

# Cavernous sinus approaches

The most common surgical approaches involve some variation of the standard [frontotemporal craniotomy](#)

In 1965 Dwight Parkinson <sup>1)</sup> was the first to realize an anatomical study and to propose a surgical [approach](#) to the cavernous sinus (CS). Despite the development of the microsurgical [technique](#) in the seventies, it was thought that [microneurosurgery](#) was reaching its furthest limits in the approach of lesions in and around the CS. The extremely high risk of damaging nervous structures, as well as causing uncontrollable haemorrhage or postoperative CSF [leak](#) seemed to be an unavoidable and insuperable obstacle. Thanks to the anatomical work of [Vinko Dolenc](#) and his surgical experiences, a rational surgical approach was eventually developed and the different relations between the lesion and the neurovascular structures were defined. In Dolenc's book preface, Yasargyl states that "there is no doubt that this type of microsurgical anatomical study is a new step in the 100 year history of neurosurgery" <sup>2)</sup>.

Once this frontier was opened the experiences of other groups of skull base surgeons were added and we started to develop different approaches and new techniques to address these tumours <sup>3) 4)</sup>

New and less invasive endoscopic routes started to flourish. These approaches are less invasive and allow to address the tumour combining two complementary corridors, one antero-lateral and one trans-sphenoidal.

Still, a complete radical removal or the attempt of near total excision with anatomo-functional preservation is a very arduous exercise or even an illusion. The intimacy between tumour, nerves and vessels can be hardly overcome and represents the main unfavourable prognostic factor.

The role of both radiotherapy and radiosurgery to treat the recurrent tumours of the skull base is well known <sup>5)</sup>.

However, it was with the gradual evolution of stereotactic radiosurgery that the method of dealing with the CS pathology has really changed. A multimodal treatment strategy combining surgery with radiotherapy, as well as radiotherapy alone in selected cases, have become the main practice to handle these tumours.

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The surgical [approaches](#) to the [cavernous sinus](#) were examined in 50 adult cadaveric cavernous sinuses using magnification of X3 to X40. The following approaches were examined:

- 1) the superior intradural approach directed through a frontotemporal craniotomy and the roof of the cavernous sinus
- 2) the superior intradural approach combined with an extradural approach for removing the anterior clinoid process and unroofing the optic canal and orbit
- 3) the superomedial approach directed through a supraorbital craniotomy and subfrontal exposure to the wall of the sinus adjacent to the pituitary gland
- 4) the lateral intradural approach directed below the temporal lobe to the lateral wall of the sinus

5) the lateral extradural approach for exposure of the internal carotid artery in the floor of the middle cranial fossa proximal to the sinus

6) the combined lateral and inferolateral approach, in which the infratemporal fossa was opened and the full course of the petrous carotid artery and the lateral wall of the sinus were exposed

7) the inferomedial approach, in which the medial wall of the sinus was exposed by the transnasal-transsphenoidal route. It was clear that a single approach was not capable of providing access to all parts of the sinus. The intracavernous structures best exposed by each route are reviewed. The osseous relationships in the region were examined in dry skulls. Anatomic variants important in exposing the cavernous sinus are reviewed <sup>6)</sup>.

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The Transorbital endoscopic approach (TOEA), either with or without lateral [orbital rim](#) (LOR) [osteotomy](#) are feasible for [cavernous sinus](#) (CS) exposure. Although the incremental effect of maneuverability is attained following the LOR osteotomy, it should be performed selectively. Additional research is needed to further validate the safety and efficacy, as well as for precisely defining the clinical application of these techniques <sup>7)</sup>.

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Altay et al. describe a surgical approach to access the cavernous sinus that involves the removal of the lateral orbital wall.

To achieve exposure of the cavernous sinus, a lateral canthal incision is performed, and the lateral orbital rim and anterior lateral wall are removed, for later replacement at closure. The posterior lateral orbital wall is removed to the region of the superior and inferior orbital fissures. With reflection of the dural covering of the lateral cavernous sinus and removal of the anterior clinoid process, the cavernous sinus is exposed.

Exposure and details of the procedure were derived from anatomical study in cadavers. After the approach, with removal of the anterior clinoid process, the entire cavernous sinus from the superior orbital fissure anteriorly to the Meckel cave posteriorly is exposed. More exposure to the lateral middle fossa, foramen spinosum, and petrous carotid artery is obtained by further removal of the lateral sphenoid wing. An illustrative case example for approaching a cavernous sinus meningioma is presented.

The translateral orbital wall approach provides a simple, rapid approach for lesions with primary or secondary involvement of the cavernous sinus. Advantages of this simple, extradural approach include the lack of brain retraction and no interruption of the temporalis muscle <sup>8)</sup>.

<sup>1)</sup>

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<sup>2)</sup>

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<sup>3)</sup>

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<sup>4)</sup>

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<sup>5)</sup>

Krengli M, Apicella G, Deantonio L, Paolini M, Masini L. Stereotactic radiation therapy for skull base

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6)

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7)

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8)

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