

Periorbital aesthetic concerns in patients seeking corneal refractive surgery

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Purpose: To report the frequency of periorbital aesthetic abnormalities in patients undergoing refractive surgery and to report the ability of the patient and the refractive surgeon in picking up these findings compared to the oculoplastic surgeon. **Methods:** Single-center, prospective observational case series. All patients underwent standard pre-operative work-up for refractive surgery, answered a study questionnaire, and underwent face photographs (with and without glasses). The patient, the refractive, and the oculoplastic surgeons evaluated the photographs to categorize the concerns as none, presence of ptosis, tear trough deformity, scleral show, and others. The findings of the oculoplastic surgeon were taken as the standard of reference. **Results:** The photographs of 121 patients were analyzed. The mean age was 25.76 ± 3.75 years and 72% were males. The main indication for surgery was to eliminate dependency on glasses in a majority (76%) followed by cosmesis in 23%. The oculoplastic surgeon noted tear trough deformity in 14 (11.5%) cases, scleral show in 51 (42.1%), ptosis in 35 (28.9%), and other findings in 45 (37.1%). When the symmetrical scleral show was excluded, the patient picked up aesthetic concerns in only 8.26%, the refractive surgeon in 14% as compared to 39% by the oculoplastic surgeon ($P < 0.01$). **Conclusion:** Periorbital aesthetic significant findings were noted in 39% of the patients undergoing corneal refractive surgery when assessed by an oculoplastic surgeon. The refractive surgeon was able to pick up less than 50% of these. We recommend a basic aesthetic initial evaluation prior to refractive surgery and photographic documentation, especially in cosmetically aware patients.

Key words: Eyelid bags, patient satisfaction after refractive surgery, periorbital aesthetics, ptosis and refractive surgery, refractive surgery

Corneal refractive surgery is commonly performed to get rid of glasses and yields high rates of success and patient satisfaction.^[1] One of the important reasons why patients seek refractive surgery is to improve their cosmetic appearance by the elimination of glasses. While the refractive surgeons evaluate in great detail the suitability of the patient for the refractive surgical procedure and also attempt to achieve extremely precise refractive results, despite all attempts in all practices, the odd patient ends up dissatisfied for reasons unrelated to a perfect visual outcome. For patients who are habituated to wearing glasses, several periorbital findings and aesthetic concerns such as the presence of eyelid bags, periorbital pigmentation (dark circles), tear trough deformity, ptosis, and scleral show are camouflaged behind the spectacle frames [Fig. 1]. Prior to refractive surgery, patients are often unaware of these findings, as they cannot recognize these changes due to poor uncorrected visual acuity. Post-operatively, these periorbital aesthetic concerns are likely to become apparent both due to the improvement in the uncorrected visual acuity and also as a result of elimination of the spectacle frame, thereby unmasking these findings [Fig. 2]. Refractive surgery, just like any other

ocular surgery, can lead to ptosis which is rare but has been reported post-operatively.^[2-4] Whether the periorbital problem was pre-existing or occurred post-operatively then becomes a moot question. In this context, it may be important to document pre-existing findings, as patients are likely to observe them more carefully after refractive surgery, or even attribute them to the refractive intervention, leading to post-operative dissatisfaction.

Certain periorbital aesthetic findings such as pigmentation and globe prominence may require non-surgical or surgical correction if cosmetically significant.^[5,6] Anecdotally, both refractive and oculoplastic surgeons increasingly encounter post-refractive surgery patients who complain about periorbital aesthetic concerns and attribute some of these concerns (which could have been pre-existing) to the corneal refractive surgery. Therefore, both the patient and the surgeon should be aware of these findings, and adequate pre-operative documentation is of potential medico-legal importance. The research questions that remain unanswered in this field include the following: What is the prevalence of periorbital aesthetic concerns in patients undergoing refractive surgery? Do spectacles hide some of them? How often do the patients

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Figure 1: Clinical photograph of patients seeking refractive surgery with (a and c) and without (b and d) their glasses. Note the right mild ptosis in the first patient (b) with increased tarsal plate show. Also, note the tear trough deformity in the second patient (d) that gives a 'tired' look, which may persist

notice these findings? Should a refractive surgeon alone or the oculoplastic surgeon be involved collaboratively in the pre-operative workup?

In this study, we prospectively looked at the prevalence of significant periorbital aesthetic findings which could be of potential concern in patients undergoing corneal refractive surgery, and the ability of the stakeholders (the patient, corneal refractive surgeon, and the oculoplastic surgeon) in picking up these findings. To our knowledge, this is the first study that reports such a comparison.

Methods

This was a prospective study approved by the institutional review board of LV Prasad eye institute (LEC--07--18--099) and the research adhered to the tenets of the Declaration of Helsinki. Informed consent was obtained from all patients prior to enrollment. Patients were consecutively recruited from the refractive surgery clinic between August 2018 and March 2019.

Inclusion criteria: All patients above 21 years of age seeking corneal refractive procedure, with no periocular surgical/aesthetic treatment in the past 12 months. **Exclusion criteria:** Patients who had undergone any previous intra- or extraocular surgery, on long-term topical medications, ocular diseases such as dry eye, glaucoma, allergic conjunctivitis, or uveitis, patients not willing to participate in the study, or unacceptable quality of clinical photographs that would hinder the assessment of periorbital aesthetic concerns.

Sample size calculation

As there is no literature available on unmasking of periorbital aesthetic abnormalities following the elimination of spectacles, we did a pilot project in which the periorbital aesthetic concerns with and without spectacles were studied in 30 subjects to calculate the prevalence. It was found that 18 out of 30 subjects had periorbital aesthetic abnormalities as identified by the oculoplastic surgeon. Based on a proportion of 0.6, confidence limit of 95%, and delta of 0.1 from the estimate, a sample size of 122 was calculated.^[7]

After enrollment, all patients were asked to fill in a pre-operative study questionnaire as part of the study. They,

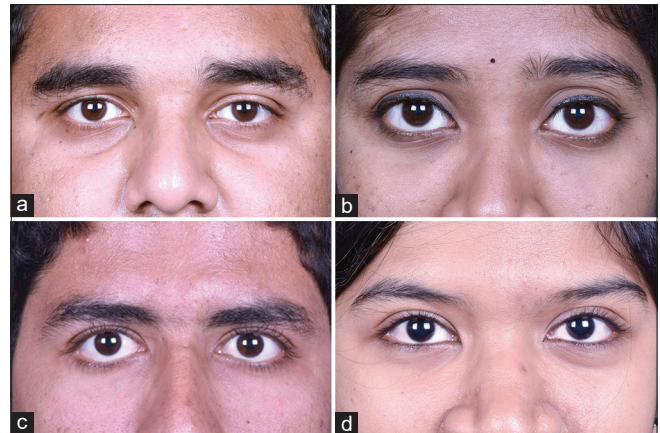


Figure 2: Various periorbital aesthetic concerns in patients seeking corneal refractive surgery. Tear trough deformity is a hollow noted around the infero-medial orbital rim (a) Also note the mild left ptosis in the same patient. Asymmetric scleral show (c) can often be due to asymmetric axial myopia and can lead to perceived 'enlargement' of the eye. Periorbital pigmentation, and brow asymmetry is seen in third patient (b) Young lady showing abnormally prominent left lower eyelid orbicularis roll which may resemble persistent edema (d)

then, underwent an assessment of refractive parameters of the eye, including corneal topography and a comprehensive eye examination including binocular indirect ophthalmoscopy. Prior to pupillary dilatation, the patients underwent clinical digital photography. The patient photographs were assessed by a senior oculoplastic surgeon and a senior refractive surgeon with adequate knowledge of comprehensive ophthalmological evaluation.

Photography

Full-face digital photography was done with and without spectacles. The photographs were taken over a gray background with the Nikon D7200 camera with a 60 mm Macro lens set at 2.8 aperture. Photographs were cropped from trichion to menton vertically, and tragus to tragus horizontally using the Adobe Photoshop CS6 version and standardized to 300 dpi resolution and 6 inch × 4 inch portrait size.

Response to the questionnaire and data analysis

The photographs with and without spectacles were shown to the patient on a 21-inch video display unit under ambient light settings. The patient was asked to comment (1) whether they perceived themselves to look better with/without spectacles; (2) whether they noted any periocular aesthetic concerns (in the photograph without spectacles) that bothered them from a cosmetic standpoint. Standard photographs of periorbital concerns were not shown to the patients as reference.

All photographs were randomly numbered and shown to the refractive surgeon as well as the oculoplastic surgeon in a masked manner. First, the set of photographs with the spectacles were shown, and at a later date, the ones without spectacles, to eliminate recall bias. Both surgeons were asked (1) whether they noted any periorbital asymmetry or aesthetic finding of concern; and (2) if they did, to specify it. Fig. 1a–d shows the clinical photographs of patients with and without glasses, which were rated by the surgeons, showing various periorbital concerns.

Analysis was done based on the presence or absence of fat bags, scleral show, tear trough deformity, asymmetry of the palpebral fissure height, periocular pigmentation, or any other cosmetic deformity noted in the periorbital region (miscellaneous). Fig. 2a–d shows the various periocular findings noted in the patients. Responses were noted separately for photographs with and without spectacles.

Statistical analysis

Statistical analysis was done using ‘R’ software V 3.1.2 (University of Auckland, New Zealand). The Chi-square test was used to compare the proportions. Cohen’s kappa was used to look at the agreement between the two observers.^[8] A P value of less than 0.05 was considered statistically significant

Results

A total of 122 patients were enrolled in the study of which 1 patient was excluded due to exotropia. The mean age at the time of enrollment was 25.76 ± 3.75 years, and 87 (72%) were males.

From the patient’s perspective, 102 (84%) reported that they looked better without spectacles. With regards to the reason for undergoing refractive surgery, 76% desired convenience (independence from wearing glasses), 18.2% desired improved cosmesis as the primary reason, and an additional 5% stated both convenience and cosmesis. Therefore, 23% of the patients had cosmesis as one of the reasons to undergo refractive surgery.

Table 1 shows the prevalence of periorbital aesthetic abnormalities as picked up by the patient, the refractive surgeon, and the oculoplastic surgeon. For the purpose of analysis, the numbers picked up by the oculoplastic surgeon [Table 1, column 4] were considered as the reference standard, being the experienced observer. The patient and refractive surgeon’s data were compared to the oculoplastic surgeon’s findings. The Chi-square test was applied to assess the significance of the periorbital aesthetic abnormalities as picked up by the refractive surgeon and the oculoplastic

surgeon in photographs *with* and *without* spectacles. In both sets of patient photos (with and without spectacles), the oculoplastic surgeon could pick up more findings, and the difference was found to be statistically significant ($P < 0.01$).

Sixteen photos were marked as an aesthetic abnormality by respective patients; 50 aesthetic abnormalities were marked by the refractive surgeon in 48 cases; 145 by the oculoplastic surgeon in 92 cases [Table 1]. When the symmetrical scleral show was excluded, the patient picked up aesthetic abnormalities in 10 (8.26%), the refractive surgeon in 17 (14%), and the oculoplastic surgeon in 47 (39%) cases.

Cohen’s kappa analysis^[8] was performed to check the agreement between the periorbital aesthetic findings that were picked up by the refractive surgeon and the oculoplastic surgeon (in photographs without spectacles) and is given in Table 2. A moderate and fair agreement was found for findings such as ‘scleral show’ and ‘ptosis,’ but poor agreement for findings such as ‘tear trough deformity,’ ‘periocular pigmentation,’ and ‘others.’

Removal of the spectacles enabled the oculoplastic surgeon to detect 26 new findings. We assessed the significance of this with the Chi-square test and this is shown in Table 3. The yield of detecting tear trough ($P = 0.03$) and ptosis ($P = 0.008$) was statistically significant. Findings such as scleral show, fat bags, and others were detected more often without spectacles but did not achieve statistical significance ($P = 0.06$). Tear trough and periorbital pigmentation were picked up better by the patients (7 times) as compared to the refractive surgeon (once).

Discussion

Refractive surgery and the resultant elimination of glasses are reported to have better psychological self-esteem among patients.^[9–11] The desire to eliminate dependency on the glasses and achieve better cosmesis are the two prime reasons for patients undergoing refractive surgery. Although robust pre-operative screening for suitability of refractive surgery is the norm, a comprehensive or even cursory pre-operative evaluation of many periorbital aesthetic abnormalities is not

Table 1: Comparison of the periorbital aesthetic concerns detected by the patient, the refractive surgeon, and the oculoplastic surgeon

Total number=121	Numbers detected by the patient	Numbers detected by the refractive surgeon	Numbers detected by the oculoplastic surgeon
Tear trough	4	1	14 (11.6%)
Scleral show	6	31	51 (42.1%)
Ptosis	2	16	35 (29%)
Fat bags	1	2	1 (0.8%)
Periorbital pigmentation	3	0	25 (20.6%)
Upper lid retraction	0	0	5 (3.3%)
Orbicularis roll	0	0	4 (3.3%)
Brow asymmetry	0	0	5 (3.3%)
Lower lid fold	0	0	2 (1.65%)
Pretarsal show	0	0	2 (1.65%)
Dermatochalasis	0	0	1 (0.8%)
Total	16	50	145
Total when symmetrical scleral show is excluded	10 (8.26%)	17 (14%) *	(39%) *

(*Chi-square test, $P < 0.01$)

commonplace for refractive surgical practices. It is also not standard practice to document the external features with clinical photographs prior to corneal refractive surgery. Anatomical abnormalities or aesthetic concerns such as aponeurotic ptosis, scleral show, fat bags, and unilateral proptosis due to high myopia have a direct causal link with refractive errors and are likely to be present in the young population seeking corneal refractive surgeries.^[12] Other aesthetic findings such as tear trough deformity, eyelid fold asymmetry, and periocular pigmentation though not directly linked to refractive error, could still be unmasked after the elimination of glasses. It is also possible that post-refractive surgery, these patients would have a heightened perception of these findings and could even attribute causality to the refractive procedure in the rarest of instances.

Fortunately, the oculoplastic complications of anterior segment or refractive surgeries are extremely rare.^[2-4] Patients seeking refractive surgery are not routinely counseled about these pre-operatively.^[13] Therefore, in the event of a patient noting some of the significant aesthetic findings only post-operatively (such as ptosis), and attributing this to the surgery, it would be extremely difficult for the refractive surgeon to prove otherwise.

Our study showed a male preponderance with a mean age at presentation of 25.76 ± 3.75 , which is similar to previous refractive surgery cohorts.^[12] Cosmetic improvement was the reason to undergo refractive surgery in only 23% of the patients in our series, and therefore, the chances of detecting aesthetic findings by our cohort may be lower. However, in those practices where the patients predominantly seek cosmetic improvement, the patients may be more aware of their aesthetic concerns and the results may be different.

In our study, the periorbital aesthetic concerns were picked up on the photographs in increasing order by the patient,

the refractive surgeon, and the oculoplastic surgeon. Since symmetrical inferior scleral show can be considered as a normal finding (or not of high aesthetic concern), we excluded this abnormality. When the scleral show was excluded, periorbital aesthetic concerns were picked up by patients in 8.26% of the cases, by a refractive surgeon in 14% of the cases, and by an oculoplastic surgeon in 39% of the cases. This indicates that the refractive surgeon is able to detect them more often than the patient, albeit far less often than the oculoplastic surgeon, which is an expected result. Between the refractive surgeon and the oculoplastic surgeon, there was moderate agreement in picking up the scleral show and fair agreement in picking up ptosis. However, other aesthetic findings such as tear trough, periocular pigmentation, and others had a poor agreement. Findings such as periorbital pigmentation, upper lid retraction, orbicularis roll, brow asymmetry, lower lid fold, pretarsal show, dermatochalasis were not picked up at all by the refractive surgeon, but only by the oculoplastic surgeon, as these conditions are addressed commonly in the oculoplastic practice on a daily basis.

Finally, when the oculoplastic surgeon’s assessment was analyzed with and without spectacles, it was clear that removal of spectacles does increase the ability to pick up these findings. This can easily be extrapolated to real-life situation, where the patients are likely to notice them more after the elimination of glasses. Our results show that while an oculoplastic surgeon performing the pre-operative evaluation would obviously have a higher frequency of detecting peri-orbital abnormalities, it may not be practical or necessary for this to be done in all refractive surgery practices. The refractive surgeons too can be trained to better evaluate and detect these findings and bridge the gap. One important aspect to be considered is that these evaluations should be a simple screening to document some of the findings if significant and not to make the patient aware of any deficiencies about which they are not concerned. In our study, the results of the refractive and the oculoplastic surgeons’ evaluation were not shared with the patients. The authors do not in any way recommend that this evaluation should be utilized as a means to motivate patients to undergo any aesthetic surgery based on these results.

The strengths of this study are that it is the first study to report the frequency of periorbital aesthetic findings of cosmetic significance in refractive surgery patients. The study design was prospective, and photographs were masked to the clinical findings or medical records. A three-level comparison between the patient, refractive surgeon, and oculoplastic surgeon makes this a unique study.

The limitations of the study are that there was no control group. The majority of patients were undergoing surgery to

Table 2: Cohen’s kappa analysis evaluating the agreement on the periorbital aesthetic findings between the oculoplastic and refractive surgeons in photographs without spectacles

	Oculoplastic surgeon			
	Tear trough	Scleral show	Ptosis	Others
Refractive surgeon				
Tear trough	0.11	--	--	--
Scleral show	--	0.53	--	--
Ptosis	--	--	0.35	
Others	--	--	--	0.05

Table 3: Chi-square test to assess the significance of “unmasking” of findings after removing spectacles as seen by the oculoplastic surgeon

Oculoplastic surgeon	With spectacles	Without spectacles	Percentage of findings picked up after removing spectacle	p
Tear trough	6	14	57.1%	0.003
Scleral show	46	51	9.8%	0.06
Ptosis	27	35	22.8%	0.008
Others (fat bags and dark circles)	40	45	11.1%	0.06

get rid of glasses, rather than cosmesis, therefore, the findings detected do not translate into a cosmetic concern from the patient's perspective. Also, only one refractive and one oculoplastic surgeon were included, hence the results could have been different if a different set of surgeons were included.

Despite these limitations, this study is the first to demonstrate the role of such an evaluation.

Conclusion

In conclusion, our study demonstrated that the frequency of significant periorbital aesthetic findings can be up to 39% in patients undergoing corneal refractive surgery as assessed by an experienced oculoplastic surgeon. In the authors' opinion, we recommend that in practices where the patients predominantly seek surgery for a cosmetic reason, a basic pre-refractive surgery screening of the periorbital region could be performed. These conditions can be documented with photographs and explained to the patient prior to surgery.

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Conflicts of interest

There are no conflicts of interest.

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