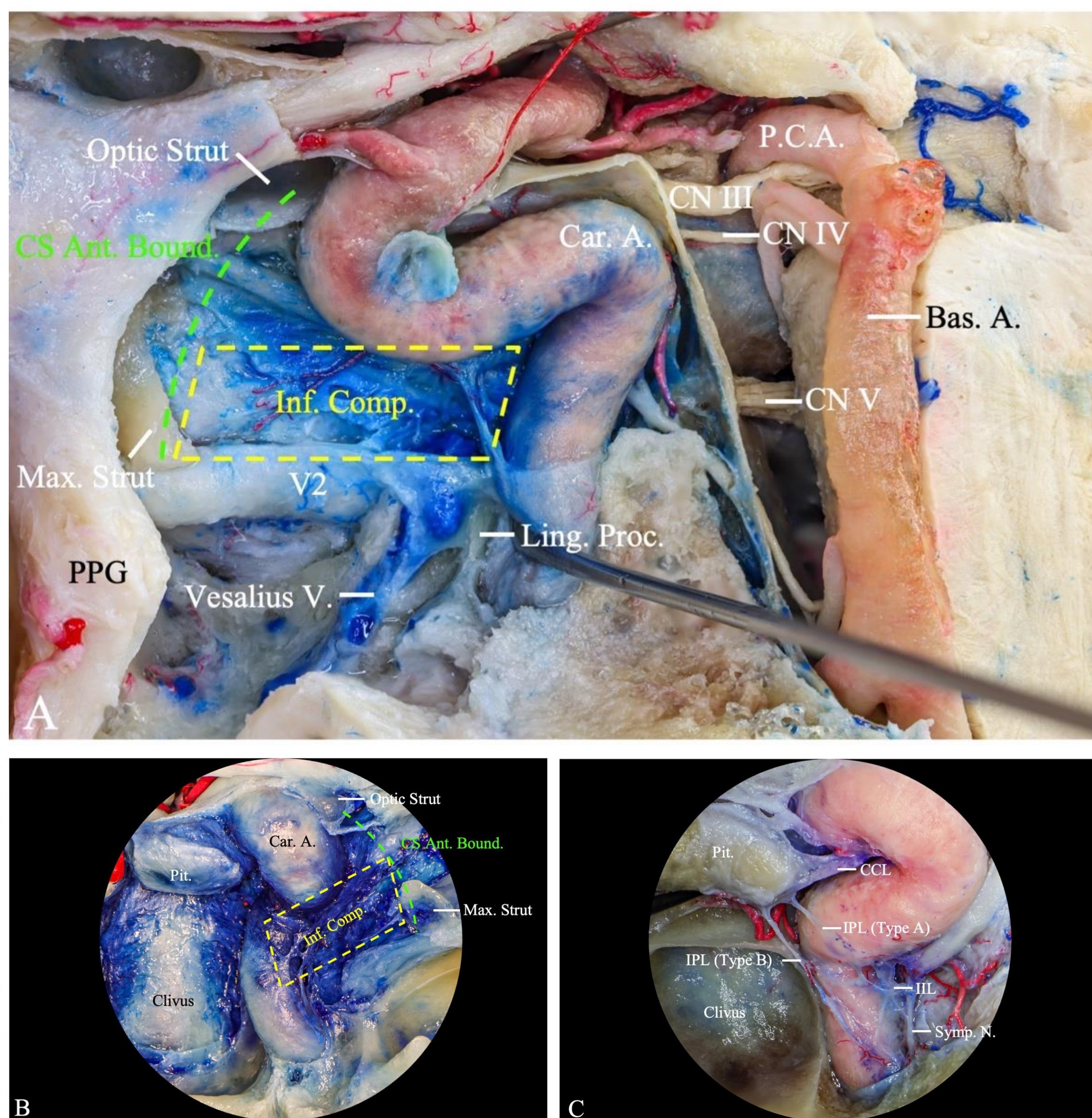


Figure 1. Microsurgical anatomy of inferior compartment of cavernous sinus.

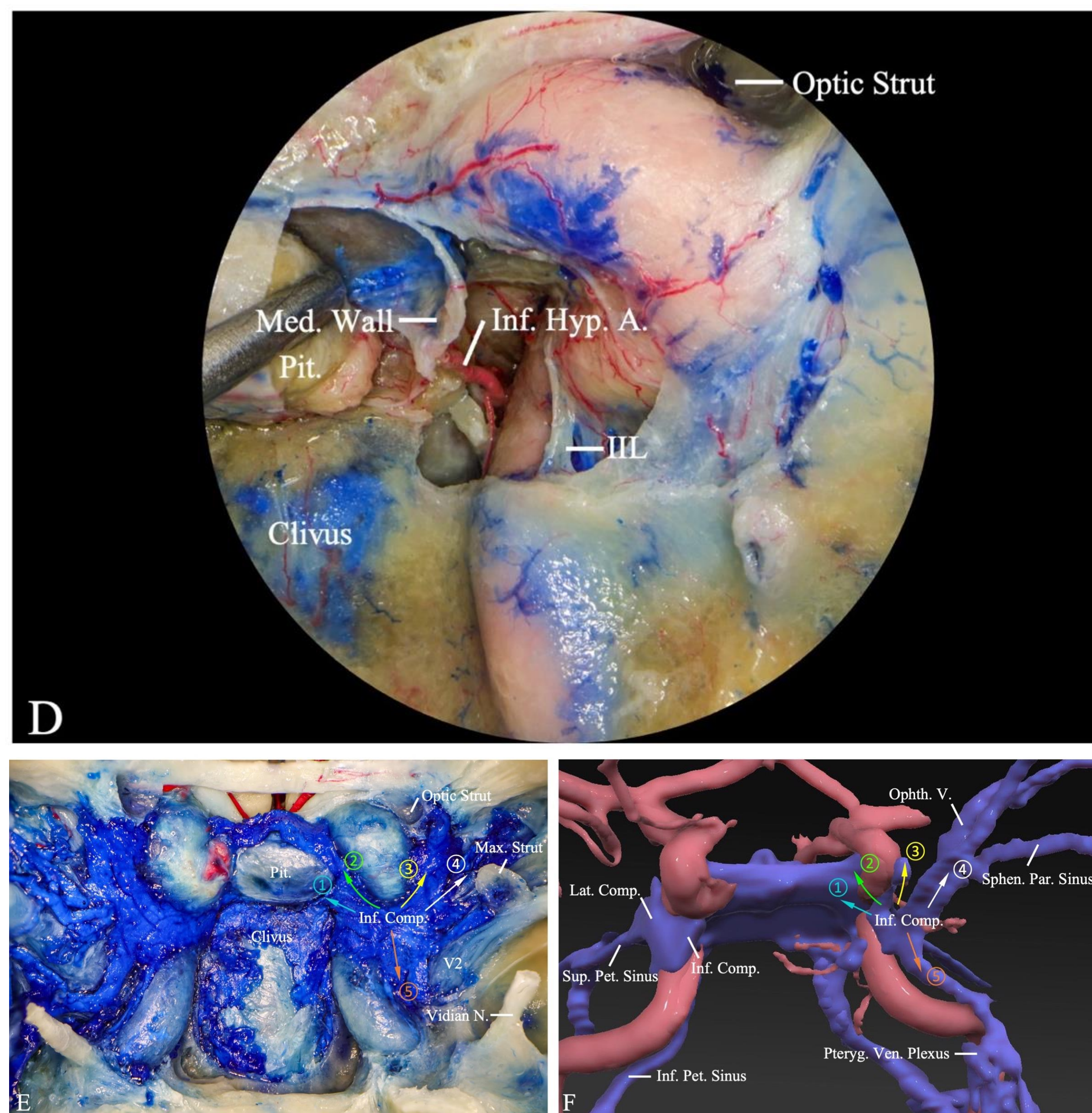
A., artery; Ant., anterior; Car., carotid; CCL, caroticoclinoid ligament; Clin., clinoid; CN, cranial nerve; Dist. Ring, distal dural ring; Dor., dorsal; Ling., lingual; Max., maxillary; Med., medial; Men., meningeal; MCP, middle clinoid process; N, nerve; Ophth., ophthalmic; Pit., pituitary; Post., posterior; Proc., process; Prox. Ring, proximal dural ring; Symp., sympathetic; Tent., tentorial; Tri., triangle; V1, ophthalmic nerve; V2, maxillary nerve.

METHODS

Thirty-nine colored-silicone-injected specimens were utilized in this study, in which nineteen underwent transcranial dissection and twenty were dissected using an endoscopic endonasal approach. Two illustrative cases highlighting the technique nuances in the inferior compartment were included to contextualize the anatomical findings.

RESULTS

The boundaries of the inferior compartment are defined by the inferior surface of the horizontal subsegment of the cavernous internal carotid artery (ICA) superiorly, the short vertical subsegment of the cavernous ICA posteriorly, and imaginary lines extending from the upper surface of the lingual process to the maxillary strut inferiorly, and the lower portion of an imaginary line extending from the maxillary strut to the optic strut anteriorly. Three distinct morphological types of inferior parasellar ligament are identified: Type-A is anchored medially at the medial wall of the CS and laterally at the inferior surface of the horizontal subsegment of ICA and the adjacent dura; Type-B, similar to Type-A but with a more inferior lateral anchor at the anterior wall of the clival ICA; Type-C is oriented vertically with its upper anchor located beneath the horizontal subsegment, and its lower anchor at the anterior wall of the clival ICA. Additionally, five venous outlets of the inferior compartment were identified, facilitating significant venous communications with other CS compartments and extra-CS venous structures.



CONCLUSION

This study elucidates the complex anatomical intricacies of the inferior compartment of the CS, enhancing the safety and efficacy of the endoscopic endonasal approach. Detailed knowledge of key surgical landmarks significantly improves surgical outcomes, reducing the risk of complications.

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