Effects of Chalazion Excision on Ocular Aberrations

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Purpose: The goal of this study was to compare higher-order aberrations before and after upper lid chalazion excision.

Methods: Fourteen eyes from 12 patients (8 females, mean age: 28.7 ± 2.7 years) with upper lid chalazion were enrolled in this prospective interventional case series. Chalazia were excised by standard transconjunctival vertical incision. Ocular aberrations were evaluated by aberrometry (ZYWave) before and 2 months after chalazion excision.

Results: Root mean square of total higher-order aberrations decreased from 0.67 ± 0.12 to 0.43 ± 0.15 μm (P = 0.012) after excision. The root mean square of Zernike orders in the vertical and horizontal trefoil and horizontal coma were decreased after excision. Orbscan Ilz tomography showed a statistically significant decrease in 5 mm zone irregularity (P = 0.027) and an increase in minimum simulated keratometry after surgery (P = 0.046).

Conclusions: Chalazion increases higher-order aberrations, as measured by the Hartmann-Shack aberrometer, which could affect the preoperative evaluation and results of refractive surgery, especially wavefront-guided approaches. Chalazion excision could reduce ocular aberrations and is recommended before refractive surgeries.

Key Words: chalazion, ocular aberration, Hartmann-Shack aberrometer

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Chalazion Excision

To anesthetize the eyelid, 1.5 mL of 2% lidocaine HCl + 1/80,000 epinephrine (Persocaine, Tehran, Iran) was injected subcutaneously into the eyelid with a 29-gauge needle. The conjunctiva was anesthetized with a drop of 0.5% tetracaine (Anestocaine; Sina Darou, Tehran, Iran). The eyelid was everted, and a lid clamp was placed. A vertical incision was made through the tarsal plate into the meibomian gland. A curette was inserted into the chalazion to break up the loculations and drain the chalazion. The patient was given erythromycin ointment and betamethasone drops (Betasonate; Sina Darou) to apply to the affected eye 3 times daily for 5 days.

Statistical Analysis

Statistical testing was performed with SPSS Windows (version 16; SPSS, Inc, Chicago, IL). Variables are expressed as mean ± standard deviation. Paired t test was used to compare differences. Differences were considered significant at a P value of <0.05.

RESULTS

Fourteen eyes (9 right and 5 left eyes) of 12 patients (8 women, 4 men) with a mean age of 28.7 ± 2.7 years (range, 19–38 years) were examined. All patients had a single central, upper lid, medium- or large-sized chalazion.

Mean preoperative best-corrected visual acuity was 0.003 ± 0.013 logarithm of the minimum angle of resolution (0.943 ± 0.024 in decimal scale), and it was not changed after excision. After surgical treatment, Orbscan IIz tomography showed a statistically significant improvement in 5 mm zone irregularity (P = 0.027). The data analysis also documented an average steepening in the flat corneal meridian (minimum simulated keratometry) after surgery (P = 0.046). Results of the Orbscan IIz analysis are summarized in Table 1.

The total aberration in the 6-mm optical zone was 3.84 ± 1.04 μm, which decreased to 1.46 ± 0.38 μm after excision (P = 0.007). The RMS of total higher-order aberrations in the 6-mm optical zone decreased from 0.67 ± 0.12 to 0.43 ± 0.15 μm (P = 0.012; Fig. 1).

TABLE 1. Orbscan IIz Findings Before and 2 Months After Chalazion Excision

<table>
<thead>
<tr>
<th></th>
<th>Before</th>
<th>After</th>
<th>P*</th>
</tr>
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<tbody>
<tr>
<td>Anterior best-fit sphere</td>
<td>43.37 ± 0.76</td>
<td>43.86 ± 0.64</td>
<td>0.218</td>
</tr>
<tr>
<td>Posterior best-fit sphere</td>
<td>52.72 ± 0.07</td>
<td>52.82 ± 0.89</td>
<td>0.562</td>
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<tr>
<td>SimK astigmatism</td>
<td>−0.96 ± 0.12</td>
<td>−0.89 ± 0.18</td>
<td>0.098</td>
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<tr>
<td>Maximum SimK</td>
<td>44.82 ± 1.43</td>
<td>44.18 ± 1.65</td>
<td>0.131</td>
</tr>
<tr>
<td>Minimum SimK</td>
<td>42.74 ± 1.34</td>
<td>43.94 ± 1.04</td>
<td>0.045†</td>
</tr>
<tr>
<td>3 mm zone irregularity</td>
<td>1.16 ± 0.32</td>
<td>1.07 ± 0.25</td>
<td>0.168</td>
</tr>
<tr>
<td>5 mm zone irregularity</td>
<td>1.57 ± 0.49</td>
<td>1.23 ± 0.74</td>
<td>0.027†</td>
</tr>
</tbody>
</table>

*Values are given as mean ± standard deviation.
†Statistically significant (P value < 0.05).
SimK, simulated keratometry.

The RMS values of the horizontal and vertical trefoil after excision (0.45 ± 0.16 and 0.47 ± 0.09 μm, respectively) were less than those before excision (−0.06 ± 0.11 and 0.21 ± 0.14 μm, respectively; P < 0.05 for both). We also found a significant change in the RMS of the horizontal coma (from 0.31 ± 0.06 to −0.08 ± 0.13 μm, P = 0.008) and spherical aberration (from −0.27 ± 0.08 to −0.13 ± 0.09 μm, P = 0.046). Results of the aberrometry are summarized in Table 2.

DISCUSSION

In this study, we evaluated the effect of chalazion on ocular aberrometry by measuring the ocular aberration before and 2 months after chalazion excision. Included individuals were 18 to 40 years old, with a unilateral or bilateral upper lid chalazion and otherwise normal eye exam results. We aimed to reduce the effects of all other ocular conditions on our results. Chalazia were treated by the incision and curette method, which rapidly decompresses the mass effect over the cornea. It also decreases the chance of residual chalazion compared with medical treatment.

Several studies have evaluated the effect of chalazion on refraction and corneal topography. Bagheri et al8 showed that chalazion excision can decrease corneal astigmatism and irregularity, which are more prominent in upper lid lesions. Santa Cruz et al10 noted that the pressure of an upper lid chalazion induces hyperopia and astigmatism. Cosar et al11 reported a case of visual improvement secondary to hyperopic astigmatism in a patient with prior laser in situ keratomileusis, which was successfully treated with excision of the upper lid chalazion.

In our study, mean preoperative best-corrected visual acuity was near 20/20 and it did not change postoperatively. This might preclude the importance of chalazion in preoperative evaluation. However, Orbscan IIz and aberrometer showed significant change in corneal regularity and ocular aberration as a result of chalazion. Orbscan IIz recorded an improvement in corneal 5 mm zone irregularity, postoperatively. Changes in Orbscan IIz parameters, other than minimal simulated keratometry, were not statistically significant. Lack of difference in corneal astigmatism, despite documented changes in other studies, might reflect differences in mean keratometry readings between corneal topographers.12 In addition, relatively small sample size of this study might limit the ability to detect small differences. However, aberrometric evaluation easily detected the optical changes before and after chalazion excision. It indicates the importance of aberrations in the detection of minimal optical distortion. “Irregularity” in Orbscan IIz is equal to higher-order aberrations.

In this study, excision of the upper lid chalazion decreased the ocular aberrations, including higher-order aberrations, RMS of horizontal coma, vertical and horizontal trefoil, and spherical aberrations. Although chalazion is not a corneal pathology, it could compress the cornea, make it irregular, and consequently influence the ocular aberration. Our study shows that chalazion could be associated with horizontal (coma and trefoil), vertical (trefoil), and even symmetrical (spherical) aberrations.
We did not find any relationship between the size of the chalazion and induced aberrations, perhaps because of the small sample size of this study. Moreover, in cases with more ptosis, the chalazion is closer to the visual axis and could distort the central cornea more. We think that this risk factor is as important as the chalazion size and might offer another explanation for why we did not find size as a risk factor for induced aberration.

Changes in the ocular media could cause aberrations, either in the beginning (eg, pterygium) or in the termination of the optical axis (eg, macular diseases).

Wavefront-guided refractive surgery is gaining popularity among ophthalmologists. According to our results, the existence of a chalazion could cause higher-order aberrations; therefore, we suggest that each refractive surgery candidate be examined carefully for chalazia before refractive surgery. Excision of the chalazion before refractive surgery may reduce the direct effect of the chalazion on the cornea and help the surgeon find the true ocular aberrations.

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REFERENCES