

New Techniques for Surgical Decompression of Thyroid-related Orbitopathy

S M Graham,**MBBS (Hons), FRACS*, L Chee,***FAMS, MBBS, FRCS (Edin)*, MA Alford,****MD*, K D Carter,*****MD, FACS*

Abstract

Certain cases of thyroid-related orbitopathy may require surgical decompression of the orbit. The purpose of this paper is to highlight new techniques of orbital decompression in thyroid-related orbitopathy. We present two illustrative cases selected from our recent surgical experience. The techniques of combined-approach decompression, transcaruncular approach to the medial orbital wall, drilling reduction of the greater wing of sphenoid and lateral wall lag-screw fixation after lateralization by greenstick fracture are presented. The relative utility of each technique is examined. These techniques expand the surgical repertoire for this condition and allow individualization of treatment for a specific patient's needs.

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Introduction

For a number of years, transantral orbital decompression formed the mainstay of surgical treatment of thyroid-related orbitopathy.¹ The goal of this and several subsequently-described operations was to increase orbital volume at the selective expense of the bony orbital walls and, often, the adjacent paranasal sinuses. Surgical expansion of the orbit may be required because of the increase in volume of the extraocular muscles and fat caused by inflammatory cell infiltration and mucopolysaccharide deposition. This increase in volume within the tight bony anatomical confines of the orbit produces predictable sequelae which include proptosis, exposure keratopathy, globe subluxation and, rarely, compressive optic neuropathy.² Globe subluxation occurs in cases of extreme proptosis where the upper eyelid may retract behind the equator of the globe. This painful condition may give the appearance of further displacement of the globe in front of the trapped upper eyelid.

Most patients with thyroid-related orbitopathy and exposure symptoms do not require surgery. Simple ocular lubrication will suffice for many. Lid surgery, such as levator muscle recession with muellerectomy or

lower retractor extirpation with spacer grafts, may be helpful in some patients.³ More severe disease is most often managed initially with oral corticosteroid treatment. Other treatments have included orbital irradiation for selected cases of compressive optic neuropathy.⁴ Orbital irradiation involves 2000 rads directed toward the orbital apex with sparing of the globe. The autoimmune basis of the orbital inflammation has led to cyclophosphamide being proposed as treatment.⁵

In those patients requiring surgical decompression, Walsh and Ogura's description of removal of the medial orbital wall and orbital floor through a Caldwell-Luc approach⁶ was the most popular operation for many years. Concerns with both the morbidity of the transantral approach and difficulties with visualization of the orbital apex prompted the development of new techniques. In the ophthalmology literature, the focus has been on transorbital approaches to the floor and medial wall, using a subciliary incision.⁶ The use of a transconjunctival and lateral canthotomy/cantholysis approach allows access to the medial wall, floor and lateral orbital wall.⁷ The lateral wall could be decompressed and the lateral orbital rim repositioned with miniplates in a more anterior and lateral position.⁸ Trokel

* Associate Professor

** Fellow

Division of Head and Neck Surgery

Department of Otolaryngology-Head and Neck Surgery

*** Fellow

**** Associate Fellow

Oculoplastic Orbit and Oncology Service

Department of Ophthalmology

University of Iowa, Iowa City, Iowa, USA

Address for Reprints: Dr Scott M Graham, University of Iowa Hospitals and Clinics, Department of Otolaryngology-Head and Neck Surgery, 200 Hawkins Drive, E230 GH, Iowa City, Iowa 52242, USA.

in 1993⁹ described a group of selected decompression patients treated by removal of orbital fat without bony surgery. The recent focus in the otolaryngology literature has been endoscopic orbital decompression. Kennedy et al¹⁰ described an endoscopic approach where a total ethmoidectomy was performed, a huge middle meatal antrostomy fashioned, the orbital floor medial to the infraorbital canal removed and the periorbita incised. They achieved comparable results to transantral decompression with less morbidity and with the potential for reduced hospitalization times. Their experience has subsequently been mirrored by other authors.^{11,12}

The purpose of this paper is to highlight new techniques in surgical decompression for thyroid-related orbitopathy. We have chosen two cases from our recent surgical experience of approximately 26 orbital decompressions which illustrate these procedures. The cases highlight the surgical techniques of combined-approach decompression and transcaruncular medial wall surgery. Techniques for lateral decompression of lateral wall greenstick fracture with lag-screw fixation and drilling reduction of the greater wing of sphenoid are included.

Case Reports

Case 1

A 27-year-old woman presented to the Oculoplastic Service with worsening exophthalmos. She had been diagnosed with thyroid-related orbitopathy at the age of 15. Her treatment had included thyroidectomy and she was taking thyroxine at presentation. For the past two and a half years, the patient had been successfully treated with lubricating drops and night-time ointment. Recently, the patient had complained of pain and dryness of her eyes. Her visual acuity and color vision were normal. Hertel measurements were 25/25. There was no evidence of compressive optic neuropathy. There was, however, evidence of exposure keratopathy, prompting surgical intervention. A combined-approach orbital decompression was performed initially on the left side and, six months later, a right-sided combined-approach decompression was utilized. On both sides, an endoscopic medial wall decompression was performed. A total ethmoidectomy and mega antrostomy were fashioned with removal of lamina papyracea, except in the area of the frontal recess. The periorbita was incised, allowing prolapse of fat. The orbital floor and lateral wall were approached through a transconjunctival and lateral canthal incision. A strut of bone was preserved anteriorly at the junction of the medial wall and orbital floor. The greater wing of sphenoid was drilled through diploë to the opposite cortex. Parallel osteotomies were made in the lateral orbital wall and the wall greenstick fractured into a more lateral position. The wall was maintained in the new lateral position by two lag screws.

The patient is now 30 months status post the left orbital decompression and 24 months have passed since the right-sided surgery. Hertel measurements improved from 25/25 preoperatively to 21/21 at her last visit. Her vision remains normal. Her eyes are comfortable without exposure keratopathy. There has also been a considerable aesthetic improvement in her proptosis. There was no infraorbital hypoesthesia postoperatively or any other complications.

Case 2

A 33-year-old woman presented with complaints of recurrent bilateral globe subluxations. She had been diagnosed with thyroid-related orbitopathy six years before and, prior to her present problems, had been treated for exposure symptoms. Preoperative motility, visual acuity and color vision were normal. Hertel measurements were 30/30 preoperatively. There was no evidence of compressive optic neuropathy or corneal exposure. Because of the recurrent bilateral globe subluxations, the patient underwent bilateral three-wall orbital decompressions, performed five weeks apart. Postoperatively, vision and motility remained normal and Hertel measurements improved to 23/23 at six months postoperatively. In the staged orbital decompressions, the lateral wall was approached via a lateral canthotomy and cantholysis. The lateral orbital rim was identified and tissue was elevated superiorly to the frontozygomatic suture and inferiorly to the zygomatic arch. The periosteum was incised and the periorbita of the lateral wall was elevated posteriorly to the level of the inferior orbital fissure. The periosteum of the lateral wall was elevated into the temporalis fossa, clearing the temporalis muscle from the lateral orbital wall. A diamond bur was used to remove bone from the greater wing of sphenoid and zygoma. Sufficient bone and marrow were removed to expose the opposite cortex. An oscillating saw was used to make horizontal lateral wall cuts, at the level of the frontozygomatic suture and just above the zygomatic arch. The lateral wall was greenstick fractured into a more lateral position, with this new position being maintained by two lag screws. A transcaruncular approach was used to expose the medial wall where a transorbital total ethmoidectomy was performed. A bony strut was maintained anteriorly at the junction of the medial wall and the orbital floor. After the bony exposure had been achieved, the periorbitum was incised to allow orbital fat prolapse. The orbital floor was approached through a transconjunctival incision. Surgery was performed without complications.

Discussion

The transcaruncular approach to the medial orbital wall has previously been described in maxillofacial

trauma for repair of orbital fractures.¹³ We have recently used this technique for medial wall exposure in orbital decompression. The transcaruncular approach (Figs. 1 & 2), in combination with a transconjunctival and lateral canthal approach, provides excellent exposure of the medial wall, orbital floor and lateral wall. The benefits of the caruncular incision are rapid orbital entry, lack of cutaneous scar and minimal soft tissue dissection.¹³ An ethmoidectomy is performed from the orbital aspect, using the configuration of the orbital bones and the anterior and posterior ethmoid arteries as surgical landmarks. While affording excellent exposure to the orbital walls, the transcaruncular approach suffers from the same limitations as other transorbital surgery. Visualization of the orbital apex is often less than with endoscopic approaches and no middle meatal antrostomy is performed.³ A limitation of this approach is the possibility of inducing postoperative maxillary sinusitis. With the prolapse of orbital fat after periorbital incisions, the fat may obstruct the ostium of the maxillary sinus.

The strength of endoscopic orbital decompression lies in the exposure of orbital apex and in refinements of

medial wall surgery.³ Excellent visualization and illumination allow complete removal of ethmoid cells to the face of sphenoid. The so-called "mega-antrostomy" can be fashioned to reduce the likelihood of possible postoperative maxillary sinusitis from ostial obstruction. Endoscopic decompression can be difficult or impossible to perform when the bones of the orbital floor are hard or thick.¹⁰ In any case, bone can only be removed medial to the infraorbital nerve with this technique. The endoscopic approach also allows for preservation of bone in the medial wall in the area of the frontal recess. Anatomic subtleties such as this can be difficult to judge in transorbital approaches. A combination technique, utilizing the strengths of the transorbital approach to the floor and the endoscopic technique for the medial wall and apex, offers a number of advantages. This is particularly so in the case of compressive optic neuropathy³ where excellent visualization is achieved in the critical area of the orbital apex. Disadvantages of this technique include the need for extra specialized instrumentation and an increased preoperative setup time.

Surgery of the lateral orbital wall in cases of severe proptosis has entailed removal of the lateral orbital rim with refixation of the rim, using miniplates in a more advantageous anterior and lateral position.* While increasing orbital volume by the new, more lateral fixation, this technique also serves to camouflage proptosis using the new, more anterior rim position. In cases where there is less proptosis, orbital volume can be increased laterally by two other techniques. First, the bone of the greater wing of sphenoid can be drilled down through diploë to opposing cortex, producing a modest increase in volume. Second, the lateral wall can be greenstick-fractured into a more lateral position and this new position can be maintained by a lag screw (Fig. 3). This is a quicker technique than orbital rim refixation and requires less soft tissue dissection.

An increase in orbital volume at the expense of the



Fig. 1. Incision for transcaruncular approach to orbit. The arrow indicates the incision site between the caruncle and the plica semilunaris.



Fig. 2. Medial wall of the orbit exposed. Sewell retractor, small arrow, retracts the eye laterally. Large arrow denotes the opening to the medial wall.



Fig. 3. Magnified view of the lateral orbital rim. A 1.3 mm fixation screw is in place, preventing the out fracture bony fragment from returning to its normal anatomical position.

medial wall, the posterior floor and the lateral wall is thought to produce a "balanced" decompression. While large clinical studies will be required to see whether a more balanced decompression reduces the diplopia risk inherent in this surgery, the concept of balanced decompression is attractive.

It has been suggested that postoperative diplopia might also be reduced by retention of a small bony strut at the anterior junction of the orbital floor and medial wall.¹⁴ This strut may reduce medial globe migration after medial wall decompression. While again theoretically attractive, the confirmation of the utility of this technique awaits wide clinical examination.

The modern surgical team attempting orbital decompression for thyroid-related orbitopathy needs to be proficient in a variety of surgical techniques and conversant with a number of surgical approaches. The choice between specific techniques will depend, of course, on a surgeon's training, preferences and expertise; but, more particularly, the choice will be based on a desire to individually tailor surgery to the specific needs of each patient.

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