The Evolution of Endoscopic Approaches to the Lateral Cavernous Sinus

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The endonasal endoscopic approaches undoubtedly pushed the envelope in the treatment of skull base lesions. However, large midline tumors with lateral extension beyond the cavernous sinus and ICA are still a challenge despite the improvement of surgical techniques and instrumentation. Surgeons are faced with a situation of decision making between an endonasal and a transcranial approach when treating these tumors, and frequently more than one approach is required if the goal is a gross total resection.

In this context, we read with great interest the recent paper by Bly et al.[1] In this anatomical study the authors evaluated the feasibility of performing a transorbital endoscopic approach to the lateral cavernous sinus. The authors used a navigation system to evaluate approach trajectories with preservation of the orbital rim and defined the area of the greater wing of the sphenoid bone that required removal. Anatomical dissections were performed in three preserved latex-injected cadaver heads. A lateral retrocanthal endoscopic approach provided access to the orbit and enabled the bone removal with an ultrasonic bone aspirator. Once the approach was complete, the navigation system was used again to evaluate anatomical exposure.

Bly et al achieved an adequate working corridor with medial orbital retraction < 9 mm and obtained access to the orbital apex in addition to the cavernous sinus, middle fossa floor, Meckel cave region, and their associated neurovascular structures. They highlighted the strengths and limitations of the lateral transorbital endoscopic approach.

We have also studied multiport endoscopic approaches and agree with the authors about the potential benefits of minimally invasive routes used solely or in adjunct to the endonasal approach.[2,3] The lateral reach limitation of the endoscopic endonasal surgery may be overcome by the use of a supplemental transcranial endoscopic approach that provides view and working space directly to the parasellar and paraclival regions ("beyond" the nerves).

Different transcranial endoscopic routes (supraorbital, transorbital, pterional, or subtemporal) have been described to access the lateral cavernous sinus and Meckel cave regions.[1–4] Although they are all directed to the parasellar and paraclival regions, each approach has an advantageous working corridor. The knowledge of the anatomical limitations of each approach is essential to obtain the desired exposure. The supraorbital endoscopic approach provides an anterior superior route to the lateral cavernous sinus region, but it requires the use of angled endoscopes if a more inferior exposure is needed.[4] The lateral transorbital endoscopic approach offers access to the anterior inferior lateral cavernous sinus region, but the superior orbital fissure (SOF) limits the exposure superiorly.[1] The pterional endoscopic approach provides a lateral route to the same region exposed by the supraorbital approach and permits better inferior working corridor of the lateral cavernous sinus (unpublished data). The subtemporal endoscopic approaches provide good inferior posterior access to the lateral cavernous sinus. It also provides access superiorly above the SOF, but it has the disadvantage of the temporal lobe retraction.[2]

The concept of approaching skull base lesions exclusively with dual-port or multiport endoscopy (the combination of the endonasal and a transcranial approaches) is still in its infancy. It may ease mobilization and removal of mass lesions, assist anatomical orientation, and provide circumferential visualization of neurovascular structures, especially when displaced by the tumor. It has the potential to enhance safety and decrease time when dissecting the associated neurovascular structures in midline skull base lesions with lateral extension.

Nonetheless, some aspects of these transcranial endoscopic approaches need to be pointed out. Our experience demonstrates that these narrow corridors may limit the surgical maneuverability and application of microsurgical techniques. This is of particular importance when working in and around

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the neurovascular structures of the cavernous sinus. However, the use of an endoscope significantly improves illumination and provides a wide view of the surgical field if enough working space is achieved.

The limitation of surgical maneuverability can be minimized when the port or keyhole craniotomy (supraorbital, transorbital, pterional, or subtemporal) is placed based on the target area of interest. In addition, the development of multifunction endoscopic instrumentation, as stated by Bly et al, might minimize the crowding through the surgical port. It might even allow work in smaller surgical windows.

Limited brain retraction due to the small bone openings is also a concern. Although it has the obvious benefit of less brain manipulation, sometimes it may hinder adequate exposure of the area of interest. In this article, we had difficulty understanding how the authors maintained temporal lobe retraction to perform bimanual dissection of the lateral cavernous sinus.

At last, we should always keep in mind the risk-to-benefit profile these minimally invasive approaches where the aesthetic result should never be a priority in relation to the patients' safety. In that sense, we still have some doubts of the real benefits by not removing the orbital rim in the lateral transorbital approach.

We are enthusiasts of the subject and believe that these single-port and multiport endoscopic approaches will likely become increasingly popular with the improvement of endoscopic instrumentation and the refinement of robotic neurosurgery. Therefore, we applaud Bly et al for their valuable contribution to the literature and stimulating work in the field of endoscopic surgery.

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