Decompression for dysthyroid ophthalmopathy via the orbital rim approach

Technical note

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A technique is described wherein the approach to the orbital cavity, with resection of its roof and lateral wall, is facilitated by a single burr hole and local en bloc removal of the lateral and supraorbital margins. A satisfactory decompression with reduction of proptosis of the orbital contents and a good cosmetic result is achieved without the need for a large dural exposure. The approach may be combined with removal of the anterior wall of the frontal sinus in cases where the lateral aspect extends appreciably laterally. Access to the orbital roof and lateral wall is straightforward and can be coupled with further removal of the floor lateral to the infraorbital nerve and medial wall. Advancement of the orbital rim upon bone replacement adds to orbital volume, creating better mechanical advantage for eyelid closure.

KEY WORDS • dysthyroid ophthalmopathy • Graves' disease • orbital decompression

 Orbital decompression has been commonly performed in the treatment of the dysthyroid patient with compressive optic neuropathy or exophthalmos. In the latter case, surgical treatment is designed to prevent or reduce the harm of exposure keratopathy and corneal ulceration. A less stringent and relative indication for decompression has been the disfiguring appearance of exophthalmos, whether unilateral or bilateral.

Numerous surgical approaches have been described for the treatment of dysthyroid ophthalmopathy commonly associated with Graves' disease.1-7,10,11,15,17,19-21 Historically, these have concentrated on the removal of one or more orbital walls, although a successful result has been achieved with transpalpebral removal of intraorbital fat.16 Transcranial removal of the orbital roof was introduced by Naefzerger1 and continues to be practiced effectively through the present day in combination with removal of other orbital walls. Several limited approaches have been described concentrating on resection of the medial orbital wall alone17 or in combination with resection of the floor.15,20 Other authors have described a complete four-wall decompression14 in an attempt to preserve visual acuity. The indications for surgery have included proptosis exceeding 30 mm and/or visual compromise due to optic nerve dysfunction or corneal injury. Orbital decompression in dysthyroid ophthalmopathy must be tailored to the particular needs of the patient in order to preserve vision and achieve appropriate cosmesis.

A surgical method is described that allows considerable exposure of the orbital contents and yet avoids a large dural exposure and the need for any facial incisions. Additionally, minor advancement of the orbital margins will add further to narrowing the palpebral fissure in the event that maximum decompression is insufficient to reduce the proptosis. Sufficient exposure of the orbital contents for decompression by removal of any number of walls commensurate with the patient’s disease is possible. A satisfactory orbital decompression is achieved with good and lasting cosmetic results.

Operative Technique

A standard bicoronal incision is made, with reflection of the scalp sufficiently forward to expose the supraorbital and lateral margins bilaterally and to allow stripping of the periorbita from the walls. The supraorbital nerve and artery are easily preserved within the reflected tissue, although at times a small osteotomy is necessary to mobilize the neurovascular bundle from the osseous margin. The temporal fascia and muscle are stripped anterosuperiorly and along the anterior margin of attachment sufficiently to allow exposure of the lateral orbital rim and placement of a burr hole immediately behind the orbital process of the frontal bone.
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Fig. 1. Schematic illustrations of the orbital rim approach for unilateral orbital decompression. Left: Removal of the superior and lateral rims along with a portion of the adjoining inferior rim can be accomplished via a single burr hole placed below the superior temporal line and behind the orbital process of the frontal bone. Center: When repositioned following orbital decompression, the orbital rim may be advanced slightly by the interposition of a small amount of bone prior to securing the rim with wire or plate-and-screw fixation. Right: This interposed bone is then effectively sandwiched between the reapplied orbital rim and the cranium.

below the superior temporal line (Fig. 1 left). The need for reflection of the temporal muscle, with its attendant postoperative discomfort and swelling, is avoided as only a minor exposure of the cranium immediately behind the orbital process of the frontal bone is necessary. A malleable brain retractor is then advanced through the burr hole extradurally behind the supraorbital margin toward the midline. The orbital soft tissue with the periorbita intact is retracted away from the lateral and superior orbital margins and protected. These margins are then removed en bloc with an oscillating saw and osteotomes, thus exposing the orbital roof and lateral walls sufficiently to allow a generous removal of both with decompression of the cavity. Further removal of bone from the medial wall of the orbit may be accomplished by ethmoidectomy if necessary, although strict attention must be paid to the location of the trochlea in the anteromedial aspect of the orbital roof. Commonly, this area is not included in the supraorbital bone removal and any entry into the ethmoid sinuses is performed well posterior to the trochlea.

This approach also allows advancement of the superolateral orbital margin upon replacement of the bone in this location (Fig. 1 center). An advancement of 1 to 3 mm may be secured firmly against an interpositional bone graft placed behind the orbital margin both laterally and superiorly when it is reapplied. The graft consists of narrow slivers of bone obtained from the posterior aspect of the en bloc segment of the orbital margin or simply the bone removed from the orbital roof and remaining walls. A smooth contour is easily achieved with no evidence of a step deformity supraorbitally. The orbital margin is secured to the facial skeleton with fine stainless-steel wire or microplate-and-screw fixation (Fig. 1 right). In addition to providing further depth to the cavity, better mechanical advantage for eyelid closure is achieved in this manner. The microplate is commonly applied behind the superolateral orbital margin below the superior temporal line where it may be hidden by the reapplied temporal musculature. This surgical approach is believed to be a useful alternative to the standard frontal craniotomy approach and in most cases obviates the large dural exposure while affording the same functional and cosmetic results.

Summary of Cases

Clinical Material

Three female patients, aged 17 to 46 years, underwent orbital decompression via the orbital rim approach as treatment for problems associated with Graves' disease (Table 1). The duration of illness ranged from 2 to 8 years. Visual acuity was not compromised preoperatively. Extraocular movement was

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<th>Case No.</th>
<th>Age (yrs)</th>
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<th>Orbital Recession (mm)</th>
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* Hertel measurements.
† Case 2 was operated on a right-sided proptosis only.
restricted bilaterally in one patient (Case 3), and lid retraction with lagophthalmos and corneal staining was identified in two patients (Cases 1 and 3). Proptosis was marked in all three patients, with Hertel measurements ranging from 25 to 33 mm, and was cosmetically disfiguring. One patient required psychiatric care due to this deformity. Illustrative pre- and postoperative photographs for Case 3 are presented in Fig. 2.

Operative Results

Five orbits were decompressed via the orbital rim approach in the three patients. Significant recession of the ocular globe, measuring 9 to 21 mm, was achieved with good comesus. One patient (Case 3) experienced further diplopia and required strabismus surgery. All three patients have been followed for 4 to 6 years, and continued postoperative benefit has been recorded.

Discussion

The lateral orbitotomy approach, as reviewed by Kroll and Casten³ in their series, resulted in corneal healing in nine of 13 eyes presenting with exposure keratopathy. No mention was made of the degree of proptosis, and thus the degree of reduction was not appreciated. Later studies on dried skulls suggested, in fact, that little volume could be added to the orbit by lateral expansion. Transcranial decompression of the orbital roof, greater wing of the sphenoid, and lateral wall was described by Naffziger12,13 and reviewed in a series reported by MacCarty, et al.⁶ Preoperative measurements of 23 mm or more were considered abnormal, and postoperative reductions of 3 mm or more were regarded as an improvement. Of 30 patients measured both pre- and postoperatively, 26 were found to have a reduction in proptosis. In light of the criteria used and the results obtained, it was difficult to recommend this approach for the treatment of more marked exophthalmos (with Hertel measurements of 30 mm or more). A medial (frontoethmoidal) orbital expansion was advocated by Sewall¹⁷ and was later combined with resection of the inferior wall via a Caldwell-Luc maxillary antrostomy,¹⁸ effecting a greater reduction of proptosis. In a review of their series using the latter technique, Ogura and Lucente¹⁴ reported reductions of 1 to 12 mm from preoperative Hertel measurements of 22 to 36 mm. Although extraocular function improved in many patients postoperatively, a significant number were left with a strabismus requiring one or more muscle-balancing operations. This risk was highlighted in a recent study of orbital surgery involving the procedure.¹⁷ A worsening of motility problems may arise from disturbance of the muscle insertions in the medial orbital apex near the floor. Again, adequate reduction of a marked exophthalmos could not be guaranteed with the two-wall decompression. Panoribital decompressions performed either via a lateral canthotomy approach⁸,¹⁰ or transcranially¹⁹ have been advocated for the more marked presentations of proptosis (> 30 mm). In their review of seven decompressed orbits, Maroon and Kennerdell¹⁰ achieved reductions of 10 to 17 mm in proptosis that measured between 31 and 38 mm preoperatively. Stranc and West,¹⁹ in their larger series of 22 decompressed orbits using a transcranial approach, achieved more varied results in patients who presented with Hertel measurements of 21 to 35 mm; total recissions of 1 to 14 mm were identified.

The orbital rim approach for decompression of the orbital cavity in Graves' disease provides an alternative method to achieve a variable release of orbital contents tailored to the needs of the individual patient. It does so without the need for a large dural exposure and avoids a facial incision. The approach itself offers no better potential for reduction of severe proptosis than other recently well-described procedures for orbital decompression for the same condition.¹⁰,¹⁹ In cases of severe proptosis where vision may be compromised by corneal keratopathy and ulceration or by optic nerve compression, the orbital rim approach offers sufficient exposure for panoritbital (four-wall) decompression. The cranial vault remains unperturbed save for that which is exposed upon removal of the superior orbital rim and roof. Use of frontal sinus space for decompressive purposes is uncommon unless it is particularly voluminous and extends over the orbital cavity sufficiently to impede adequate access via the orbital rim approach alone. In cases where the frontal sinuses are prominent and extend laterally to or beyond the vertical meridian of the orbital cavity, the anterior wall may be removed en bloc using the template technique described by Colohan, et al.,¹ with removal of the posterior wall and exenteration of the mucosa. This allows removal of the medial portion of the orbital roof prior to replacement of the anterior wall. In cases of severe bilateral proptosis, use of a large frontal sinus space for added decompression of the orbital cavity superomedially is possible while still avoiding a standard bifrontal craniotomy (Fig. 3).

Despite the extent of decompression in some cases, it is of interest that the reduction in proptosis remains quite variable and almost negligible at times.¹⁰,¹⁹ This has necessitated further intervention such as lengthening of the levator palpebrae suspensions, excision of Muller's muscle, or reduction of orbital fat.¹⁹ Advance...
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Fig. 3. Schematic illustration of the orbital rim approach for bilateral orbital decompression in patients with a large frontal sinus (left). Removal of the anterior wall of the frontal sinus and exenteration of sinus content facilitates superomedial exposure of one or both orbital cavities (right).

Indications and techniques. J Neurosurg 60:1226-1235, 1984

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