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The effects of chalazion excision on corneal surface aberrations

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ABSTRACT

Purpose: This study is the first to consider the effects of chalazion on corneal surface aberrations taking into account of corneal zones, and to establish the size standard for the excision of chalazion.
Methods: Twenty three eyes from 23 patients with central upper eyelid chalazion larger than 3 mm were recruited in this prospective study. The participants were classified into two groups, depending on size of the lesion: Group 1 with lesion size 3–5 mm and Group 2 with lesion size >5 mm Chalazion was excised by standard transconjunctival vertical incision. Corneal surface aberrations were measured using a Galilei™ analyzer and an auto-refractometer before and 2 months after the excision.
Results: Corneal astigmatism in all patients decreased significantly in both auto refractometer ($P = 0.012$) and Galilei™ ($P = 0.020$) measurements after chalazion excision. RMS of total HOAs decreased significantly in 6 mm ($P = 0.043$) and 3 mm zone ($P = 0.051$). The RMS of Zernike orders in the vertical and horizontal trefoil decreased significantly in 6 mm ($P = 0.035$) and 3 mm ($P = 0.041$) zone. Group 2 showed a significant decrease in corneal astigmatism in both auto refractometer ($P = 0.040$) and Galilei™ ($P = 0.017$) parameters after chalazion excision. Group 1 showed an insignificant decrease in corneal astigmatism. Unlike Group 1, the RMS of total HOAs and vertical and horizontal trefoil in 6 mm zone decreased significantly in Group 2 ($P < 0.05$).
Conclusions: The existence of an upper lid chalazion increases astigmatism and HOAs, especially at the peripheral cornea. Significantly induced astigmatism and HOAs are caused by chalazion >5 mm in size. Thus, we recommend the surgical excision of chalazion >5 mm in size to reduce corneal surface aberrations.

1. Introduction

Chalazion is considered as a lipogranulomatous inflammation caused by plugging of the meibomian glands [1]. Patients with chalazion usually complain about cosmetic disfigurements and ocular discomforts such as foreign body sensation, visual disturbance, mass effects due to lid ptosis or swelling [1–4]. As a result of corneal warpage induced by lid pressure, chalazion is known to increase astigmatism and higher order aberrations (HOAs) [5]. As corneal refractive surgery become more prevalent, astigmatism and HOAs are becoming more important in preoperative evaluation. Likewise, decision of chalazion excision before refractive surgery becomes important in postoperative results.

This study is the first to consider the effects of chalazion on corneal surface aberrations taking into account of corneal zones, and to establish the size standard for the excision of chalazion.

2. Methods

Patients diagnosed with primary chalazion were invited to participate in the prospective study. Patients with a history of ocular surgery, ocular trauma, contact-lens wear, corneal scarring, or anterior segment diseases other than chalazion were excluded. All the study patients had a chronic unilateral upper-lid chalazion that failed to resolve after conservative treatment that included warm compresses, antibiotics administration, and application of steroid ophthalmic ointments. Only patients with chalazion larger than 3 mm in the central upper-lid were included and classified into two groups depending on the lesion size: Group 1 with 3–5 mm and

Abbreviations: I and C, incision and curettage; HOAs, higher order aberrations; UCDVA, uncorrected distant visual acuity; BCDVA, best corrected distant visual acuity; IOP, intraocular pressure; LogMAR, logarithm of the minimum angle of resolution; RMS, root mean square.

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Group 2 with >5 mm Central upper-lid area was defined as central 1/3 portion between from medial canthus to lateral canthus. Horizontal and vertical radius of the chalazion was measured by ruler after gentian violet marking of the margin, and the average value was used for the measurement.

Patients who agreed to enter the study signed an informed consent. Incision and curettage (I and C) was performed under local anesthesia with 2% lidocaine injection, and lesion grasp and lid eversion was performed with chalazion forceps. Chalazion was incised vertically with no. 12 blade following curettage of capsule and pus removal. After I and C, pressure patching with antibiotics was performed and patients were instructed to retain the patch for more than 4 h.

All the patients in the study underwent ophthalmic examinations including uncorrected distant visual acuity (UCDVA), best corrected DVA (BCDVA) and intraocular pressure (IOP). The optical components of the treated eyes were measured using an auto-refractometer (RM-A3000, Topcon, Japan) and a dual rotating Scheimpflug camera (Galilei^{TM}, Ziemer Group; Port, Switzerland) at each visit. All the patients in each group were followed up for two months after the I and C. Patients with remnant or recurrent chalazion after the treatment were excluded from the study. Resolution was defined as lesion regression of 90–100%, and 10% of the lesion remaining after the treatment was defined as the remnant. Regrowth of the lesion size was defined as the recurrence [1]. Data were expressed as means ± standard deviation. Comparisons between the preoperative and postoperative values were made using the paired *t*-test. Differences were considered statistically significant at $P < 0.05$.

We certify that all applicable institutional and governmental regulations concerning the ethical use of human volunteers were followed during this research.

3. Results

Twenty three eyes (13 right and 10 left) from 23 patients (13 males, 10 females, mean age: 24 ± 2.7 years) with central upper-lid chalazion larger than 3 mm were procured for this study. The preoperative UCDVA was 0.09 ± 0.10 logarithm of the minimum angle of resolution (LogMAR) units in Group 1 and 0.21 ± 0.17 LogMAR units in Group 2 ($P = 0.020$). The postoperative UCDVA was 0.07 ± 0.07 LogMAR units in Group 1 and 0.15 ± 0.13 LogMAR units in Group 2 ($P = 0.055$). The improvement of the UCDVA was −0.02 ± 0.06 LogMAR units in Group 1 and −0.07 ± 0.10 LogMAR units in Group 2 ($P = 0.045$). The preoperative BCDVA was 0.00 ± 0.00 LogMAR units in all patients and that remained unchanged after the excision. IOP of all patients was normal before and after the excision. Twelve of the 23 patients with chalazion size 3–5 mm were categorized into Group 1, and the remaining 11 patients with chalazion size >5 mm were categorized into Group 2.

Corneal astigmatism in all the patients decreased significantly in both auto-refractometer (−2.0 ± 0.69*D* to −1.78 ± 0.73*D*, $P = 0.012$) and Galilei^{TM} (1.65 ± 0.78*D* to −1.38 ± 0.82*D*, $P = 0.020$) parameters after the chalazion excision (Fig. 1).

Root mean square (RMS) of total HOAs after the excision decreased from 1.91 ± 0.61 to 1.38 ± 0.48*D* in 6 mm zone ($P = 0.043$) and from 1.85 ± 1.06 to 1.25 ± 0.55*D* in 3 mm zone ($P = 0.051$). The RMS of Zernike orders in the vertical and horizontal trefoil also decreased significantly in 6 mm ($P = 0.035$) and 3 mm ($P = 0.041$) zone after the excision. The RMS of horizontal coma and spherical aberrations showed an insignificant decrease in both zones (Table 1).

Tables 2 and 3 show the comparative results of corneal astigmatism and HOAs, respectively, for Group 1 (chalazion size of 3–5 mm) and Group 2 (chalazion size >5 mm). Group 2 showed a significant decrease in corneal astigmatism in both auto-refractometer and Galilei^{TM} measurements after chalazion excision. On the contrary, Group 1 showed an insignificant decrease in corneal astigmatism after the excision (Table 2). Unlike the Group 1, the RMS of total HOAs and vertical and horizontal trefoil in 6 mm zone also decreased significantly in Group 2 (Table 3).

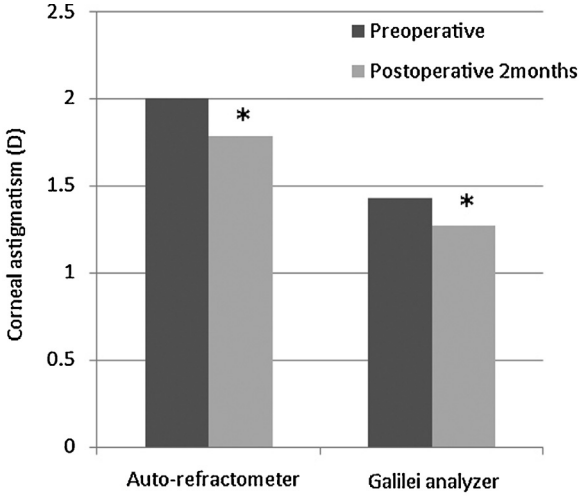

Fig. 1. The change of corneal astigmatism in all patients after the chalazion excision. Corneal astigmatism of all the patients decreased significantly in both auto-refractometer ($P = 0.012$) and Galilei^{TM} ($P = 0.020$) parameters after the chalazion excision. *Statistically significant (P value < 0.05).

Table 1
The change of high-order aberration in all the patients after the chalazion excision.

	Preoperative	Postoperative 2 months	*P* value
Corneal surface aberration in 6 mm zone			
RMS total	1.91 ± 0.61	1.38 ± 0.48	0.043*
Coma	0.28 ± 0.14	0.25 ± 0.15	0.221
Trefoil	0.33 ± 0.26	0.18 ± 0.08	0.035*
Spherical aberration	−0.22 ± 0.11	−0.21 ± 0.11	0.186
Corneal surface aberration in 3 mm zone			
RMS total	1.85 ± 1.06	1.25 ± 0.55	0.051
Coma	0.25 ± 0.23	0.16 ± 0.10	0.083
Trefoil	0.32 ± 0.37	0.13 ± 0.07	0.041*
Spherical aberration	−0.07 ± 0.04	−0.06 ± 0.03	0.206

Values are given as mean ± standard deviation (*D*). RMS, root mean square.
* Statistically significant (P value < 0.05).

4. Discussion

Mostly, a small-size chalazion is treated with conservative methods or corticosteroid injection [1–3,6]. Surgical procedures like I and C are usually preferred for chalazion larger than 3 mm

Table 2
The change of corneal astigmatism in Group 1 and Group 2 after the chalazion excision.

	Preoperative	Postoperative 2 months	*P* value
Corneal astigmatism measured by auto-refractometer			
Group 1	−1.92 ± 0.68	−1.83 ± 0.82	0.182
Group 2	−2.06 ± 0.88	−1.80 ± 0.65	0.040*
Corneal astigmatism measured by dual rotating Scheimpflug camera			
Group 1	−1.60 ± 0.85	−1.54 ± 0.81	0.284
Group 2	−1.70 ± 0.77	−1.19 ± 0.89	0.017*

Values are given as mean ± standard deviation (*D*).
* Statistically significant (P value < 0.05).