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# Efficacy of lateral orbital rim decompression in patients with prior rim-sparing, three-wall orbital decompression

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## Abstract:

**PURPOSE:** The purpose was to study the effects of removal of the lateral orbital rim in patients with prior three-wall decompression for thyroid eye disease (TED).

**MATERIALS AND METHODS:** This was a single-institution retrospective case series of patients presenting with symptoms and signs of residual symptomatic proptosis that had previously undergone three-wall decompression for TED. Data collected included patient age, gender, presenting symptoms, ocular history, proptosis reduction, and complications.

**RESULTS:** Eleven orbits were identified. The mean preoperative exophthalmometry for the operative eye was 24.0 mm with 2.7 mm of relative proptosis. Removal of the lateral orbital rim resulted in a mean reduction in proptosis of 2.5 mm (range: 0.5–5.0 mm,  $P < 0.001$ ). There was no significant change in diplopia, lagophthalmos, margin reflex distance (MRD) 1, MRD2, or exposure keratopathy. No cantal deformities were noted. All subjects reported satisfaction with functional and cosmetic outcomes of lateral orbital rim removal, and none reported problems with external contour irregularities of the lateral canthal region.

**CONCLUSION:** Removal of the lateral orbital rim as part of a maximal orbital bony decompression adds to the decompressive effect of proptosis reduction with minimal side effects.

## Keywords:

Lateral wall decompression, orbital decompression, orbital rim removal, thyroid eye disease

## Introduction

Orbital decompression is the treatment of choice for functionally disfiguring exophthalmos secondary to thyroid eye disease (TED). For patients with severe exophthalmos, a “maximal decompression” typically refers to a lateral rim-sparing, three-wall orbital decompression with fat removal. Incomplete decompression surgery or disease progression can result in residual exophthalmos that may cause persistent symptoms, signs, and disfigurement. In these cases, further decompression

may be necessary to achieve improved patient outcomes if medical therapies are unsuccessful.

Many strategies exist for handling the lateral orbital rim during lateral wall decompression surgery. Some surgeons may not remove the lateral orbital rim during orbital decompression surgery due to concerns about functional impairment and cosmetic deformity, whereas others may remove the rim for improved visualization but replace it at the end of the surgery.<sup>[1-3]</sup>

Several studies have looked at the functional and esthetic outcomes when removing

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the lateral orbital rim as part of a primary lateral orbital decompression surgery.<sup>[2-7]</sup> These studies used different surgical techniques and showed a fairly wide range of proptosis reduction between studies, and conclusions were mixed. Sagiv *et al.* studied the issue of replacement versus removal of the orbital rim in patients undergoing two- and three-wall decompressions and supported the idea of removal of the rim without replacement.<sup>[3]</sup> Meanwhile, Zhang *et al.* studied rim-sparing versus rim-removal lateral orbital decompression and concluded that rim-sparing was preferable in their study due to better improvement in quality of life.<sup>[2]</sup>

This study evaluated functional, cosmetic, and patient satisfaction outcomes associated with secondary lateral orbital rim decompression (LORD) in patients who had previously undergone rim-sparing, three-wall orbital decompression with continued symptomatic exophthalmos. In choosing this study population, we aimed to isolate and study the direct effect of LORD based on the authors' surgical technique when prior deep lateral wall decompression had already been performed.

### Materials and Methods

This retrospective, interventional case series included 11 subjects with severe TED who had undergone prior rim-sparing, three-wall orbital decompression who subsequently underwent LORD surgery for residual exophthalmos. Institutional review board approval (HRPP #180153) and patient consent were obtained for this study.

### Technique

Through an upper eyelid crease incision, the lateral orbital rim was completely removed *en bloc* from the frontozygomatic suture to the zygomatic arch using an oscillating saw or through direct burring with a diamond burr drill to remove the entire lateral orbital rim while

leaving a very thin layer of bone overlying the temporalis muscle.

Primary outcomes included change in exophthalmos, change in relative proptosis, complications, cosmesis of the lateral canthal region, presence or absence of masticatory oscillopsia, development of new strabismus, and patient satisfaction. Secondary outcomes included change in margin reflex distance (MRD) 1, MRD2, and exposure keratopathy. SPSS (IBM, Armonk, New York, USA) was used to perform statistical analysis including calculating *t*-tests.

### Results

Eleven orbits underwent secondary LORD surgery. The mean preoperative exophthalmometry for the operative eye was 24.0 mm with 2.7 mm of relative proptosis. LORD resulted in a mean reduction in proptosis of 2.5 mm (range: 0.5–5.0 mm, *P* < 0.001) [Table 1]. There was no significant change in lagophthalmos, MRD1, MRD2, or exposure keratopathy.

There were no instances of complications associated with LORD surgery, such as worsened diplopia, decreased vision, pupillary abnormalities, or masticatory oscillopsia. There were no external deformities of the lateral canthal region that were appreciable by either the treating physician or the patient. All subjects reported satisfaction with functional and cosmetic outcomes of LORD, and none reported problems with external contour irregularities of the lateral canthal region.

### Discussion

Patients with persistent exophthalmos and symptomatic TED who have already undergone a “maximal decompression” can be clinically challenging. In cases where this is due to reactivation or progression of orbital inflammation, medical therapies such as biologic therapy

**Table 1. Patient data of study cases**

Case	Means of rim removal	Side	Preoperative exophthalmometry (mm)	Preoperative relative proptosis (mm)	Δ exophthalmometry (mm)
1	Burr	Left	26.0	4.0	-5.0
2	Saw	Left	21.5	2.5	-1.5
3	Burr	Right	28.5	0.5	-0.5
4	Burr	Right	21.0	2.0	-2.0
5	Saw	Left	27.0	4.0	-4.0
6	Saw	Left	19.0	2.0	-2.0
7	Saw	Right	21.5	3.5	-3.0
8	Saw	Left	24.0	2.0	-2.0
9	Saw	Left	27.0	3.0	-4.0
10	Saw	Right	25.0	3.0	-2.0
11	Saw	Left	23.0	3.0	-1.5
Mean			24.0	2.7	-2.5

may be effective in reducing proptosis and orbital inflammation.<sup>[8]</sup> However, in the setting where there is minimal active orbital inflammation, the surgeon must determine a plan for revisional surgery that can further reduce exophthalmos and treat the symptoms of TED.

In certain cases, a postoperative computed tomography scan can easily reveal areas where a prior three-wall decompression surgery was incompletely performed and where additional volume could be created. Often, the revisional surgery may require removing the residual bone that is closest to the dura, the skull base, the middle cranial fossa, or the infraorbital nerve with the associated risk of injuring these structures. However, once complete internal decompression of all walls is performed, including the deep lateral wall, the surgeon has limited remaining options, such as decompressing the orbital roof (potentially in conjunction with a neurosurgeon) or removing the lateral orbital rim if it was not removed with the primary surgery.

Various studies have examined primary lateral wall decompression surgery that includes rim removal. Some of these studies used a surgical approach through an upper eyelid crease incision (as was done in this study), whereas others used a lateral canthotomy incision or swinging eyelid incision. Unsurprisingly, these studies showed a wide range of proptosis reduction, most likely due to varying amounts of bone removal in the deep lateral wall, as well as varying amounts of fat removal.

We controlled for this potential variability in this study by examining the effect of lateral orbital rim removal in patients who had already had a prior three-wall decompression, including the deep lateral wall. This more closely isolated the effects of rim removal on proptosis reduction and on any adverse effects in function and cosmesis. Using the authors' surgical technique, LORD resulted in additional mean proptosis reduction of 2.5 mm and had an excellent safety profile and a high degree of patient satisfaction. While LORD was successfully performed in this study with either an oscillating saw or a diamond burr drill, our technique has shifted toward using a diamond burr drill in order to preserve a very thin layer of bone overlying the temporalis muscle. This has the benefit of serving as a barrier to prevent potential adhesions between the temporalis and the rectus muscles and also reducing the risk of potential masticatory oscillipsia. It also helps to prevent the collapse of the temporalis muscle into space previously occupied by the lateral orbital wall, which could potentially reduce the decompressive effect and result in subtle temporal hollowing. Men *et al.* have described a technique for using an implant to further expand the orbit and prevent the collapse of the temporalis muscle into the orbit.<sup>[9]</sup>

Despite concerns about functional or cosmetic defects to the lateral canthal region, none of these were noted by physicians or patients in this study. Preservation of the soft-tissue architecture in the lateral canthal region likely explains the normal external appearance of the lateral canthal region following removal of the lateral rim. Preservation of the lateral canthal complex by removing the rim through a lid crease incision rather than canthotomy may also contribute to the avoidance of canthal irregularity.

## Conclusion

Surgeons performing "maximal" orbital decompression should consider including removal of the lateral orbital rim, either during primary lateral orbital decompression surgery to achieve a greater decompressive effect or in cases where residual exophthalmos persists after traditional three-wall orbital decompression.

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## Conflicts of interest

The authors declare that there are no conflicts of interests of this paper.

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