The Meningo-Orbital Band: Microsurgical Anatomy for Anterior Clinoidectomies in Relation to Dural Layers

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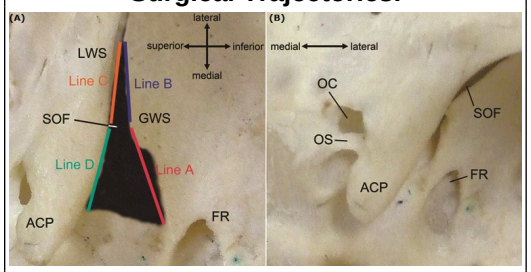
Introduction

The meningo-orbital band (MOB) connects the periorbita to the temporal and frontal lobe dura, but disrupts access to the anterolateral skull base (Figure 1). Detaching the MOB enables wide exposure of the anterior clinoid process (ACP), the superior orbital fissure (SOF), and the anterior portion of the cavernous sinus, but increases the potential risk of cranial nerve injury. The complex microsurgical anatomy of the MOB and its surrounding structures presents a challenge to skull base neurosurgeons. Currently, there are no widely accepted methods for safe detachment of the MOB. Here, we describe the microanatomy of the membranous structures and propose a stepwise method for their detachment, while minimizing potential complications.

Figure 1, Bony Structures in Two Surgical Trajectories.

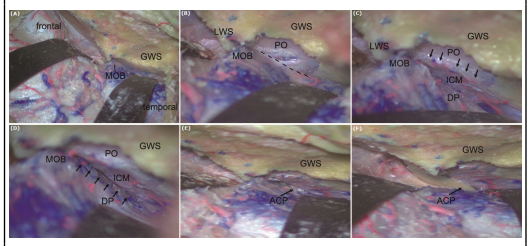


(A) Right temporal tip view for MOB detachment. (B) Right subfrontal view in extradural anterior clinoidectomy. The superior wall of the SOF, optic canal roof, and optic strut are shown as three feet to connect the ACP to the frontal and sphenoid bones.

Methods

MOB detachment and subsequent extradural anterior clinoidectomies were performed on 10 preserved cadaveric heads and later in 5 clinical cases (Table 1). Detachment of the MOB was accomplished using a four step dissection (Figures 2,3) based on the structure's detailed microanatomy and included

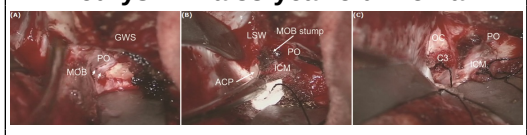
Figure 2. Stepwise Detachment of the MOB.



(A) Retraction of the basal dura revealed the MOB. (B) Partial unroofing of the lateral SOF, exposure of the periorbita and Line A (dotted line). (C) Retraction of the temporal base dura revealed a divided dura propria and inner cavernous membrane. The stump of Line A is shown (arrows). (D) Peeling off the dura propria superiorly showed the lateral edge of the lesser wing of the sphenoid and the ACP covered with a thin pericranial layer (Line D, arrows). (E,F) Views of the SOF and ACP before (E) and following (F) MOB detachment; ACP is widely exposed. MOB, meningo-orbital band; GWS, greater wing of sphenoid; LWS, lesser wing of sphenoid; PO, periorbita; ICM, inner cavernous membrane; DP, dura propria.

(1) partial unroofing of the lateral wall of the SOF, (2) incising of the lateral periosteal dura of the SOF, (3) peeling off of the dura propria of the temporal lobe from the inner cavernous membrane, and (4) fully detaching the exposed MOB from the periorbita.

Figure 3. Clinical Neck Clipping of an Unruptured Right Ophthalmic Aneurysm in a 38-year-old Woman.



(A) The lateral wall of the SOF was unroofed, exposing the periorbita and Line A (arrowheads). (B) The MOB was detached to expose the inferolateral plane of the lesser wing of the sphenoid and the ACP. (C) The extracranial anterior clinoidectomy was completed by sequentially detaching the SOF superior roof, optic canal, and optic strut. MOB, meningo-orbital band; GWS, greater wing of sphenoid; PO, periorbita; ICM, inner cavernous membrane; ACP, anterior clinoid process; OC, optic canal; C3, C3 portion of internal carotid artery.

Table 1. Anterior Clinoidectomy Patient Characteristics.

Case No.	Age/Sex	Presentation	Diagnosis	Result	Complications
1	38/F	incidental	right ophthalmic aneurysm	complete clipping	none
2	55/F	incidental	right SHA aneurysm	complete clipping	none
3	45/F	visual worsening	left Onodi cell mucocele	visual aquity improved	none
4	46/M	visual worsening	right optic canal fracture	visual aquity improved	none
5	29/M	convulsion	right trigeminal neurinoma	subtotal removal	none

SHA, superior hypophyseal artery.

Results

Successful detachment of the MOB and subsequent wide exposure of the anterolateral skull base was accomplished in all cases with no ensuing complications.

Conclusions

Understanding the complex microanatomy of these structures enabled a safe and effective stepwise detachment of the MOB. We recommended that surgeons possess sufficient anatomical knowledge before surgically manipulating this structure.

Learning Objectives

By the conclusion of this session, participants should be able to understand (1) the microsurgical anatomy of the meningo-orbital band and (2) the dural layers associated with structures encountered during anterior clinoidectomies.

References

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