Levator recession with adjustable sutures in management of upper eyelid retraction

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Purpose
To assess the efficacy of levator recession with adjustable sutures in treatment of upper eyelid retraction.

Patients and Methods
Patients with upper eyelid retraction were included in this prospective, non-randomized, interventional case series study. All patients underwent correction of upper eyelid retraction with levator recession using adjustable sutures ,and were followed up every week for a month, then monthly for three months. In each visit, the margin reflex distance (MRD1) and palpebral fissure (PF) were measured.

Results
The included patients of the present work were classified into 3 groups: Group A: lid retraction secondary to over correction of ptosis, group B: thyroid related lid retraction, and group C congenital lid retraction. Among the 17 patients that participated in the follow-up examination, mean age ± SD was 21.12 ± 13.73 years (range 7–52 years). Eight were males and nine were females. Mean ± SD (range) of central height of the palpebral fissure was 13.79 ± 1.37 mm (10–16 mm) preoperatively, and 11.04 mm (9–12 mm) at follow up. Mean ± SD (range) of MRD1 was 6.77 ± 0.86 mm (5–8 mm) preoperatively, and 4.78 mm (4.5–5 mm) at follow-up.

Conclusion
Levator recession with adjustable sutures is effective technique in treatment of upper eyelid retraction of all degrees with different causes. However,increase the number of cases with long term follow up are recommended.

Keywords:
contour, eyelid surgery, keratopathy, lagophthalmos and symmetry

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Introduction

Upper lid retraction can in its mildest form lead to symptoms of ocular irritation and blurred vision. Meanwhile, severe upper eyelid retraction can lead to corneal ulceration, potential perforation, and permanent loss of vision, and this can be worsened in the setting of a poor Bell's phenomenon and poor reflex tearing. It is important for each surgeon to customize and evolve their own treatment algorithm to achieve increasingly better results, and even in the most experienced hands, there is a relatively high reoperation rate [1]. The surgical repair of upper eyelid retraction is significantly complicated by the inability to predict postoperative height and contour [2].

Various measurements that are essential in the documentation of a patient with lid retraction include position of the upper and lower lids in relation to the corresponding limbus, the vertical palpebral fissure (PF) height, lagophthalmos, levator muscle function, exophthalmometry, marginal reflex distance-1, and extraocular movements [3].

The position of the eyelid is measured relative to the limbus with the normal position being 1–1.5 mm below the limbus. Retraction is considered to be present when the eyelid is less than 0.5 mm below the limbus [4]. A classification scheme is composed of three categories of retraction: myogenic, neurogenic, and mechanical [5].

Myogenic eyelid retraction is commonly caused by thyroid eye disease (TED) and is present in ~90% of such patients at some point in the clinical course of the disease [2].

Neurogenic eyelid retraction can be acquired or present at birth. Benign conjugate downward gaze with upper eyelid retraction has been present in preterm infants. Acquired causes include the dorsal midbrain syndrome (Parinaud's syndrome) [4] and aberrant regeneration of the oculomotor nerve [6].

Mechanical eyelid retraction is due to inability of the upper eyelid to maintain coverage of the globe

prominence as seen in TED, buphthalmos, severe myopia, and orbital tumor [1,5,7].

There are many surgical procedures in the management of upper eyelid retraction, and in general, they tend to weaken or lengthen the eyelid retractors [5]. They include excision of Muller's muscle alone, recession of the levator aponeurosis with or without hang back sutures or other spacer, with or without Muller's muscle recession [8], levator recession with adjustable sutures [2], measured myotomy of the levator muscle, and full-thickness transverse blepharotomy [9]. Upper eyelid spacers include fascia lata, donor sclera, ear cartilage, and alloplastic materials [10,11]. Small eyelid-splitting lateral tarsorrhaphy combined with recession of the upper and lower eyelid retractors can improve the upper eyelid contour, if the patient has lateral flare (common in TED) [5]. The choice of procedure depends on severity of lid retraction and associated features like proptosis, status of extraocular muscles, and corneal condition [3].

Time of surgery in upper lid retraction secondary to overcorrection of ptosis is best performed within 6 weeks after surgery [12]. In eyelid retraction owing to TED, surgical procedures are not performed until the ophthalmopathy is fully stabilized, which normally takes ~6–12 months [3].

The aim of the study was to assess the efficacy of levator recession with adjustable sutures in treatment of upper eyelid.

Patients and methods

This study was conducted following the tenets of Helsinki declaration and after approval of ethical committee of faculty of medicine Assiut university. This was a prospective, nonrandomized, interventional case series study. Patients attending the oculoplastic clinic at the Department of Ophthalmology, Assiut University Hospital, between December 2015 and December 2016 were recruited. All patients underwent correction of upper eyelid retraction with levator recession using adjustable sutures.

Inclusion criteria included undesirable cosmetic appearance of upper eyelid retraction as well as corneal and conjunctiva exposure that require correction, such as thyroid eyelid retraction, following ptosis surgery, trauma, and congenital.

Exclusion criteria were systemic disease (such as Guillain–Barré syndrome), pseudoretractions, contralateral ptosis, local skin condition (as scar adherence), medication (such as sympathomimetic drugs, lithium, and steroid), and neurological condition (such as dorsal midbrain syndrome and hydrocephalus).

Baseline clinical evaluation

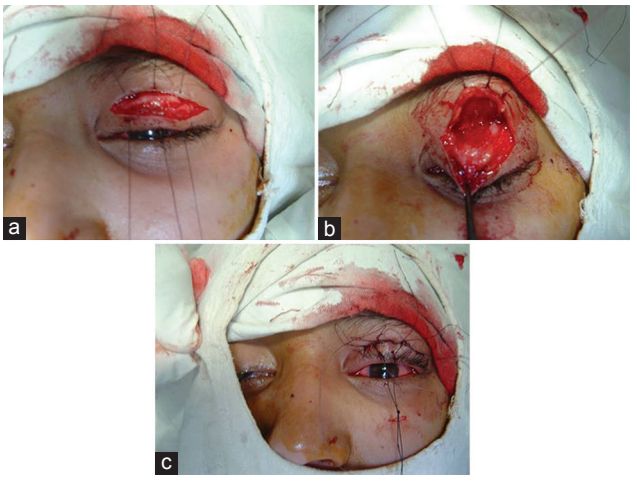
All patients of this study were subjected to clinical evaluation 1 day before surgery. Ophthalmic examination included best-corrected visual acuity measurement, clinical examination including slit-lamp and anterior segment examination, lid height or PF, levator function the eyelid crease, MRD1, and exophthalmometer in TED. (Hertel Exophthalmometer; Richmond Products Inc., Chicago, Illinois, USA).

Informed consent was obtained from patients or parents after thorough explanation of operation and its potential benefits and risks.

Surgical technique

All patients underwent surgical correction by the same oculoplastic surgeon (A.M.). General anesthesia with hypotensive technique was used in all patients. A lid crease incision down to the tarsal plate was made. The levator aponeurosis was dissected from the overlying orbicularis muscle with opening of the anterior orbital septum to allow more dissection posteriorly. The aponeurosis was separated from the tarsal plate with dissection of its underlying surface from the Muller's muscle and conjunctiva. In those cases, secondary to TED, the lateral horn was cut (Fig. 1).

Figure 1



Surgical procedure (technique). (a) Three double-armed vicryl 6.0 sutures 3 mm apart were passed from the underlying surface of the free edge of the levator aponeurosis. (b) One arm is passed through the upper part of the anterior surface of the tarsal plate and then through the lower skin edge. The other arm was passed through the upper skin edge. (c) The two arms were tied temporarily in a releasable manner. Four 6.0 black silk sutures were used for additional skin closure.

Overall, three double-armed vicryl 6.0 sutures 3 mm apart were passed from the underlying surface of the free edge of the levator aponeurosis and tied anteriorly.

One arm is passed through the upper part of the anterior surface of the tarsal plate and then through the lower skin edge. The other arm was passed through the upper skin edge. The two arms were tied temporarily in a releasable manner. Four 6.0 black silk sutures were used for additional skin closure. A tractional suture was applied in the middle of the upper eyelid to pull it down to close the eye and to help levator recession, and then was fixed to the cheek with adhesive plaster. An eye bandage was applied with cold compression for 1 h postoperatively.

Eyelid position was adjusted the day after surgery and was repeated on the third postoperative day by pulling the sutures to advance the levator complex and raise the lid or release it and pull on the lid to lower. After 1 week, if the upper eyelid was ptotic, the vicryl sutures were removed, but if the eyelid is in the desired position, the sutures were tied and then removed 4 weeks postoperatively.

The postoperative care includes a daily eye patch with an antibiotic eye ointment was applied for a week. Nonsteroidal anti-inflammatory drugs were given for 2 weeks. The black skin sutures and the upper eyelid tractional suture were removed 1-week postoperatively.

All patients were followed up every week for a month, and then monthly for 3 months. In each visit, the MRD1 and PF were measured.

Figure 2

(a-c) Preoperative photography; (d-f) postoperative photography). (a and d) Lid retraction secondary to overcorrection of ptosis. (b and e) Thyroid-related lid retraction. (c and f) congenital lid retraction.

Results

A total of 17 patients were included. Mean age ± SD was 21.12 ± 13.73 years (range: 7–52 years) (Table 1). Surgical correction was performed bilaterally in six (35.3%) patients, and unilaterally in 11 patients [five (29.4%) right and six (35.3%) left side]. There were eight were males and nine females. Mean central height of the PF was 13.79 ± 1.37 mm (10–16 mm) preoperatively and 11.04 ± 1.2 mm (9–12 mm) at final follow-up. Mean MRD1 was 6.77 ± 0.86 mm (5–8 mm) preoperatively and 4.78 ± 0.35 mm (4.5–5 mm) at follow-up.

According to the etiology of upper eye lid retraction, patients of the present work were classified into three groups (Fig. 2):

Table 1 Demographic data and baseline examination of the studied groups

	All groups (*n*=17) [*n* (%)]	Group A (*n*=9) [*n* (%)]	Group B (*n*=6) [*n* (%)]	Group C (*n*=2)[*n*(%)]
Age (years)				
Mean±SD	21.12±13.73	14±6.46	36.2±10.2	8±1.41
Range	45 (7-52)	20 (7-27)	30 (22-52)	2 (7-9)
Sex				
Male	8 (47.1)	6 (66.7)	2 (33.3)	0 (0)
Female	9 (52.9)	3 (33.3)	4 (66.7)	2 (100)
Eye				
Unilateral	11 (64.7)	9 (100)	0 (0)	2 (100)
Bilateral	6 (35.3)	0 (0)	6 (100)	0 (0)
Preoperative MRD1 (mm)				
Mean±SD	6.77±0.86	6.72±1.09	6.95±0.51	6.5±0.7
Range	3 (5-8)	3 (5-8)	1.25 (6.25-7.5)	1 (6-7)
Preoperative PF (mm)				
Mean±SD	13.79±1.37	13.67±1.87	14.01±0.38	13.5±0.7
Range	6 (10-16)	6 (10-16)	1 (13.5-14.5)	1 (13-14)

Group A, lid retraction secondary to overcorrection of ptosis; group B, thyroid-related lid retraction; group C, congenital lid retraction; MRD1, marginal reflex distant; PF, palpable fissure.

Table 2 Relation of marginal reflex distant and PF before and after operation among studied groups

Variables	Preoperative (mean±SD)	Postoperative (mean±SD)	*P*
Group A			
MRD1 (mm)	6.72±1.09	4.72±0.26	<0.001 (HS)
PF	13.67±1.87	10.78±1.09	<0.001 (HS)
Group B			
MRD1 (mm)	6.95±0.51	4.75±0.27	<0.001 (HS)
PF	14.01±0.38	11.5±1.049	<0.001 (HS)
Group C			
MRD1 (mm)	6.5±0.7	4.75±0.35	0.26 (NS)
PF	13.5±0.7	9.5±0.4	0.067 (NS)

Paired sample *t*-test was used. Group A, lid retraction secondary to overcorrection of ptosis; group B, thyroid-related lid retraction; group C, congenital lid retraction; HS, highly significant; MRD1, marginal reflex distant; PF, palpable fissure. *P*<0.001, high statistically significant difference.

(1) Group A: lid retraction secondary to overcorrection of ptosis
(2) Group B: thyroid-related lid retraction
(3) Group C: congenital lid retraction.

Group A

A total of nine patients with upper eyelids retraction secondary to overcorrection of ptosis underwent levator recession with adjustable sutures, and their ages ranged between 7 and 27 years, with a mean of 14 years. Overall, six were males and three were females. The retracted upper eyelid was the left one in five cases, whereas it was the right one in four cases. The obtained mean preoperative MRD1 was 6.7 mm and was 4.72 postoperatively. The mean preoperative PF was 13.66 mm and postoperative PF was 10.77 mm (Table 2).

Group B

A total of six patients with upper eyelids retraction due to TED underwent levator recession with adjustable sutures, and their ages ranged between 22 and 52 years, with a mean of 36 years. Overall, two were males and four were females. The retracted upper eyelids were bilateral in all cases of this group. The obtained mean of preoperative MRD1 was 6.95 mm and postoperatively was 4.75. The mean of preoperative PF was 14.03 mm and postoperative PF was 11.5 mm.

Group C

A total of two patients with congenital upper eyelids retraction underwent levator recession with adjustable sutures, and their ages were 7 and 9 years. Both were females. The retracted upper eyelid was the left one in one case, whereas it was the right one in the other case. The obtained mean of preoperative MRD1 was 6.5 mm and postoperatively was 4.75. The mean of preoperative PF was 13.5 mm and postoperative PF was 9.5 mm.

Discussion

Upper eyelid retraction is difficult to treat surgically, as postoperative eyelid position height and contour is highly unpredictable, particularly in patient with thyroid disease. There are many surgical procedures in the management of upper eyelid retraction, and in general, they tend to weaken or lengthen the eyelid retractors [5]. Few studies were reported in literature about levator recession with adjustable suture.

The present study is the first one to use MRD and PF height for assessment of the results. Levator recession with adjustable sutures decreases MRD1 and PF height. The mean MRD1 decreased from 6.82 mm (5–8 mm) preoperatively to 4.78 mm (4.5–5 mm) postoperatively. Mean central vertical height of PF was 13.869 mm (10–16 mm) preoperatively, and changed to 11.04 mm (9–12 mm) postoperatively. In all 17 patients, a satisfactory level of symmetry in PF height was obtained. The included 17 patients were classified into three groups: group A – lid retraction secondary to overcorrection of ptosis, group b – thyroid-related lid retraction, and group C – congenital lid retraction.

In group A, nine patients with upper eyelids retraction secondary to overcorrection of ptosis. The obtained mean preoperative MRD1 was 6.7 mm and postoperatively was 4.72. The mean preoperative PF was 13.66 mm and postoperative PF was 10.77 mm.

In group B, six patients with upper eyelids retraction due to TED. The obtained mean preoperative MRD1 was 6.95 mm and postoperatively was 4.75. The mean preoperative PF was 14.03 mm and postoperative PF was 11.5 mm.

In group C, two patients with congenital upper eyelids retraction. The obtained mean preoperative MRD1 was 6.5 mm and postoperatively was 4.75. The mean of preoperative PF was 13.5 mm and postoperative PF was 9.5 mm.

Tucker and Collin [2] compared adjustable and nonadjustable sutures in management of upper eyelid retraction. Adjustable sutures were used for the repair of eyelid retraction in 13 eyelids of 10 patients, and good results were obtained in 10 (77%) of the 13 eyelids. Nine eyelids in seven patients were due to thyroid eyelid retraction, and good results were obtained in 67% (6/9). Three patients (Four eyelids) due to nonthyroid-related eye lid retraction; three of them due to over corrected ptosis, and one posttraumatic; good results were obtained in 3/4 (75%).

Nonadjustable sutures were used in 148 eyelids of 108 patients. Good results were obtained in 56 (39%) of 148 eyelids. A total of 93 eyelids were due to thyroid eyelid retraction, whereas 55 eyelids were due to nonthyroid-related cases (seven congenital, 27 after overcorrected ptosis, nine following other eyelid surgery, and 12 posttraumatic).

The mean preoperative palpebral aperture of all eyelids was 12.4 mm (SD: 2.9), with a median of 12.0 mm, and postoperatively was 9.2 mm, with a median of 9.0 mm, whereas mean preoperative levator function was 13.5 mm and postoperatively 12.7 mm. So, even with the small number of eyelids treated with the adjustable technique, good results were obtained significantly more often than for nonadjustable surgery (77 vs 38%, $P < 0.01$) [2].

In our study, mean central vertical height of PF was 13.869 mm (10–16 mm) preoperatively and 11.04 mm (9–12 mm) postoperatively.

Ueland *et al.* [4] used levator recession with adjustable sutures for correction of upper eyelid retraction in TED. A total of 58 patients who participated in the follow-up examination, correction was performed bilaterally in 28 patients, and unilaterally in 30 patients. Retraction was defined as mild (eyelid margin <1 mm above limbus) in eight lids, moderate (1–2 mm above limbus) in 62 lids, and severe (>2 mm above limbus) in 16 lids [4].

Median central height of the PF was 13 mm (10–19 mm) preoperatively, and 10 mm (7–12 mm) at follow-up. Median values of eyelid retraction measured as the distance from the limbus to the eyelid margin was 1 mm preoperatively (range: −0.5 to 3 mm) and −1.5 mm at follow-up (range: −3 to 1 mm). Mean reduction of eyelid retraction was 2.5 mm ($P < 0.001$).

In our study, in the group of patient with thyroid lid retraction, the mean of preoperative PF was 14.01 ± 0.38 mm and postoperative PF was 11.5 ± 1.049 ($P < 0.001$, HS).

Ben Simon *et al.* [8] used transconjunctival Müller muscle recession with levator disinsertion for correction of eyelid retraction associated with thyroid-related orbitopathy. A total of 78 patients had thyroid-related orbitopathy. Patients underwent surgery for correction of eyelid retraction [8]. The patients (15 men and 63 women, with mean age of 49 ± 13 years) with unilateral or bilateral upper eyelid retraction underwent surgery for correction of eyelid retraction [8]. Overall, 29 (37%) patients underwent bilateral surgery. Grading of eyelid retraction was performed according to the severity of upper eyelid retraction measured by the MRD1 (the distance from the pupillary light reflex to the margin of the upper eyelid). MRD1 of 5 mm or less was graded as mild eyelid retraction, MRD1 less than 5 mm and more than 7 mm as moderate retraction, and MRD1 more than 7 mm as severe upper eyelid retraction [8].

Marginal reflex MRD1 decreased an average of 2.6 ± 1.6 mm from 6 ± 1.9 mm preoperatively to 3.4 ± 1.6 mm postoperatively ($P < 0.001$); lagophthalmos decreased on an average of 0.6 ± 1.3 mm from 1.3 ± 1.5 mm preoperatively to 0.4 ± 0.9 mm postoperatively ($P = 0.006$); and eyelid asymmetry defined as absolute height difference between both upper eyelids improved from a mean of 1.0 ± 1.5 mm preoperatively to 0.4 ± 0.6 mm postoperatively ($P = 0.001$, paired samples *t*-test) [8].

In our study, in the group of patient with thyroid lid retraction, the mean of preoperative MRD1 was 6.95 ± 0.51 mm and postoperatively was 4.75 ± 0.27 ($P < 0.001$, HS).

A range of postoperative results has been reported in the literature, but it is difficult to make comparisons between studies owing to differences in surgical techniques and variability in the definition of 'success' [2]. Moreover, the studies vary with respect to the number of patients studied, the severity of lid retraction, and the criteria used for evaluating the outcome. In addition, in some series, there is a mix of patients with TED and other conditions. Some studies included re-examination of patients, whereas others are based solely on hospital records [4].

Conclusion

This study states that levator recession with adjustable sutures is a good technique for management of upper eyelid retraction of different causes and of all degrees. However, increasing the number of cases with long-term follow-up is recommended.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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