Endoscopic-Assisted Removal of Orbital Roof Lesions via a Skin Crease Approach

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ABSTRACT

Objective: To describe the technique and indications for an endoscopic-assisted approach to orbital roof lesions. **Materials and Methods:** The technique was used for six cases of orbital roof lesions. An anterior orbitotomy was performed via an upper eyelid skin crease incision. Areas of the lesion behind the superior orbital rim or abutting the dura were removed with the aid of a rigid Storz 3-chip video-endoscope with 30-, 45-, or 70-degree tip. **Results:** Six patients with lesions involving the orbital roof were treated using endoscopic-assisted curettage. There were five males and one female with a mean age of 39.6 years (range, 5 months to 67 years). There were two cases each of cholesterol granuloma, Langerhans' cell histiocytosis, and orbital dermoid. The lesions were successfully removed in all cases with a good outcome. Average follow-up was 2.6 years; range, 6 months to 5 years. **Conclusion:** This technique may be suitable for selected erosive lesions of the superior orbit involving the orbital roof.

KEYWORDS: Orbital roof, endoscope, orbit

Although nasal endoscopy has been used in orbital fracture repair, orbital decompression, foreign body retrieval, and orbital apex lesions,¹⁻³ the use of the endoscope within the orbit itself has been largely limited by the lack of an actual or safely distensible cavity within the orbital soft tissue.^{4,5}

However, the subperiosteal space created by retraction of the orbital contents does provide a cavity where the endoscope can be utilized to enhance visualization and obviate the need for bone removal for adequate surgical exposure. Furthermore, the endoscope has also been used as a teaching tool in

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subperiosteal procedures involving the posterior orbital floor (such as orbital floor fracture repairs) and medial orbital wall (such as transcaruncular medial wall decompression) where direct supervision is not possible.⁶

In this report, we describe the use of the video-endoscope via a skin crease approach in the management of orbital roof lesions.

INDICATIONS

The use of the endoscope via an anterior orbitotomy approach may be helpful in cases where visualization of orbital roof lesions would be difficult without bone removal. Erosive lesions located posterior to the superior orbital rim, such as cholesterol granulomas⁷ (Fig. 1), orbital dermoids, and eosinophilic granulomas, may be particularly amenable to this technique.

SURGICAL TECHNIQUE

After induction of general anesthesia, a skin incision is placed in the upper eyelid skin crease. A suborbicularis dissection is performed to the superior orbital rim (Fig. 2) and the periosteum is incised 5 mm above the arcus marginale. The periorbital is then elevated off the orbital roof and

Figure 1 Coronal computed tomography scan of case 4 illustrating cholesterol granuloma involving the right superolateral orbit.

Figure 2 Upper eyelid skin crease incision with sub-orbicularis dissection to the superior orbital rim (Case 4).

orbital contents retracted inferiorly with malleable retractors. As much of the lesion as possible is removed under direct visualization (Fig. 3). A rigid Storz 3-chip video-endoscope with a 30- or 45-degree tip is then introduced posterior to the superior orbital rim (Fig. 4). Endoscopic survey reveals the extent of the lesion, which can now be removed under visualization from areas which are not directly visible behind the orbital rim and any areas abutting the dura. A 70-degree tip is on

Figure 3 The anterior portion of the cholesterol granuloma is curetted under direct visualization. Orbital contents together with the periorbital are retracted inferiorly using malleable retractors (arrow, superior orbital rim, Case 4).

Figure 4 The rigid endoscope is introduced just under the superior orbital rim to allow further curettage of the lesion (Case 4).

occasion required for a better view of the internal aspect of the superior orbital rim and the anterior wall of the frontal sinus, for those lesions that abut these areas. The periosteum is reattached and the skin incision closed.

RESULTS

We have used this technique in six cases of orbital roof lesions with good functional and cosmetic outcome in all cases (Table 1).

Case Illustration (Case 2)

A 5-year-old boy presented with a 3-week history of presumed preseptal cellulitis, which had failed to respond to antibiotics. A computed tomographic (CT) scan revealed an irregular lytic lesion within the frontal bone, which had extended into the roof of the orbit and the anterior cranial fossa (Fig. 5A). The lesion was approached via a skin crease incision and a grayish friable mass was exposed in the superior orbit. This was removed from the dura with the assistance of a 30-degree endoscope as described above (Fig. 5B). Histological analysis confirmed Langerhans' cell

histiocytosis. The patient made an uncomplicated recovery and was discharged the same day. No systemic disease was found on staging and there was no recurrence at follow-up 3 years later.

DISCUSSION

The primary advantage of an endoscopic-assisted percutaneous approach to orbital roof lesions is avoidance of bone removal for adequate exposure. Furthermore, the utilization of a more minimally invasive technique in all the cases described enabled management as day surgical patients, thus reducing length of hospitalization in comparison with the traditional postoperative management of a lateral orbitotomy or craniotomy. Additional advantages include increased illumination and magnification and an extended viewing angle,⁸ all of which enable good visualization of the surrounding bone and dura. This facilitates a safer and more meticulous removal of tissue abutting the dura and perhaps also decreases the risk of a cerebrospinal fluid leak in comparison with a partially blind subtotal curettage. Although the 30- or 45-degree tip endoscopes were found to provide the best view of the roof and dura, the 70-degree tip was better able to show the internal aspect of the superior orbital rim or the anterior wall of the frontal sinus.

Alternative approaches to the superior orbit and orbital roof include lateral orbitotomy, extended superolateral orbitotomy (removal of lateral wall with adjacent temporal or parietal bone), and transcranial orbitotomy.⁹ These approaches provide good exposure but are possibly associated with increased risk of morbidity due to the bone removal and greater tissue dissection. Although a supra-orbital endoscopic approach to the anterior cranial base and frontal sinus (via a 1.5-cm craniotomy above the supraorbital rim) has also been described in the neurosurgical literature,¹⁰ its use may be limited in lesions which also extend into the superior orbit.

Table 1 Clinical Findings and Outcome in Six Patients

Age/Sex	Clinical Features	CT/MRI Findings	Diagnosis	Complications of Surgery	Follow-up
1 10 mo/M	LE proptosis and skin lesions on scalp	Destructive lesion involving left frontal bone, orbital roof, greater wing of sphenoid and extending into temporal fossa	LCH	None	Commenced chemotherapy (vincristine and prednisolone); no recurrence at 6 mos
2 5 yr/M	Preseptal cellulitis	Irregular lytic lesion within the frontal bone eroding the roof	LCH	None	No recurrence at 3 yrs
3 54 yr/M	LE proptosis	Osteolytic superolateral mass with high T1- and T2-signal intensities	Cholesterol granuloma	None	No recurrence at 5 yrs
4 50 yr/M	RE proptosis	Osteolytic, superolateral mass with high T1- and T2-signal intensities	Cholesterol granuloma	None	No recurrence at 4 yrs
5 61 yr/M	LE proptosis	Superotemporal mass eroding roof to abut the dura	Dermoid	None	No problems at 2 yrs
6 67 yr/F	RE proptosis	Superotemporal mass eroding the roof	Dermoid	Transient diplopia in right gaze which resolved in 3 months	No problems at 14 mos

CT/MRI, computed tomography/magnetic resonance imaging; LCH, Langerhans' cell histiocytosis; RE, right eye; LE, left eye.

Figure 5 (A) Coronal computed tomography scan and (B) endoscopic view of case 2 illustrating eroded orbital roof with underlying dura (asterisk) following curettage of Langerhans' cell histiocytosis (arrow, superior orbital rim.)

CONCLUSION

The endoscopic-assisted skin crease approach enabled safe removal of selected lesions involving the orbital roof and provided an effective and less invasive alternative to a frontal craniotomy or lateral orbitotomy.

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