Outcome Following Surgery for Contact Lens-Induced Ptosis

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Purpose: To assess the outcome of surgery in patients with a history of contact lens wear.

Design: Retrospective, comparative interventional case series.

Methods: A total of 419 patients underwent ptosis surgery during a 1-year period (2005–2006) at Moorfields Eye Hospital. Those included in this study had a diagnosis of aponeurotic ptosis and history of contact lens wear.

Main Outcome Measures: The outcome was considered a success if the following criteria were met: 1) a margin reflex distance of between 3 and 5 mm, 2) an interlid difference of 1 mm or less, and 3) absence of redo surgery.

Results: Thirty patients (7.2%) were identified with a history of contact lens wear and were matched against a control group of 46 patients. The mean margin-reflex distance at presentation was 0.5 ± 2.4 mm. This equated to a ptosis graded as mild (≥1.5 mm) for 32% of patients, moderate (0.5–1.0 mm) for 29%, and severe (≤0.0 mm) for 39%, with similar proportions in the control group (36% mild, 39% moderate, and 25% severe). The power of the refractive correction ($p < 0.005$) and the age of the patient ($p < 0.05$) were directly related to increased severity of ptosis at presentation. The surgical outcome of the ptosis correction was successful in 72% of patients, which was significantly lower than in the control group (89%) ($p < 0.005$).

Conclusions: The severity of contact lens-related ptosis was related to the degree of myopia and the age of the patient but not to the duration of contact lens wear. There was a higher level of failure and requirement for redo surgery in patients with contact lens-related ptosis compared with matched controls.

(*Ophthal Plast Reconstr Surg* 2011;27:186–189)

Aponeurotic blepharoptosis results from a combination of thinning and possible disinsertion of the levator aponeurosis, resulting in a characteristic high skin crease with good levator function.[1–3] Hard contact lens wear, along with involutional and other causes, has been identified as a risk factor for acquired aponeurotic ptosis.[4]

Previous studies have highlighted the association of hard contact lens use and acquired involutional ptosis, although the exact mechanism remains unknown. The repeated insertion and removal of contact lenses has been said to mechanically damage the upper eyelid retractor mechanism with resulting ptosis.[4–6] Although studies have evaluated features of ptosis patients with a history of contact lens wear, there is a paucity of information on results following surgical correction.

In this study, we evaluated the outcome of ptosis surgery in patients with a history of contact lens wearing. To further investigate the surgical outcome, the results were compared with a matched control group who underwent surgery for involutional ptosis without a history of contact lens wear.

MATERIALS AND METHODS

Study Design. The criteria for inclusion in this study included 1) a diagnosis of aponeurotic ptosis, 2) history of contact lens wearing, 3) surgical correction by the standardized anterior approach of levator aponeurosis advancement, and 4) surgery performed by an oculoplastics specialist at Moorfields Eye Hospital. Exclusion criteria included previous surgery on the eyelids, concomitant surgery performed at the time of ptosis repair, e.g., blepharoplasty, and a concurrent ocular or systemic condition that might influence eyelid height, e.g., thyroid eye disease.

A total of 419 patients underwent ptosis surgery during a 1-year period from 2005 to 2006 at Moorfields Eye Hospital. Of these, 30 cases (7.2%) were identified with a history of contact lens wear and were included in this retrospective case series. Seven patients who had undergone previous intraocular surgery were excluded from the analysis, including 3 patients who wore contact lenses following penetrating keratoplasty for keratoconus, 2 patients with contact lenses for aphakia, and 2 patients with cosmetic contact lenses in blind nonfunctional eyes.

Outcome Measures. Outcome was considered a success if the following criteria were met: 1) a margin reflex distance of between 3 and 5 mm, 2) an interlid difference of 1 mm or less, and 3) an absence of redo surgery.

Patients. The average age of the patients was 52 ± 13 years, with a range of 26 to 74 years. Eighteen of the 23 patients were women (78%) and 5 were men (22%). Fifteen cases (65%) were unilateral (11 right and 4 left) and 8 (35%) bilateral. The demographic information is summarized in Table 1.

All patients were questioned regarding the use of their contact lenses, including duration of wear, time per day, type of contact lenses, and other ocular or medical conditions. Examination included assessment of palpebral fissure height, margin reflex distance, levator function, position of the eyelid in downgaze, skin crease, fatigue, and ocular movements and manual elevation of the more affected eyelid to evaluate the presence of contralateral ptosis. Slit lamp biomicroscopy included evaluation of the cornea for keratopathy and eversion of the eyelid for papillae.

Ptosis was defined by a margin reflex distance of ≤2.5 mm margin-reflex distance or ≥2 mm of eyelid asymmetry.[3,7] Aponeurotic ptosis (whether involutional or with a history of contact lens wear) was diagnosed by characteristics of reduced margin-reflex distance, raised

Accepted for publication February 13, 2010.

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DOI: 10.1097/IOP.0b013e318201cfcc

TABLE 1. Demographics of ptosis in patients with a history of contact lens wear and the control involutional ptosis group

Demographics	CL group	Control group
Age (years)		
Mean ± SD	53 ± 13	65 ± 12
Range	23–74	48–84
Race [% (no. eyes)]		
Caucasian	87% (20)	78% (36)
Asian	9% (2)	13% (6)
African	4% (1)	9% (4)
Gender [% (no. eyes)]		
Male	22% (5)	35% (16)
Female	78% (18)	65% (30)
Unilateral or bilateral [% (no. eyes)]		
Bilateral	35% (8)	57% (26)
Unilateral	65% (15)	43% (20)
Follow-up period [months (mean ± SD)]	13.2 ± 4.7	12.2 ± 4.0
CL characteristics (no. patients)		
Indication		
Myopia	21	NA
Hypermetropia	2	—
No. with indicated type of CL		
GP	13	—
PMMA	2	—
GP and PMMA	2	—
Soft	4	—
Unknown	2	—
Duration of CL wear [years (mean ± SD)]	25.2 ± 4.7	—
CL wear per day [hours (mean ± SD)]	13.8 ± 1.6	—
Refractive error [SE (mean ± SD)]*	−8.9 ± 7.2	—

*Excluding 2 eyes from 2 patients with hypermetropia (SE +6.75).
CL, contact lens; GP, gas permeable; NA, not applicable; PPMA, polymethylmethacrylate; SD, standard deviation; SE, spherical equivalent.

or absent skin crease, deep sulcus, normal ocular movements, and levator function. Failure of surgical correction was defined as undercorrection with residual ptosis. For the purpose of data analysis, the patients were divided in 3 groups based on the severity of ptosis: mild (margin reflex distance of ≥1.5 mm), moderate (0.5–1.0 mm), and severe (≤0.0 mm).

Surgical Technique. The patients at Moorfields Eye hospital underwent surgical correction by a previously reported anterior approach, levator aponeurosis advancement.[1] After informed consent was obtained, the eyelid crease was marked with the patient in the supine position. An equal mixture of 1 to 2 mL of 2.0% lidocaine with epinephrine 1:100,000 and 0.75% bupivicaine was injected. The surgical technique adopted involved an eyelid crease incision approximately 20 mm long. The tarsus was identified, the dissection was continued superiorly, and the orbital septum was opened to expose the orbital fat and aponeurosis. The upper two thirds of the tarsal plate was cleared by dissection under the orbicularis oculi muscle and the aponeurosis resected or advanced and sutured to the tarsal plate. All procedures used 3 6-0 long-acting absorbable sutures (Vicryl, polyglactin 910). The skin crease was reformed and skin closed with 6-0 absorbable suture. At the conclusion of surgery, patients were given 1.0% chloramphenicol ointment and a pressure patch was applied. The patch was removed on the first day after surgery, and 0.5% chloramphenicol drops and lubricants were administered 4 times daily for 2 weeks. Patients were reviewed at 1 week for removal of sutures and then at 6 weeks, 6 months, and 1 year. All measurements were taken at the patient's last outpatient appointment at 1 year.

TABLE 2. Clinical findings of ptosis in patients with a history of contact lens wear and the control involutional ptosis group

Clinical findings	Contact lens group	Control group
Preoperative measurements		
Visual acuity (logMAR)	0.2 ± 0.2	0.0 ± 0.1
Margin-reflex distance (mm)	0.5 ± 2.4	1.7 ± 1.5
% (no.) with indicated severity level		
Mild (≥1.5 mm)	32% (10)	36% (26)
Moderate (0.5–1.0 mm)	29% (9)	39% (28)
Severe (≤0.0 mm)	39% (12)	25% (18)
Difference to contralateral eye* (mm)	1.9 ± 0.8	2.2 ± 1.0
Levator function (mm)	14.8 ± 2.0	14.2 ± 1.9
Skin crease (mm)	10.9 ± 2.5	9.2 ± 2.3
Postoperative measurements		
Margin-reflex distance (mm)	3.5 ± 1.7	3.6 ± 0.9
Difference to contralateral eye* (mm)	0.18 ± 1.4	0.6 ± 0.5
Complications [% (no.)]		
Corneal erosions	16% (5)	8% (6)
Surgical outcome [% (no.)]		
Margin-reflex distance 3–5 mm	66% (19)†	78% (58)
Intermargin reflex distance ≤1 mm	69% (20)†	89% (66)
Redo surgery	28% (8)†	11% (8)

Values are given as mean ± SD or as indicated.
*Patients with unilateral ptosis only.
†$p < 0.005$.
logMAR, log minimum angle of resolution; SD, standard deviation.

Population-Based Controls. From the total of 419 patients who underwent ptosis surgery, 50 patients with involutional ptosis were randomly selected as controls. The identical inclusion and exclusion criteria were adhered to, except for the history of contact lens wear. Of these 50 patients, 46 had a diagnosis of involutional ptosis and underwent surgical correction during the 1-year period 2005–2006 at Moorfields Eye Hospital; 4 patients were excluded with inadequate postoperative data. The details of the control group are shown in Table 1.

Statistical Methods. The possible risk factors considered in the building of regression models comprised demographic factors, lens type, wear schedule, lens wear experience, duration of wear, refraction, and visual acuity. Where appropriate, chi-square tests for comparing proportions and *t* tests for comparison of means were used. A level of $p < 0.05$ was accepted as statistically significant, and analysis was completed using SPSS 10.0. (SPSS software for Windows, version 13, Chicago, IL, U.S.A.).

RESULTS

A summary of the results is shown in Table 2.

Contact Lens Wear. Most the patients wore rigid contact lenses; 13 gas permeable (GP), 2 polymethylmethacrylate, and 2 both gas-permeable and polymethylmethacrylate lenses. Four patients were currently using soft contact lenses, one had previously used gas-permeable lenses, and in 2 patients the type of contact lenses worn was unknown. Most patients had worn a number of different contact lenses in the past, including polymethylmethacrylate, gas permeable, silicone hydrogels, and standard hydrogels. The duration of contact lens wear was 25 ± 5 years, with an average of 13.8 ± 1.6 hours of contact lens wear per day.

Severity of Ptosis. The margin-reflex distance at presentation was 0.5 ± 2.4 mm. This equated to a ptosis graded as mild (≥1.5 mm) in 32% of patients, moderate (0.5–1.0 mm) in 29%, and severe (≤0.0 mm) in 39%, with similar proportions in the control group (36% mild,

TABLE 3. Studies of contact lens-related ptosis

Study	Year	Location of study	No. patients	Age (mean and/or range)	CL wearers (% [total no.])	CL type (% [no.]; type)	Unilateral (% [no.])	Bilateral (% [no.])	Surgical management (% [no.])	Outcome measure (% [no.])
Epstein and Putterman[4]	1981	Chicago, IL, U.S.A.	5	26–55	—	100% (5); hard 20% (1); hard and soft	40% (2)	60% (3)	—	—
van den Bosch and Lemij[6]	1992	Rotterdam, The Netherlands	17	39	—	88% (15); RGP or PMMA	—	—	59% (10)	—
Kersten et al.[12]	1995	Cincinnati, OH, U.S.A.	25	37	47% (91)	91%; RGP or PMMA	58%	42%	—	—
Thean and McNab[14]	2004	Melbourne, Australia	15	46	—	27% (4); RGP 73% (11); PMMA	73% (11)	27% (4)	73% (11)	—
Watanabe et al.[11]	2006	Kyoto, Japan	15	44	17% (86)	100% (15); hard	0% (0)	100% (0)	—	—
Reddy et al.[13]	2007	Houston, TX, U.S.A.	9	24 (15–35)	29% (31)	27% (9); soft 73% (1); hard	100% (9)	0% (0)	—	—
de Silva and Collin*	2011	London, U.K.	23	53	7% (419)	65% (15); RGP 9% (2); PMMA 17% (4); soft 9% (2); GP and PMMA	65% (15)	35% (8)	100% (23)	Recurrence 26% (8)

*Current publication.
CL, contact lens; GP, gas permeable; PMMA, polymethylmethacrylate; RGP, rigid gas permeable.

39% moderate, and 25% severe). The mean levator function was 14.8 ± 2.0 mm, and mean skin crease was 10.9 ± 2.5 mm. Multiple regression was used to evaluate associations between demographics, contact lens history, and examination measurements relative to the severity of ptosis at presentation. The power of the refractive correction ($p < 0.005$) and the age of the patient ($p < 0.05$) were correlated with increased severity of ptosis at presentation. No correlation was found with duration of contact lens wear, postoperative margin-reflex distance, or skin crease.

Surgical Outcome. The results of the ptosis correction were recorded at the last outpatient appointment at approximately 1 year. The outcome was successful in 66% to 72%, depending on which of the 3 surgical outcome measures was used (66% had a margin reflex distance of 3–5 mm, 70% had an intermargin reflex distance of ≤1 mm, and 72% did not require redo surgery). The surgical outcome was statistically different from the control group, in which surgery was successful in 78% to 89%, depending on the outcome measure ($p < 0.005$) (Tab. 2). Sixteen percent of patients in the contact lens group required lubricants for the management of corneal erosions in the follow-up period and had not restarted contact lens wear (the number of patients with corneal erosions in the control group was not available).

DISCUSSION

Although previous studies have evaluated the association of hard contact lens wear and ptosis, the information on outcome has remained scarce. This study evaluated the outcome following surgical correction by comparison with a matched control group. Patients with confounding factors including trauma, past eyelid surgery, and concurrent ocular or systemic conditions were excluded.

The criteria for successful eyelid surgery following ptosis surgery have differed. Frueh et al.[8] summarized the results for correction of aponeurotic ptosis and proposed that a 1.0-mm difference in eyelid height above the center of the pupil was an acceptable definition for a successful operation; 76% to 96% of the studies met this criteria. In this study, 70% of the contact lens group, compared with 89% of the control group, were deemed successes. Other studies have focused on redo surgery as an objective measure of success. They recognize that a proportion of unsatisfactory results may not result in further surgery and have reported redo rates from 8.7% to 31%.[9,10] This study identified a higher level of redo surgery (28%) in the contact lens group compared with the control group (11%) ($p < 0.005$).

Previous publications have reported an association between contact lens use and involutional ptosis. Although the mechanism is unknown, it has been hypothesized that the chronic manipulation of the eyelids with hard contact lens insertion and removal induces aponeurotic disinsertion.[4–6] This study found that increased strength of refractive correction and the age of the patient (not duration of contact lens wear) were associated with increased severity of ptosis at presentation. The association of increased severity of ptosis with age is consistent with the mechanical hypothesis for the etiology of contact lens-induced ptosis. In addition, our findings suggest that high myopia may predispose patients to further damage to the upper eyelid retractor mechanism, resulting in increased ptosis. Hypothetic mechanisms include a relative increase in globe size and longer aponeurosis with increasing myopia, which may result in additional stretching of the levator with mechanical insertion and removal of the contact lens. In addition, the increased size of the contact lens for higher myopic correction may have greater traumatic effects of damage to the levator aponeurosis. However, there was no association with years of contact lens wear and a pure mechanical etiology does not explain why some patients do not develop contact lens-related ptosis.

Although the exact mechanism of ptosis in patients with a history of contact lens wearing is not known, this study

identified a lower success rate following a standardized anterior approach, levator aponeurosis advancement. We postulate that if mechanical insertion and removal of contact lenses can be attributed as the cause, then the implication is that the increased failure rate is a result either of chronic injury to the eyelid elevating apparatus, despite normal levator function, or of recurrent injury as a consequence of further contact lens wearing. Watanabe et al.[11] identified fatty degeneration and fibrosis of the aponeurosis and Mueller muscle that was more consistent with a chronic inflammatory change in patients that underwent surgical correction of contact lens-induced ptosis, and they suggested that aponeurotic dehiscence was inadequate to explain all the histopathologic findings. Chronic inflammatory and structural changes in the eyelid-elevating complex may be implicated in the increased failure rate following corrective ptosis surgery. Postoperatively, patients were allowed to recommence contact lens wear 2 weeks after surgery, provided there were no complications or eyelid asymmetry. Two thirds of the patients that required redo surgery failed within the 3-month postoperative period. In this retrospective study, it was not possible to identify whether resumption of contact lens wearing was a risk factor for ptosis recurrence.

Our study is limited by the shortcomings inherent to a retrospective review. Most patients had a long history of contact lens wear; during this period they had used more than one type of contact lens and varied their pattern of use. In addition, patients were identified by their requirement for surgical correction, which represents a selection bias excluding mild cases that did not require surgical intervention. This study identified a history of contact lens wearing in 7% of the patients undergoing ptosis repair, compared with a range of 17% to 47% in other studies with different selection criteria (Tab. 3).[11–13] This is the first study to evaluate the surgical outcome of treatment for ptosis in patients with a history of contact lens wear, and it found a higher failure rate and requirement for redo surgery in the contact lens group compared with the matched control group.

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