Simultaneous Orbital Decompression and Correction of Upper Eyelid Retraction versus Staged Procedures in Thyroid-Related Orbitopathy

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Purpose: To evaluate the outcome of eyelid retraction surgery in thyroid-related orbitopathy (TRO) patients in 2 different surgical settings: done simultaneously with orbital decompression or as a staged procedure after orbital decompression.

Design: Retrospective, comparative, nonrandomized clinical study.

Participants: Ninety-six patients (158 eyes).

Methods: A review of electronic medical records of TRO patients who underwent surgery for upper eyelid retraction and orbital decompression at the Jules Stein Eye Institute in 1999 to 2003 was performed. Data regarding eyelid position, comprehensive eye examination, surgical outcome, and complications were analyzed.

Main Outcome Measures: Anatomical and functional success based on margin reflex distance (MRD1; $\leq$5 mm was graded as mild retraction; $>$5 mm and $<$7 mm, moderate; and $>$7 mm, severe), and patients' discomfort.

Results: One hundred fifty-eight eyelid retraction surgeries were performed on 96 TRO patients (18 male and 78 female; mean age, 48 years); mean follow up time was 15 ($\pm$12) months. Group 1 consisted of patients undergoing simultaneous eyelid retraction surgery and orbital decompression and comprised 97 cases (surgeries). Group 2 included 61 cases of staged surgery: orbital decompression and eyelid retraction at a later stage. The groups had similar surgical outcomes, and $>$85% had a better eyelid position postoperatively. Reoperation rates for residual or recurrent eyelid retraction were similar, overcorrection was higher in group 2 (5% vs. 0%, $P = 0.03$). Changes in MRD1, lagophthalmos, and exophthalmos were similar ($P>0.05$, independent samples *t* test). Correction of eyelid retraction was effective in treating patients' discomfort and exposure keratopathy ($P = 0.04$, χ^2). No severe complications occurred after orbital decompression or eyelid retraction surgery in this group of patients.

Conclusions: Transconjunctival Müller's muscle recession for correction of eyelid retraction in mild to moderate TRO patients, performed simultaneously with deep lateral wall orbital decompression, resulted in acceptable eyelid position in two thirds of our patients. Overcorrection and consecutive ptosis occurred less often after combined orbital decompression and eyelid retraction surgery than after isolated eyelid repositioning surgery. If confirmed in prospective controlled studies, eyelid-repositioning surgery performed at the time of orbital decompression may decrease the number of total procedures and compress the time needed for surgical rehabilitation. *Ophthalmology 2005;112:923–932 © 2005 by the American Academy of Ophthalmology.*

Surgical rehabilitation of Graves' orbitopathy most often requires multiple stages of surgery.[1–3] Because each stage can affect decision making for subsequent stages, it is generally accepted that the surgery should be staged in a specific sequence, with orbital decompression, followed by eye muscle surgery, followed by eyelid repositioning. Orbital decompression may result in a change in extraocular muscle position relative to the globe,[4,5] displacement of muscle cone, or muscles' pulleys, and may be accompanied by postoperative diplopia.[6,7] Postoperative primary gaze diplopia is reported to be anywhere between 0% and 70%, depending on the type of surgery, with medial and inferior decompression associated with higher rates.[5,6,8–15] For that reason, eye muscle surgery is postponed after complete healing from orbital decompression. Eyelid surgery is reserved as the last step,[16–21] because larger recessions of vertical muscle may enhance eyelid retraction secondary to anatomic connection between the retractor complex and the

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vertical extraocular muscles. Eyelid retraction secondary to vertical muscle recession can be avoided by a careful and thorough dissection of the inferior rectus and the lower eyelid retractor complex. Cosmetic eyelid and eyebrow surgeries are sometimes considered a fourth step in rehabilitation of thyroid-related orbitopathy (TRO) patients.[2]

There are disadvantages to the staged approach. A substantial time commitment is required by the patient, because an interval of healing must take place between stages. Costs are increased by multiple surgeries. Importantly, the disfigurement and dysfunction caused by the disease takes a high emotional toll on the patient, and multiple surgeries are additionally emotionally taxing.

Eyelid repositioning surgery is potentially less predictable when performed with orbital decompression. First of all, the patients are often under general anesthesia for orbital decompression, eliminating the possibility of cooperation. Second, swelling from the orbital surgery can interfere with the ability to grade and contour the eyelid retraction surgery, even under local anesthesia. Third, if strabismus is present or occurs postoperatively, the subsequent eye muscle surgery may change the eyelid position. Even if strabismus surgery is not performed, the orbital decompression itself can change eyelid position.[15,16,20–29]

Recognizing the decreased predictability of eyelid position after orbital decompression surgery, we began in 1999 selectively performing eyelid repositioning at the time of decompression. The goal was to achieve some improvement in eyelid retraction to increase patient acceptance of surgery and decrease early postoperative corneal exposure. We anticipated that because of decreased predictability, reoperations to adjust eyelid position would be common but, because the success of secondary eyelid position adjustment is good, that we would be able to achieve acceptable eyelid position eventually. We also anticipated that there would be a group of patients with whom we would get lucky and achieve acceptable eyelid position with the initial combined decompression and eyelid repositioning and that, in this group of patients, the total surgical experience would be compressed in time and number of trips to the operating room.

The purpose of this retrospective study is to assess the outcome of eyelid retraction surgery when it is combined with orbital decompression, compared with patients undergoing isolated eyelid retraction surgery. A third group of patients who underwent eyelid retraction surgery with no orbital decompression served as the control.

Materials and Methods

A retrospective medical record review of all TRO patients who underwent surgery for eyelid retraction and orbital decompression between January 1999 and December 2003 at the Jules Stein Eye Institute was performed. Patients were categorized according to surgical approach: those who underwent simultaneous orbital decompression and eyelid retraction surgery at the same side were designated as group 1, and those who underwent staged orbital decompression with eyelid retraction surgery later in the course of the disease were designated as group 2. An additional group of patients with less severe TRO who underwent eyelid retraction surgery and no orbital decompression served as a control (group 3). This was a retrospective study; therefore, patients were categorized based on surgeons' preferences. In the past, we performed staged procedures, and only recently have we converted to simultaneous surgery eyelid retraction and orbital decompression in all mild to moderate TRO patients. The study complied with the policies of the local institutional review board.

Surgeries were performed by 2 surgeons (JDM and RAG); both used the same surgical technique for orbital decompression (deep lateral wall with intraconal fat debulking) and the modified Henderson's technique for correction of upper eyelid retraction. Patients in the current study had mild to moderate TRO; orbital decompression was performed to treat symptoms of congestion and exposure and for cosmetic reasons.

Grading of eyelid retraction was performed according to the severity of upper eyelid retraction, which was measured by the margin reflex distance (MRD1)—the distance from the pupillary light reflex to the margin of the upper eyelid. An MRD1 of $\leq$5 mm was graded as mild eyelid retraction; $>$5 mm and $<$7 mm, moderate retraction; and $>$7 mm, severe upper eyelid retraction.

Surgical Technique

Informed consent was obtained from all patients.

Eyelid Retraction Surgery: Müller's Muscle and Levator Aponeurosis Recession. The upper eyelid was infiltrated with lidocaine 2% and 1:100 000 epinephrine. Next, the eyelid was everted using a Desmarres retractor, and an additional subconjunctival injection of local anesthesia was given. A conjunctival incision was carried out at the superior tarsal edge using hot tip cautery or a no. 15 blade. Meticulous dissection was performed to separate Müller's muscle from the underlying conjunctiva and the levator aponeurosis. Separation of Müller's muscle from the conjunctiva was sometimes facilitated with hydrodissection and transillumination. A strip of Müller's muscle was excised, and the eyelid was everted to examine its position. In almost all cases, graded recession of the levator aponeurosis was performed by separating the levator attachments from the tarsus, leaving attenuated central attachments to maintain eyelid contour. To address lateral flare, dissection was carried out towards the orbital rim and was accompanied by spreading of the levator aponeurotic fibers in the levator horn. The conjunctiva was repositioned; the incision was left unsutured.

Orbital Decompression (Deep Lateral Wall with Intraconal Fat Debulking).[30] The orbital surface of the sphenoid bone was exposed through an eyelid crease incision. Using a high-speed neurosurgical drill, cortical bone was removed from the lacrimal gland fossa, the marrow space of the sphenoid between the superior and inferior orbital fissure, and the zygomatic marrow space on the anterior rim of the inferior orbital fissure (Fig 1). The extent of bone removal was individualized: patients with substantial proptosis (e.g., $>$26 mm) underwent maximal bone removal from each of the 3 areas, but patients with lesser degrees of proptosis were treated with more conservative bone removal. In all patients, the maximal available intraconal fat, located between the lateral and inferior rectus muscles, was bluntly dissected out of the muscle cone and excised. The volume of fat removed ranged from 1.5 to 3 cm^3.

Statistical Analysis

Statistical analysis was performed using paired sample *t* tests to evaluate preoperative and postoperative data such as visual acuity (VA), intraocular pressure (IOP), exophthalmometry measurements, lagophthalmos, and MRD1 measurements. A one-sample *t* test was used to evaluate the change (Δ) in preoperative and

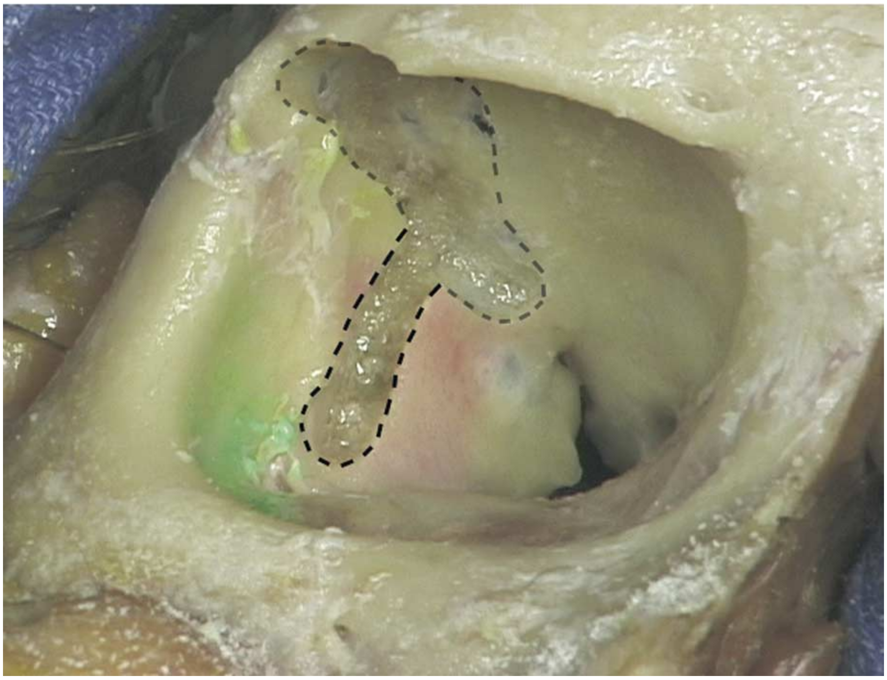

Figure 1. Cadaver dissection showing the extent of orbital decompression (dashed line) in relation to anatomic superior and inferior orbital fissures. Using a high-speed neurosurgical drill, cortical bone was removed from the lacrimal gland fossa, the marrow space of the sphenoid between the superior and inferior orbital fissures. Potential space is marked at the zygomatic marrow space on the anterior rim of the inferior orbital fissure (green).

postoperative data (VA, IOP, exophthalmos, MRD1, lagophthalmos). An independent samples *t* test was used to compare the outcome between the 3 groups of patients. Conversion of Snellen acuity to logarithm of the minimum angle of resolution values was performed.

Pearson bivariate correlation was used to examine the influence of age, duration of orbitopathy, VA, IOP, extent of exophthalmos, and time elapsed from previous orbital decompression on eyelid retraction surgery outcome. Chi-square and cross-tabs analyses were used to explore the difference in proportions of patients with eyelid retraction, previous eye muscle surgery, lagophthalmos, and exposure keratopathy preoperatively and postoperatively. Patients

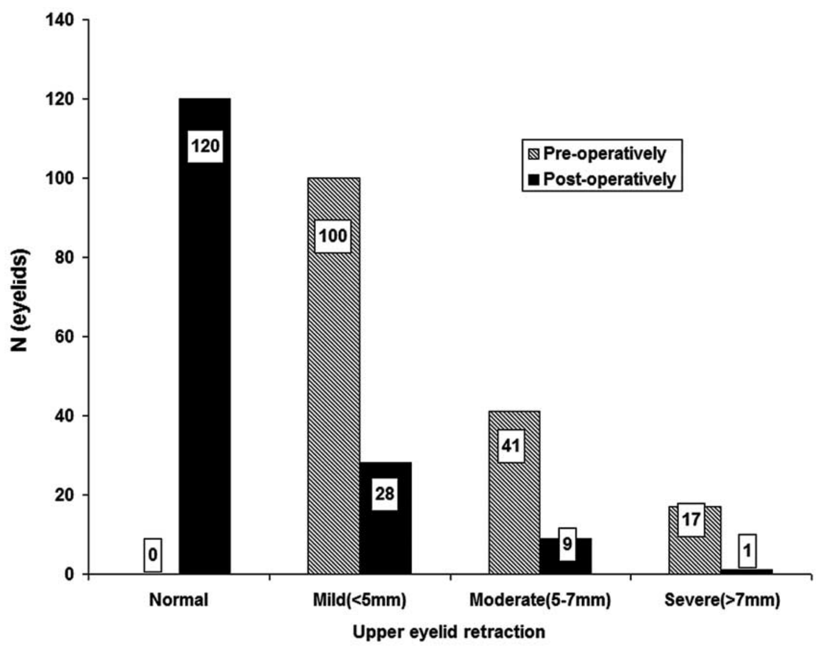

Figure 2. Preoperative and postoperative eyelid positions after Müller muscle recession with or without levator disinsertion in 158 thyroid-related orbitopathy cases operated for eyelid retraction with previous or simultaneous orbital decompression at the same side. Most cases showed no evidence of eyelid retraction after surgery; the chart represents all patients.

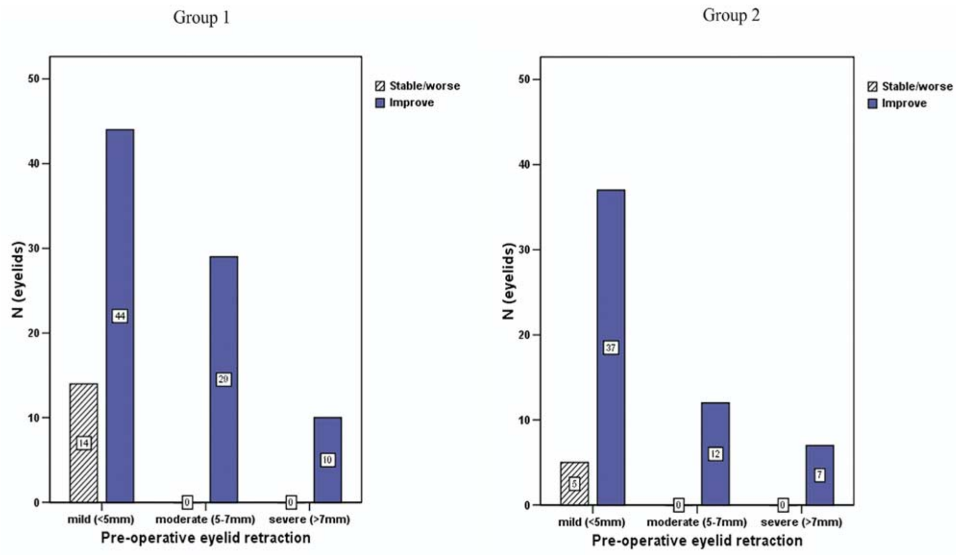

Figure 3. Outcome of 158 surgeries for eyelid retraction in thyroid-related orbitopathy patients from 1999 to 2003. Group 1 patients included 97 who underwent simultaneous orbital decompression and upper eyelid retraction surgery at the same side; patients in group 2 included 61 who underwent orbital decompression and eyelid retraction at a later stage. Patients were considered improved if they achieved a better postoperative eyelid position and unchanged/worsened if eyelid position did not change or even worsened with surgery. No statistical difference was found between groups (chi-square analysis).

with eyelid retraction were categorized according to postoperative results (improvement vs. unchanged or worsening) for proportion calculations. Statistical analysis was performed with Excel 2003 (Microsoft Corp., Redmond, WA) and SPSS.[31]

Results

Ninety-six TRO patients (18 male and 78 female; mean age, 48±11 years) underwent surgery for correction of eyelid retraction with previous or simultaneous orbital decompression at the same side. Sixty-two patients (65%) underwent bilateral eyelid surgery. Overall, 158 eyelid retraction surgeries were performed. Group 1 included 97 cases of simultaneous eyelid retraction and orbital decompression surgery. Group 2 included 61 cases of eyelid retraction performed as a subsequent stage after previous orbital decompression.

Overall, 100 cases were mild upper eyelid retraction (<5 mm); 41, moderate (5–7 mm); and 17, severe (>7 mm). Postoperatively, 120 eyelids were in a normal position (no eyelid retraction), whereas 28 showed mild eyelid retraction; 9, moderate; and 1, severe ($P<0.0001$, χ^2) (Fig 2). For both groups, 139 eyelids (88%) had a better position after surgery, whereas only 19 eyelids (12%)

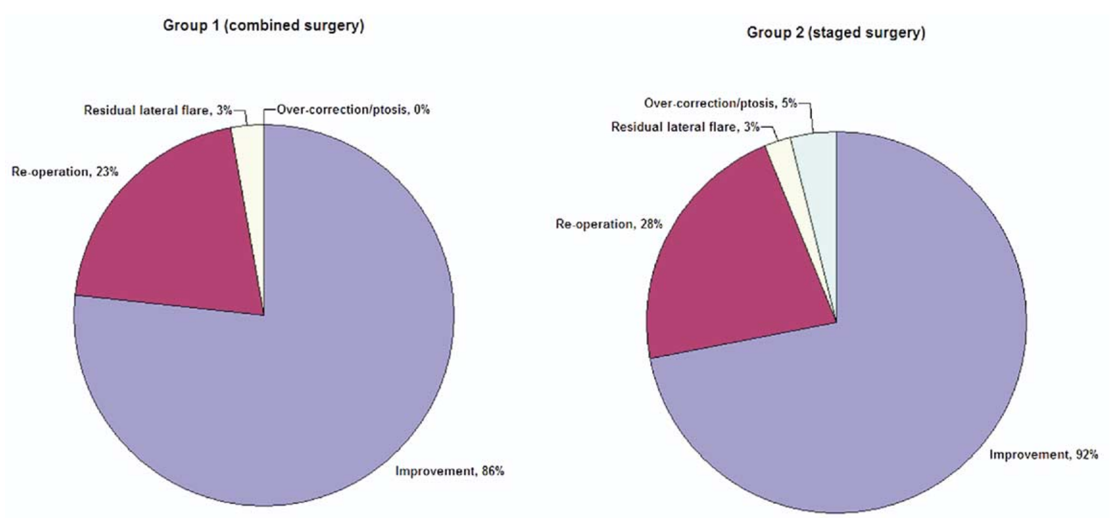

Figure 4. Surgical outcomes of thyroid-related orbitopathy patients undergoing correction of upper eyelid retraction. Group 1 comprised 97 cases of simultaneous orbital decompression and eyelid retraction surgery at the same side. Group 2 consisted of 61 patients who underwent staged surgery, and orbital decompression and eyelid retraction at a later stage. Data are presented as percentages of patients achieving outcome in each category. No differences were noted between groups regarding postoperative improvement in eyelid position or reoperation rate; however, group 2 (patients who underwent staged surgery) showed a statistically significantly higher overcorrection or ptosis ($P = 0.02$, chi-square analysis).

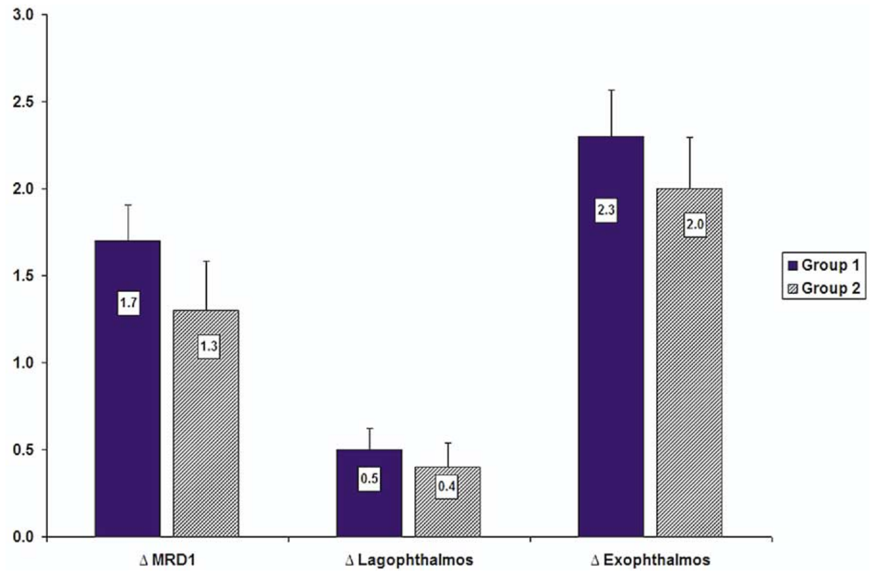

Figure 5. Mean (+ standard error) postoperative change (Δ) of the margin reflex distance measured between the upper eyelid margin and the pupillary light reflex (MRD1), lagophthalmos, and exophthalmos (millimeters) in thyroid-related orbitopathy patients undergoing combined orbital decompression eyelid retraction surgery (group 1, 97 surgeries) or staged decompression eyelid retraction surgery (group 2, 61 cases) from 1999 to 2003. Differences between groups were not significant for any of the variables.

remained stable or worsened. Thirty-nine eyelids (24.7%) were reoperated for residual eyelid retraction, and overcorrection was noticed in 3 cases (1.9%) that underwent ptosis surgery. Residual lateral flare was noticed in 5 cases (3.2%). Results were similar in men and women and at different ages.

When comparing surgical outcome between both groups, in group 1 (patients who underwent simultaneous orbital decompression and eyelid retraction surgery) 22 cases (23%) were reoperated for residual or recurrent eyelid retraction, and 3 (3%) showed residual lateral flare postoperatively. Overall in this group, 83 cases (86%) had a better eyelid position postoperatively, and a stable or worse eyelid position was noticed in 14 cases (14.4%) (Fig 3). In group 2 (patients who underwent staged surgery), 17 cases (28%) were reoperated for eyelid retraction, 56 (92%) showed a better postoperative eyelid position, and 8% had a stable or worse eyelid position postoperatively. Residual lateral flare was

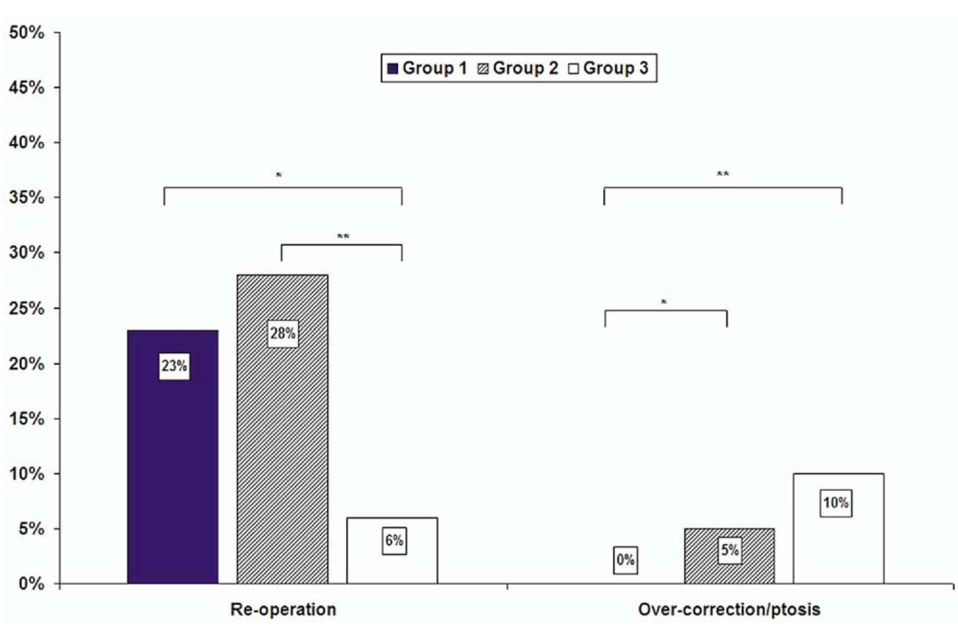

Figure 6. Reoperation for eyelid retraction and overcorrection rate of eyelid retraction surgeries from 1999 to 2003. Group 1 comprised 97 thyroid-related orbitopathy cases operated simultaneously with orbital decompression and eyelid retraction at the same side. Group 2 consisted of 61 patients who underwent staged surgery, orbital decompression, and eyelid retraction at a later stage. Group 3 consisted of 52 patients who underwent eyelid retraction surgery with no orbital decompression. Group 3 showed a significantly higher rate of overcorrection or consecutive ptosis and a lower rate of reoperation for residual eyelid retraction than groups 1 and 2 (chi-square analysis). *$P<0.05$. **$P<0.005$.

noticed in 2 cases (3.3%). Three cases (5%) had overcorrection and underwent ptosis surgery at a later stage. Chi-square analysis of the difference between the groups showed that both achieved similar improvement in eyelid position postoperatively ($P = 0.2$) and had similar reoperation rates or residual lateral flares ($P = 0.5$). Group 2 (patients who underwent staged surgery) had a statistically significantly higher overcorrection rate ($P = 0.03$) (Fig 4). Time elapsed from previous decompression surgery had no influence on outcome of eyelid retraction surgery ($P > 0.05$, Pearson bivariate correlation).

Five patients in group 1 and 12 patients in group 2 underwent eye muscle surgery sometime in the course of TRO. Strabismus or eye muscle surgery was found to have no influence on the outcome of eyelid retraction surgery, reoperation rate, or overcorrection rate ($P > 0.05$, chi-square analysis).

Postoperatively, most patients gained a normal eyelid position or improvement with mild residual eyelid retraction, whereas 5% of cases in group 1 and 8% of cases in group 2 showed moderate or severe eyelid retraction—this was not statistically significant. Changes in MRD1, lagophthalmos, and exophthalmos were similar in both groups ($P > 0.05$, independent samples t test): MRD1 decreased an average of 1.7 (± 2.0) mm in group 1 and 1.3 (± 2.2) mm in group 2.

Lagophthalmos decreased an average of 0.5 (± 1.2) mm in group 1 and 0.4 (± 1.1) mm in group 2, and exophthalmos decreased an average of 2.3 (± 2.6) mm in group 1 and 2.0 (± 2.3) mm in group 2; smokers showed a greater decrease in exophthalmos postoperatively (3.2 [± 0.6] mm vs. 2.2 [± 0.2] mm in nonsmokers, $P = 0.004$). Preoperative and postoperative data for both groups are summarized in Table 1 and Figure 5.

The control group (group 3) consisted of 52 TRO cases of operation solely for eyelid retraction; patients in this group were not operated for orbital decompression. Similarly, most patients in this group improved with surgery—45 (86%) achieved a better eyelid position postoperatively, and 7 (14%) had a stable or worse eyelid position after surgery. Regarding the severity of eyelid retraction, 33 had mild eyelid retraction; 11, moderate; and 8, severe preoperatively; postoperatively, 41 had a normal eyelid position, and 11 showed mild eyelid retraction. None of the patients showed moderate or severe eyelid retraction. Reoperation due to residual or recurrent eyelid retraction was performed in 3 cases (6%), and overcorrection or ptosis surgery was noticed in 5 cases (10%). The reoperation rate was statistically significantly lower in this group of patients ($P = 0.009$, $P = 0.008$, and $P = 0.002$ [χ^2 for all groups, groups 1 and 3 and groups 2 and 3, respectively]). The rate of overcorrection or ptosis surgery was higher in that group (10%) than in group 1 (0%) and group 2 (5%). The rate of overcorrection was statistically significantly higher in group 3 than in groups 1 and 2 ($P = 0.01$, χ^2), but this stems from the difference between groups 1 and 3 ($P = 0.002$) and not 2 and 3 ($P = 0.3$) (Fig 6). Other parameters, such as VA, IOP, and change in MRD1 or lagophthalmos, were similar in all 3 groups (data not shown). Group 3 had less severe orbitopathy that did not require orbital decompression; preoperative exophthalmos measurements were 22.5 (± 2.8) mm, 23.9 (± 3.2) mm, 21.1 (± 3.2) mm for groups 1, 2, and 3, respectively ($P = 0.006$, $P < 0.001$, independent samples t test).

Overall, 25 patients (12%) underwent strabismus surgery in the course of orbitopathy. Patients in group 2, who underwent staged surgery, had a higher percentage of strabismus surgery than group 1 patients. Rates of strabismus surgery were 5% for group 1, 20% for group 2, and 15% for group 3 ($P = 0.02$, χ^2).

Surgery for eyelid retraction with or without orbital decompression was effective in treating patients' discomfort and exposure keratopathy ($P = 0.04$, χ^2) (Table 1). Preoperative symptoms of ocular discomfort, foreign body sensation, tearing, or light sensitivity improved in all patients who displayed overall satisfactory surgical outcomes.

Table 1. Preoperative and Postoperative Data for Thyroid-Related Orbitopathy Patients Undergoing Upper Eyelid Retraction Surgery with Orbital Decompression (Group 1) or with Previous Orbital Decompression (Group 2), 1999–2003

	Group 1	Group 2	P Value*
Age (± SD) (yrs)	47 (11)	50 (11)	NS
Gender [N (%)]			
Male	20 (21)	10 (16)	
Female	77 (79)	51 (84)	NS
Mean visual acuity			
Preoperative	20/25	20/30	
Postoperative	20/25	20/25	NS
IOP (mmHg) (± SD)			
Preoperative	16.8 (4.3)	17.1 (2.8)	
Postoperative	15.5 (4.8)	17 (3.5)	NS
Preoperative eyelid retraction			
Normal (0)	0 (0%)	0 (0%)	
Mild (<5 mm)	58 (60%)	42 (69%)	
Moderate (5–7 mm)	29 (30%)	12 (20%)	
Severe (>7 mm)	10 (10.3%)	7 (11%)	NS
Postoperative eyelid retraction			
Normal (0)	72 (74%)	48 (79%)	
Mild (<5 mm)	20 (21%)	8 (13%)	
Moderate (5–7 mm)	4 (4.1%)	5 (8%)	
Severe (>7 mm)	1 (1%)	0 (0%)	
P (within group)*	<0.0001	<0.0001	NS
MRD1 (mm)			
Preoperative	5.9±2.1	5.9±1.9	
Postoperative	4.3±1.6	4.6±1.8	
P (within group)	<0.001	0.007	NS
Lagophthalmos (mm)			
Preoperative	0.7±1.2	0.8±1.5	
Postoperative	0.2±0.7	0.4±0.8	
P (within group)	0.001	0.01	NS
Exposure keratopathy (N)			
Preoperative	17 (17.5%)	20 (33%)	
Postoperative	12 (12.4%)	15 (15%)	
P (within group)	NS	NS	0.04
Exophthalmos (mm)			
Preoperative	22.5±2.8	23.9±3.1	
Postoperative	20.3±2.6	21.6±2.3	
P (within group)	<0.001	<0.001	NS
Follow-up (mo)	13±11	18±13	0.006

IOP = intraocular pressure; MRD1 = margin reflex distance; NS = nonsignificant; SD = standard deviation.
Ninety-six patients, 158 eyelids.

Visual acuity, ocular ductions, and IOP remained unchanged after surgery. Interestingly, for patients in group 1 who underwent combined orbital decompression eyelid retraction surgery, a greater improvement in eyelid position postoperatively was associated with a greater improvement in VA ($R = -0.44$, $P = 0.005$, Pearson correlation). Also, for patients who underwent staged surgery (group 2) a greater decrease in IOP was noticed, with a greater improvement in exophthalmos postoperatively ($R = 0.56$, $P = 0.005$, Pearson bivariate correlation); this, however, was not the case in group 1 patients.

Complications included postoperative residual eyelid retraction or overcorrection with eyelid ptosis, as described above. One patient with severe debilitating recurrent TRO had a full-thickness anterior blepharotomy with levator aponeurosis spacer extension using preserved pericardium. No patient developed wound infection or a full-thickness eyelid fistula. Regarding patients who

Figure 7. A 37-year-old female before (**A**) and 3 years after (**B**) staged orbital decompression and eye lid retraction surgery on both sides. Eyelid retraction surgery was performed 8 months after orbital decompression. The patient achieved a good eyelid position postoperatively.

underwent orbital decompression surgery, no severe complications such as stroke, death, or vision loss occurred. Additionally, there were no dural tears or cerebrospinal fluid leaks. Numbness or paresthesia in the lacrimal and zygomaticofacial nerve distributions occurred frequently, representing the most common postoperative complaint reported by patients, but severe prolonged numbness, paresthesia, or neuralgia did not occur in this series of patients.

Discussion

In the current study, surgery for upper eyelid retraction in TRO patients resulted in similar outcomes whether performed simultaneously with orbital decompression or done at a later stage, regardless of the time elapsed from orbital decompression. Simultaneous orbital decompression and eyelid retraction surgery is less likely to result in overcorrection or ptosis (Figs 7–9). The control group, 52 cases operated solely for eyelid retraction, showed higher overcorrection and less reoperation (or residual retraction) rates, probably because they had less severe TRO that did not necessitate orbital decompression.

Shorr and Seiff[2,5] were the first to describe the paradigm of surgical rehabilitation of TRO patients. They suggested 4 stages of surgical rehabilitation, performed in the following order: orbital decompression, eye muscle surgery, correction of eyelid retraction, and removal of excess fat and skin. Any of the stages may be skipped, but when deemed necessary, maintaining the correct order reduces the number of procedures to a minimum. The authors did not state, however, what percentage of these patients underwent orbital decompression or eye muscle surgery. Other investigators postulated the same order in staging surgical rehabilitation of TRO patients,[23–26] although some advocate orbital decompression and eyelid retraction surgery in one session for patients with no preoperative oculomotor disturbances.[26]

The reasons for treating eyelid retraction as a separate stage after orbital decompression and eye muscle surgery are difficulties in estimation of true retraction in cases of a prominent globe or displaced eye in the horizontal or vertical direction; neurogenic overstimulation of the levator muscle secondary to fibrosis of the inferior rectus muscle, which may give a false impression of upper eyelid retraction; and large recession of the inferior rectus muscle, which may increase lower eyelid retraction and decrease upper eyelid retraction.[26] Accurate evaluation of eyelid retraction can be made only if the eye is in an orthotropic position. For these reasons, investigators considered treatment of eyelid retraction to be the third step on the ladder of surgical rehabilitation. In cases of mild exophthalmos and eyelid

Figure 8. **A**, A 56-year-old female with moderate to severe eyelid retraction and proptosis. **B**, Seven months after simultaneous orbital decompression and eyelid retraction surgery, although 4 mm of proptosis reduction was achieved, the patient still had severe eyelid retraction on the right side and moderate eyelid retraction on the left. **C**, Two months after reoperation for upper eyelid retraction on both sides, with mild to moderate residual eyelid retraction.

retraction, some would prefer to perform eyelid retraction surgery and avoid orbital decompression when possible.[26]

Although anecdotal reports advocate orbital decompression and eyelid retraction surgery in the same session, especially in cases of severe exophthalmos with severe eyelid retraction,[26,29] no comparative study of staged versus single-session surgery was performed, to the best of our knowledge. Only one study, by Tremolada and Tremolada,[29] describes combining orbital fat decompression with eyelid retraction surgery by marginal myotomies, on 32 eyes of 16 patients. They state that there were good functional and cosmetic outcomes, with no severe complications, after 6 to 18 months. We believe, however, that only patients with mild to moderate proptosis can effectively be treated by fat decompression, and therefore, this surgery may not be suitable in more severe cases. Furthermore, they did not compare surgical outcome with that of patients undergoing staged surgery.

Pitfalls of our study stem from its retrospective design. It is likely that we chose staged surgery for patients in group

Figure 9. **A**, A 45-year-old female with mild upper eyelid retraction and proptosis on both sides. **B**, Nine months after bilateral orbital decompression, the patient achieved a 2.5-mm decrease in proptosis. **C**, Nine months after bilateral Müller's muscle recession for correction of eyelid retraction; note right upper eyelid ptosis. **D**, The patient underwent successful conjunctivomullerectomy (Putterman) and achieved a good eyelid position 2 months postoperatively.

2 only because they had a more severe orbitopathy, as may be reflected by the higher preoperative exophthalmos and the higher rate of eye muscle surgery in these patients. Similarly, patients in group 3 (control group) had very mild orbitopathy that could be repaired solely by eyelid retraction surgery and did not necessitate orbital decompression. Most of the patients in our study had mild to moderate orbitopathy, with only 12% requiring eye muscle surgery at some time in the course of the disease; therefore, conclusions regarding the proper staging of eye muscle surgery cannot be drawn. However, when combining our results and previous reports in the literature,[1,2,5,7,15,25,26,28,29,32] we believe that patients with mild to moderate orbitopathy, especially with no clinical extraocular imbalance before surgery, may benefit from combined orbital decompression eyelid retraction surgery. Patients with a severe preoperative extraocular muscle imbalance and diplopia in primary or other fields of gaze are more likely to develop postoperative diplopia,[5] more so if decompression is performed for vision-threatening conditions. Patients with inferior and medial rectus muscle restriction tend to have an increase in this restriction postoperatively.[5,15] Deep lateral wall orbital decompression with intraconal fat debulking, without severing the medial or inferior orbital walls, may be associated with a low rate of new-onset primary gaze diplopia.[6,29] Patients who undergo staged surgery rehabilitation (orbital decompression and eyelid retraction at a later stage) are no more likely to have a better surgical or functional outcome, but overcorrection with consecutive ptosis in that group may be higher. This also applies for the overcorrection rate in patients undergoing eyelid retraction surgery as the only surgical treatment. Prospective controlled studies are needed to evaluate the true benefit of combined orbital decompression and correction of eyelid retraction versus staged surgery in TRO patients.

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