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Effect of Upper Eyelid Surgery on Vision and Corneal Topographic Changes Measured by Pentacam

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ABSTRACT
Background: Ptosis, dermatochalasis, and eyelid surgeries can exert pressure on the cornea, inducing surface reshaping and topographic alterations measurable with imaging technologies.
Objective: To compare the effects of upper eyelid surgery on visual acuity and corneal topography using Pentacam.
Patients and Methods: In this prospective study, 20 eyes from 12 patients with ptosis or dermatochalasis underwent corrective surgery. Ophthalmic examination and Pentacam corneal topography were performed preoperatively, and repeated at 1 and 3 months. Parameters included K1, K2, KM, corneal astigmatism, and central corneal thickness (CCT). Best-corrected visual acuity (BCVA) was also assessed.
Results: At 1 month, mean BCVA showed a significant but temporary change ($p = 0.001$), which was absent at 3 months ($p = 1.000$). Corneal astigmatism demonstrated a transient myopic shift of 0.2 D ($p = 0.001$) with axis change ($p = 0.034$) at 1 month; both were non-significant at 3 months ($p = 0.119$ and $p = 0.342$). Mean K1 and KM showed no differences at 1 month ($p = 1.000$), while K2 differed significantly ($p = 0.001$). At 3 months, significant differences were found in K1 ($p = 0.017$) and KM ($p = 0.001$), but not K2 ($p = 0.173$). CCT showed a transient 1-month change ($p = 0.034$), returning to baseline at 3 months ($p = 1.000$).
Conclusion: Ptosis and dermatochalasis impose chronic corneal pressure, producing measurable topographic alterations. Surgical correction relieves this pressure, inducing short-term astigmatic changes that normalize within 3 months, while effects on BCVA remain clinically negligible.
Keywords: Upper Eyelid Surgery, Corneal Topographic, Pentacam.

INTRODUCTION
As the primary refractive element of the eye, the cornea is susceptible to alterations induced by eyelid position and pressure. Eyelid pathologies including hemangiomas, ectropion, chalazia, and meibomian gland cysts, as well as mechanical influences from normal lids—for example, palpebral aperture narrowing in downward gaze during reading—have been shown to modify corneal astigmatism and corneal topographic features [(1)]. Pressure exerted by ptosis and various eyelid pathologies can reshape the corneal surface and give rise to topographic alterations that are demonstrable with multiple imaging techniques [(1)]. The application of eyelid pressure produces corneal contour changes, characterized by peripheral flattening and central steepening, ultimately affecting with-the-rule astigmatism [(2)]. Ptosis may be accompanied by visual dysfunction, functional limitations, and cosmetic concerns. In children, upper eyelid ptosis can induce refractive errors that contribute to amblyopia, whereas in adults it may result in persistent blurred vision [(3)].

A considerable proportion of cases undergoing upper blepharoplasty report postoperative blurred vision, most often attributable to dry eye and typically transient. When edema is the underlying cause, the blurring usually subsides spontaneously within 1–3 weeks as the edema resolves [(4)].

In terms of long-term postoperative visual complaints, the underlying mechanism may involve changes in corneal configuration. Upper eyelid blepharoplasty and ptosis surgery reposition and tighten the eyelid vertically, thereby exerting increased pressure vectors on anterior cornea, resulting in curvature alterations and associated visual changes [(4)].

Pentacam assessment is based on true elevation mapping from limbus to limbus, allowing detailed evaluation of anterior and posterior corneal surfaces; evidence from prior studies indicates excellent accuracy and repeatability of these measurements. It gives all the details; "curvature units" dioptre and curvature (mm), "K type" R horizontal, R vertical, R steep/K1, R flat/K2, astigmatism and its axis and R mean/K mean in addition to the choice of the elevation reference shape [(5)].

This investigation aims to compare pre- and postoperative visual performance and corneal topographic changes associated with different upper eyelid surgical techniques, as measured by Pentacam.

PATIENTS AND METHODS
This prospective, interventional, non-randomized investigation included 20 eyes of 12 cases who underwent surgical repair for upper eyelid pathologies (blepharoptosis and dermatochalasis) at the Ophthalmology Department, Al-Azhar University Hospitals, and the Oculoplastic Department, Tanta Ophthalmic Hospital, between July 2023 and July 2024.

Eligibility criteria:
Cases of both sexes above the age of 18 years with upper eyelid conditions, including blepharoptosis and dermatochalasis, were eligible for inclusion. Cases with a history of intraocular, refractive, or eyelid surgery, those wearing contact lenses, or those diagnosed with corneal surface–modifying diseases such as pterygium or keratoconus, were excluded.

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All cases were subjected to:

History taking:

History taking thoroughly explored the current illness, emphasizing its onset, duration, pattern of progression, and degree of severity.

Examination:

Unaided and BCVA was measured using Landolt′s Snellen chart at 6 meters then the results were converted into LogMAR units for statistical purposes. Cycloplegic refraction was taken by Autorefractometer (Topcon, Japan). Measurements were performed preoperatively and postoperatively (one and three months). Slit lamp biomicroscopy, pupil, and corneal sensation were also evaluated.

Examination of ptosis:

***Palpebral fissure height*:** Under normal conditions, the upper eyelid margin covers approximately 2 mm of the cornea, while the lower eyelid margin overlaps by about 1 mm. The distance between the two lid margins is measured in the pupillary plane, with normal values ranging from 7–10 mm in males and 8–12 mm in females. Comparison with the contralateral eye and calculation of the difference allows grading of unilateral ptosis as mild (1–2 mm), moderate (3–4 mm), or severe (≥4 mm).

The upper eyelid margin reflex distance (MRD): With the case fixating on a torch light directed by the examiner, the distance between the corneal light reflex and the upper eyelid margin is measured. A normal MRD ranges from 4 to 5 mm.

***Levator function*:** The functional status of the levator muscle is evaluated by firmly fixing the case's eyebrow with the examiner's thumb while the eyes are directed downward. The case is then asked to look upward, and the excursion of the upper eyelid is measured with a scale. Levator function is graded as normal (15 mm), excellent (>12 mm), good (9–11 mm), fair (5–9 mm), or poor (<4 mm). This assessment is essential in selecting the appropriate surgical procedure for ptosis correction.

***Margin crease distance*:** MCD is defined as the distance from the upper eyelid margin to the skin crease, measured in downgaze. Normal values are 7–8 mm in males and 8–10 mm in females. The measurement is typically increased in aponeurotic ptosis, while in congenital ptosis it is absent or poorly defined.

***Bell's phenomenon*:** The test involves requesting the case to gently close the eyes, during which the examiner attempts to open them. Cases demonstrating poor Bell's phenomenon are at risk of exposure keratopathy; therefore, ptosis correction must be avoided or limited to undercorrection.

Surgical procedures:

The choice of surgical procedure mainly depends on the levator function and ptosis severity, cases with mild and moderate ptosis with good to fair levator function had levator resection, cases with moderate to severe ptosis with fair levator function had levator resection, cases with severe ptosis and poor levator function had frontalis sling surgery. In the current study, 8 eyes of 5 cases had levator resection, 2 eyes of 2 cases had frontalis sling surgery. All 5 cases with dermatochalasis had skin only blepharoplasty.

Corneal topography:

Corneal topography was performed preoperatively, and at 1- and 3-months following eyelid surgery, to evaluate topographic changes. All examinations were conducted using the Oculus Pentacam system (Pentacam HR, Oculus Optikgeräte GmbH, software version 1.22r09). Each case was comfortably positioned with the chin and forehead stabilized to ensure fixation during the procedure. After the first eye was assessed, the examination was repeated for the fellow eye. Upon completion, the system generated a three-dimensional virtual reconstruction of the anterior segment, from which all parameters were derived. The study variables included astigmatic power and axis, K1, K2, KM, and CCT.

These pre- and postoperative (one and three months) data were compared and statistically analysed.

Ethical Conduct and Consent

The study protocol received full approval from the Local Ethics Committee of Al-Azhar University, ensuring all investigative procedures were in strict accordance with the tenets of the Declaration of Helsinki, which guides ethical research involving human subjects. Prior to participation, each individual provided written informed consent, granted only after a comprehensive explanation of the study's nature, its procedures, and potential implications was thoroughly provided.

Statistical analysis

Data were entered into an Excel spreadsheet and subsequently exported to the Statistical Package for the Social Sciences (SPSS), version 21, for sorting, tabulation, and analysis. Quantitative variables were expressed as mean ± SD, while qualitative variables were presented as frequencies and percentages.

Normality of data distribution was assessed. For repeated measurements of quantitative variables (e.g., BCVA, astigmatism, keratometric values, and central corneal thickness), the **Friedman test** was applied as a non-parametric test for comparing dependent samples at baseline, 1 month, and 3 months. For pairwise comparisons between two related samples, the **Wilcoxon signed-rank** test was used. Categorical data were analyzed using descriptive statistics (frequencies and percentages). A significance level of 5% was adopted, with $p \leq 0.05$ considered statistically significant and $p \leq 0.001$ regarded as highly significant.

RESULTS

A total of 20 eyes from 12 cases were included in the study, with cases ages spanning 18–52 years. They were classified into 2 main groups, ptosis group 10 eyes of 7 cases and dermatochalasis group 10 eyes of 5 cases (Table 1).

Table (1): Demographic data of all upper eyelid cases.

	Demographic data	NO (20 eyes of 12 cases)	%
Age (years)	Mean ± SD	36.6 ± 13.7	
	Median (IQR)	40.5 (21-48)	
	Range	18 – 52	
Sex	Female	8	66.7
	Male	4	33.3

No.: number, SD: standard deviations, (IQR) for inter quartile range

As shown in table (2), the ptosis group consisted of 10 eyes from 7 cases. Congenital ptosis was found in 3 cases (6 eyes), and acquired ptosis in 4 cases (4 eyes). Severity grading revealed 6 eyes with moderate ptosis. Surgical intervention was determined by levator function: 8 eyes of 5 cases with fair-to-good levator function underwent levator resection.

Table (2): Demographic data and criteria of ptosis in blepharoptosis group.

	Demographic data	NO (10 eyes of 7 cases)	%
Age (years)**:**	Mean ± SD	26.9± 6.47	
	Median (IQR)	21 (20-31)	
	Range	18 – 34	
Sex	Female	6	60
	Male	4	40
Diagnosis	Acquired ptosis	4	40
	congenital ptosis	6	60
Operation	levator resection	8	80
	Frontalis Sling	2	20
Degree	Mild	2	20
	Moderate	6	60
	Sever	2	20
Function	Good	3	30
	Fair	5	50
	Poor	2	20
Laterality	OD	6	60
	OS	4	40

No.: number, SD: standard deviations, (IQR) for inter quartile range, **OD**: Oculus Dexter, **OS**: Oculus Sinister.

Table (3) shows demographic data and criteria of dermatochalasis group which included 10 eyes of 5 cases, all 5 cases had bilateral blepharoplasty.

Table (3): Demographic data and criteria of dermatochalasis group.

Demographic characteristics	NO (10 eyes of 5 cases)	%
Age (years)**:**		
Mean ± SD	49 ± 1.89	
Median (IQR)	48 (48-50)	
Range	47 – 52	
Sex		
Female	8	80
Male	2	20
Diagnosis		
Dermatochalasis	10	100
Operation		
Blepharoplasty	10	100
Laterality		
OD	5	50
OS	5	50

No.: number, SD: standard deviations, (IQR) for inter quartile range, **OD**: Oculus Dexter, **OS** :Oculus Sinister

Table (4) presents BCVA (LogMAR) values before surgery, and at 1 and 3 months postoperatively. A statistically significant improvement was observed between the preoperative mean BCVA and the 1-month postoperative value. A further statistically significant change was noted between the 1-month and 3-month postoperative BCVA. However, the difference between preoperative BCVA and the 3-month postoperative value was statistically insignificant.

Table (4): Best corrected visual acuity (LogMAR units) pre-operation, one month, and three months after operation in all cases.

	Mean± SD	Range	Median (IQR)	Friedman F	Friedman P
BCVA Pre-operation	0.8 ± 0.2	0.5 - 1.0	0.9 (0.7 - 1.0)	35.74	0.001*
After 1 month	0.6 ± 0.1	0.5 - 0.7	0.5 (0.5 - 0.7)		
After 3 months	0.9 ± 0.1	0.7 - 1.0	1.0 (0.7 - 1.0)		

Wilcoxon Signed Ranks Test	**Pre and post 1 month**	**Pre and post 3 months**	**Post 1 and 3 months**
	3.789	**0.791**	**3.971**
P-value	**0.001***	**1.000**	**0.001***

SD: standard deviations, IQR : inter quartile range, BCVA: best corrected visual acuity, F : Friedman test, *: p-value statistically significant at $P \leq 0.05$. p-value statistically very significant at $P \leq 0.01$. p-value statistically highly significant at $P \leq 0.001$.

Table (5) shows mean astigmatism power and axis changes preoperative, 1 month postoperative and 3 months postoperative of all cases. A substantial variation was observed between the preoperative mean astigmatism power and the 1-month postoperative value, as well as between the 1-month and 3-month postoperative values. In contrast, the difference between baseline and 3-month postoperative astigmatism power was statistically insignificant. Regarding astigmatism axis, a marked variation was noted between the preoperative mean and the 1-month postoperative value, as well as between the 1-month and 3-month postoperative values. However, the comparison between baseline and 3-month postoperative axis revealed no substantial variation.

Table (5): Astigmatic power and axis changes pre-operation, one month, and three months after operation in all cases.

	Mean± SD	**Range**	**Median (IQR)**	**Friedman F**	**Friedman P**
Astigmatism Pre-operation	0.5 ± 0.2	0.3 - 0.8	0.4 (0.3 - 0.6)	**37.50**	**0.001***
After 1 month	0.7 ± 0.3	0.4 - 1.2	0.7 (0.4 - 0.8)		
After 3 months	0.4 ± 0.2	0.2 - 0.8	0.3 (0.2 - 0.6)		

Wilcoxon Signed Ranks Test	**Pre and post 1 month**	**Pre and post 3 month**	**Post 1 and 3 months**
	3.957	**2.055**	**3.976**
P-value	**0.001***	**0.119**	**0.001***

	Mean± SD	**Range**	**Median (IQR)**	**Friedman F**	**Friedman P**
Axis Pre-operation	103.9 ± 62.8	6.6 - 175.2	131.9 (59.4 - 159.2)	**17.20**	**0.001***
After 1 month	48.4 ± 46.1	6.6 - 157.3	36.5 (13.4 - 70.60		
After 3 months	110.3 ± 49.1	21.2 - 170.0	113.5 (67.8 - 155.9)		

Wilcoxon Signed Ranks Test	**Pre and post 1 month**	**Pre and post 3 month**	**Post 1 and 3 months**
	0.800	**1.581**	**1.300**
P-value	**0.034***	**0.342**	**0.001***

SD: standard deviations, IQR: inter quartile range, F: Friedman test
*: p-value statistically significant at P ≤ 0.05.
p-value statistically very significant at P ≤ 0.01.
p-value statistically highly significant at P ≤ 0.001.

Table (6) shows corneal topographic changes (K1 and K2) of all cases. There was statistically insignificant difference between pre-operative mean K1 and one-month post-operative K1. There was substantial variation between preoperative mean K1 and three months postoperative K1, also between one-month postoperative K1 and three months postoperative K1. There was statistically significant difference between preoperative mean K2 and one-month postoperative K2, also between one-month postoperative K2 and three months postoperative K2. There was statistically insignificant difference between pre-operative K2 and three months postoperative K2.

Table (6): Corneal topographic changes (K1 and K2) pre-operation, one month, and three months after operation in all cases.

	Mean± SD	Range	Median (IQR)	Friedman F	Friedman P
K1 Pre-operation	43.2 ± 1.2	41.0 - 44.4	43.9 (42.4 - 44.1)	**11.02**	**0.004***
After 1 month	43.4 ± 1.5	41.1 - 45.1	43.9 (42.1 - 44.4)		
After 3 months	43.1 ± 1.2	40.9 - 44.1	43.8 (42.0 - 44.0)		

Wilcoxon Signed Ranks Test	**Pre and post 1 month**	**Pre and post 3 month**	**Post 1 and 3 months**
	0.937	**2.767**	**3.022**
P-value	**1.000**	**0.017***	**0.022***

	Mean± SD	Range	Median (IQR)	Friedman F	Friedman P
K2 Pre-operation	43.7 ± 1.1	41.6 - 44.6	44.2 (43.2 - 44.5)	**32.72**	**0.001***
After 1 month	45.4 ± 1.4	41.7 - 45.7	44.6 (43.4 - 44.8)		
After 3 months	43.5 ± 1.1	41.5 - 44.4	44.2 (43.1 - 44.3)		

Wilcoxon Signed Ranks Test	**Pre and post 1 month**	**Pre and post 3 months**	**Post 1 and 3 months**
	3.761	**1.897**	**3.970**
P-value	**0.001***	**0.173**	**0.001***

SD: standard deviations, IQR: inter quartile range, F: Friedman test
*: p-value statistically significant at P ≤ 0.05.
p-value statistically very significant at P ≤ 0.01.
p-value statistically highly significant at P ≤ 0.001.

Table (7) shows the mean KM changes of all cases. There was statistically insignificant difference between preoperative mean KM and one-month postoperative KM. There was a substantial variation between one-month postoperative KM and three months postoperative KM, also between preoperative KM and three months postoperative KM.

Table (7): KM changes pre-operation, one month, and three months after operation in all cases.

	Mean± SD	Range	Median (IQR)	Friedman F	Friedman P
KM Pre-operation	43.4 ± 1.2	41.3 - 44.4	44.1 (42.8 - 44.3)	**26.67**	**0.001***
After 1 month	43.7 ± 1.4	41.4 - 45.5	44.2 (42.7 - 44.6)		
After 3 months	43.3 ± 1.2	41.2 - 44.2	44.0 (42.5 - 44.2)		

Wilcoxon Signed Ranks Test	**Pre and post 1 month**	**Pre and post 3 months**	**Post 1 and 3 months**
	0.089	**4.427**	**4.348**
P-value	**1.000**	**0.001***	**0.001***

SD: standard deviations, IQR: inter quartile range, F: Friedman test
*: p-value statistically significant at P ≤ 0.05.
p-value statistically very significant at P ≤ 0.01.
p-value statistically highly significant at P ≤ 0.001.

Table (8) shows CCT changes pre-operation, one month, and three months after operation of all cases. Mean CCT shows statistically significant difference between preoperative and at 1-month postoperative, also between 1-month postoperative CCT and at three months postoperative. There was statistically insignificant variation between preoperative CCT and at 3-month postoperative.

Table (8): Central corneal thickness pre-operation, one month, and three months after operation in all cases.

	Mean± SD	Range	Median (IQR)	Friedman F	Friedman P
CCT Pre-operation	541.1 ± 20.2	496 - 563	544 (530 - 561)	**12.800**	**0.002***
After 1 month	529.3 ± 14.2	492 - 546	530.5 (527 - 538)		
After 3 months	540.2 ± 20.0	496 - 564	547 (527 - 554)		
Wilcoxon Signed Ranks Test	**Pre and post 1 month**	**Pre and post 3 month**	**Post 1 and 3 months**		
	2.954	**0.632**	**2.820**		
P-value	**0.034***	**1.000**	**0.005***		

SD: standard deviations, IQR: inter quartile range, F: Friedman test, CCT : central corneal thickness
*: p-value statistically significant at P ≤ 0.05.
p-value statistically very significant at P ≤ 0.01.
p-value statistically highly significant at P ≤ 0.001.

Case (1)

A female case aged 18 years old. No history of any systemic disease or ocular disease. No history of left ocular operation with congenital (moderate) ptosis with good levator function **(Fig. 1-4).**

Fig. (1): 18 years old female with congenital blepharoptosis before and after left levator resection.

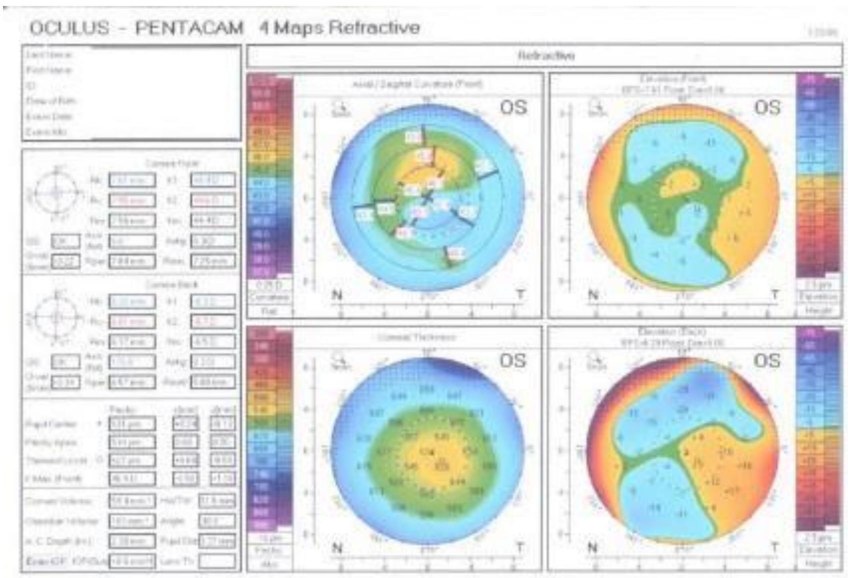

Fig: (2). Preoperative corneal topography of case (1).

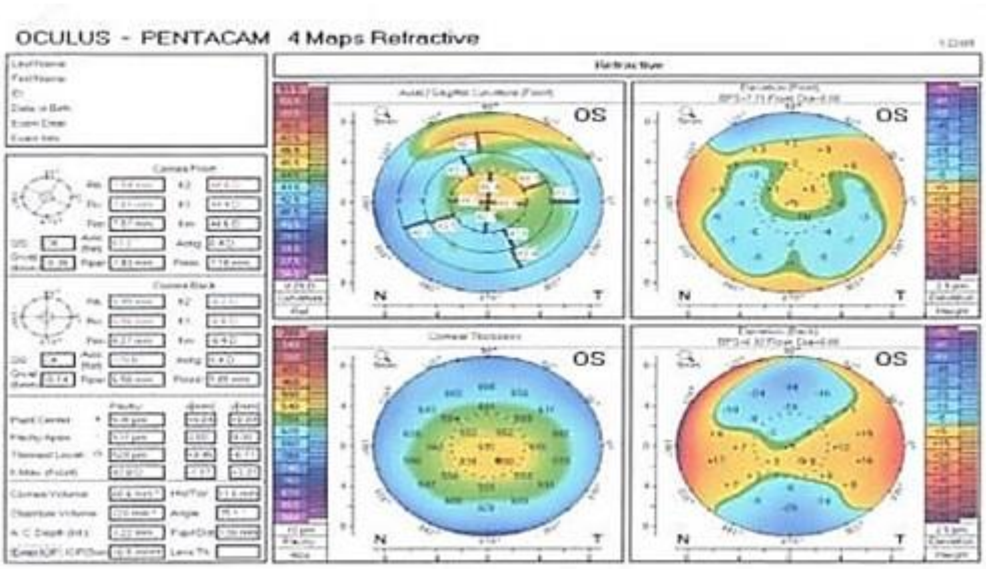

Fig. (3): 1-month postoperative corneal topography of case (1).

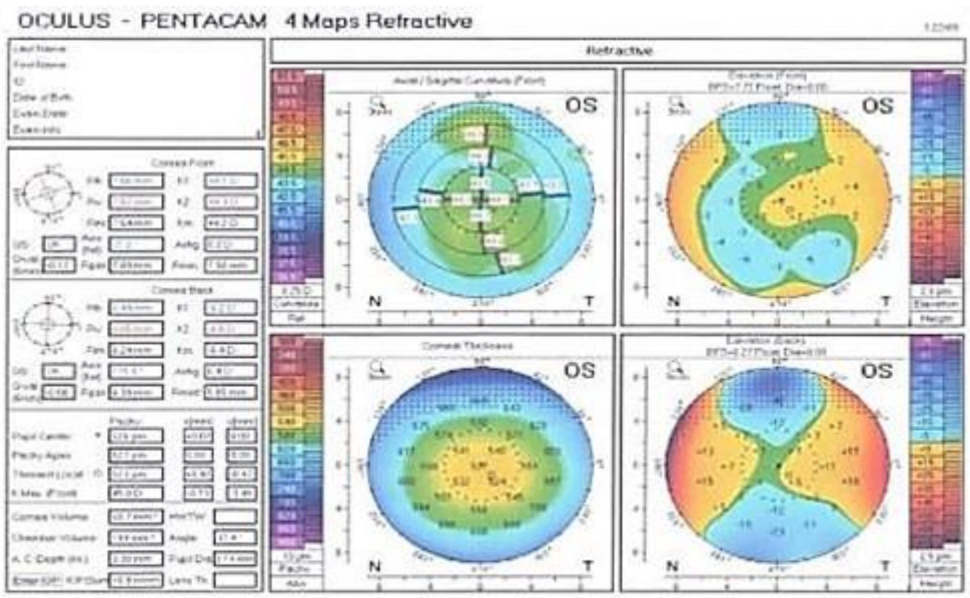

Fig. (4): 3 months postoperative corneal topography of case (1).

CASE (2)

Female case aged 48 years old. No history of any systemic disease or ocular disease. No history of ocular operation with dermatochalasis **(Fig. 5-11).**

Fig. (5): 48 years old female with bilateral dermatochalasis before and after blepharoplasty.

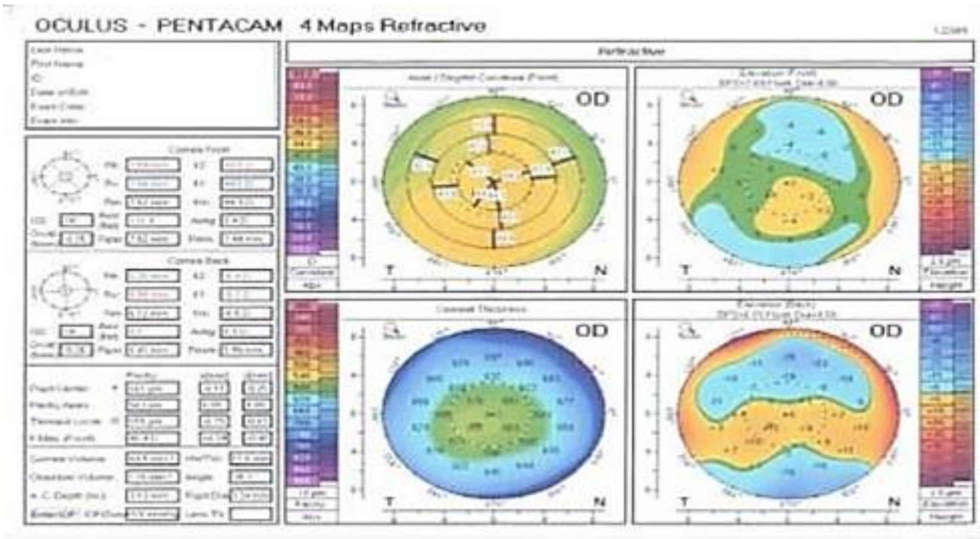

Fig. (6): Preoperative corneal topography of case (2) OD.

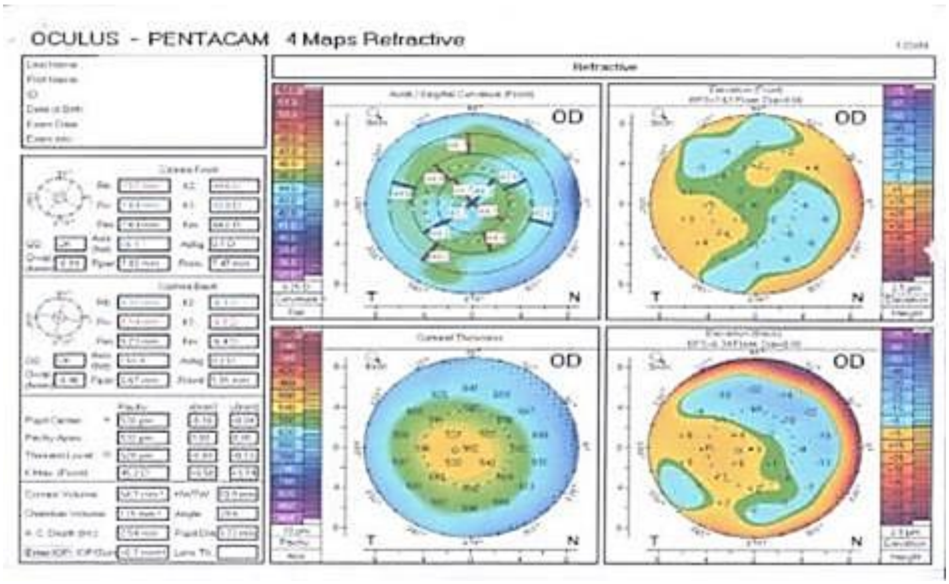

Fig. (7): 1-month postoperative corneal topography of case (2) OD.

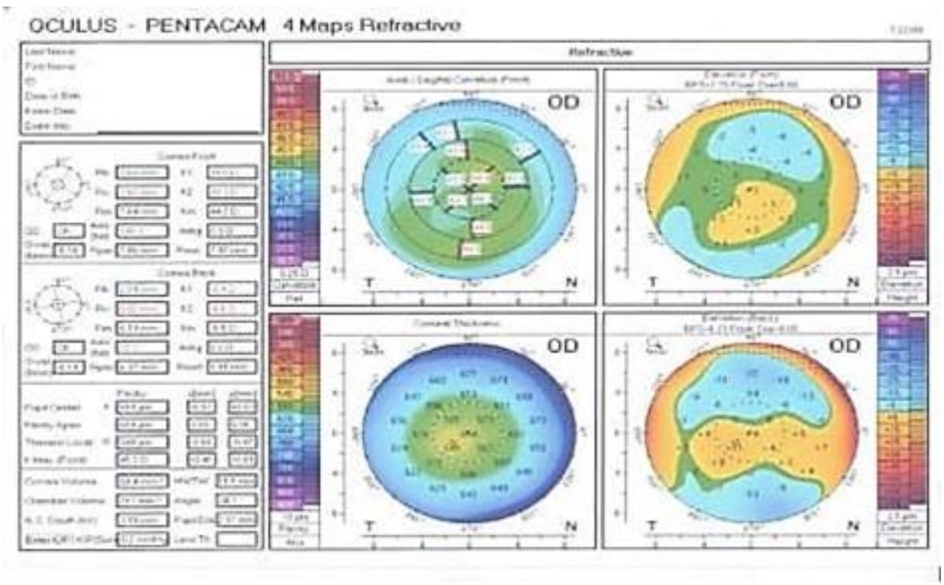

Fig. (8): 3 months postoperative corneal topography of case (2) OD.

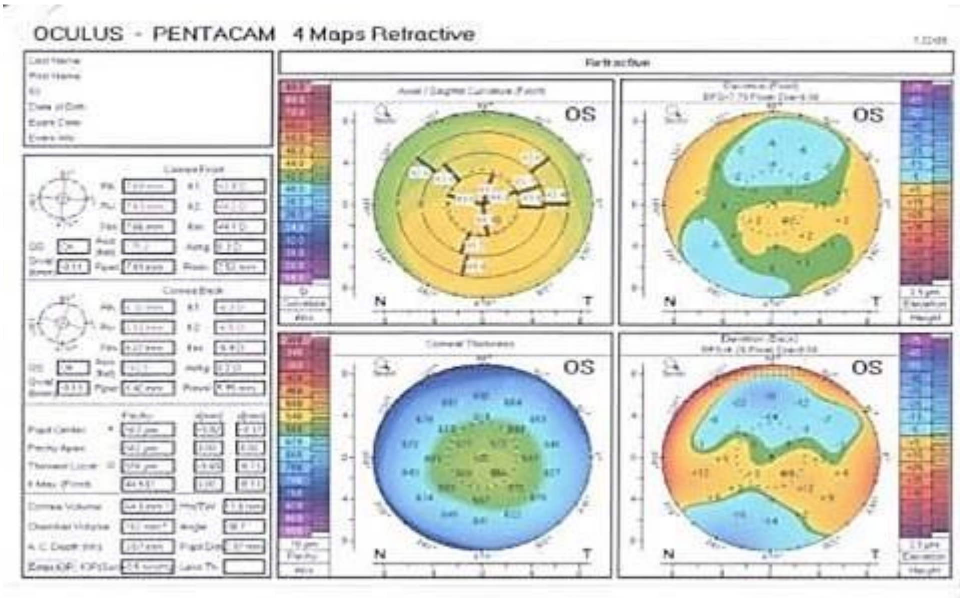

Fig. (9): Preoperative corneal topography of case (2) OS.

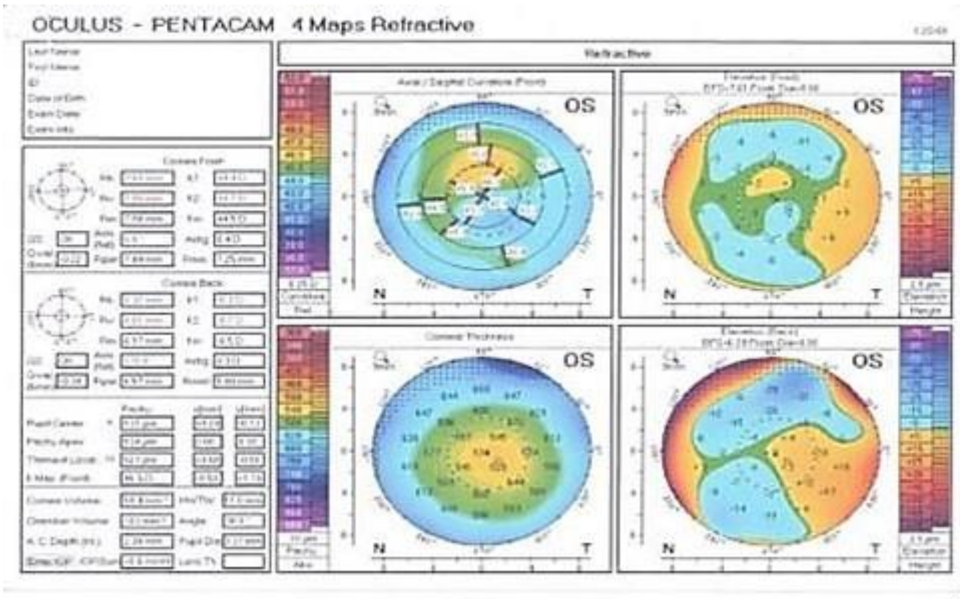

Fig. (10): 1-month postoperative corneal topography of case (2) OS.

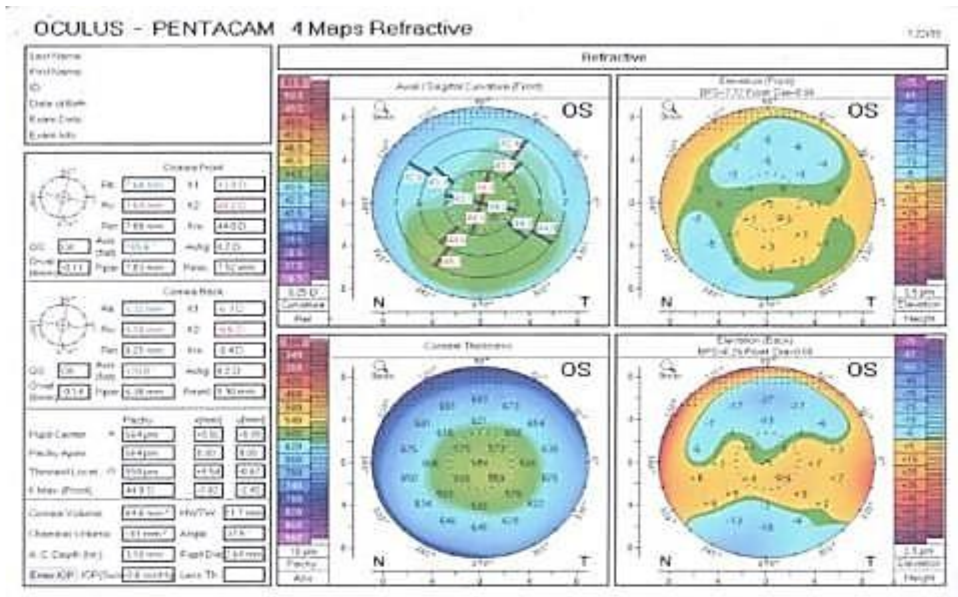

Fig. (11): 3 months postoperative corneal topography of case (2) OS.

DISCUSSION

Several studies have examined the influence of eyelids on corneal shape, particularly in cases of congenital ptosis. **Gullstrand** [(6)] proposed that eyelid pressure alters corneal astigmatism in the with-the-rule direction by inducing corneal flattening. This peripheral flattening causes the central cornea to steepen along the same axis. Furthermore, other upper and lower eyelid disorders, such as hemangiomas, chalazia, epibulbar dermoids, and involutional ectropion, have also been implicated in modifying corneal shape [(2)].

By vertically tightening and repositioning the upper eyelid, blepharoplasty or ptosis surgery increases anterior corneal pressure vectors, leading to modifications in corneal curvature that manifest as visual changes [(7)].

Corneal alterations, encompassing both topographic and refractive characteristics, can be assessed with various diagnostic devices. Topographic measurements provide detailed information about the entire corneal surface. Using a rotating scan that requires no more than 2 seconds, up to 50 Scheimpflug images of the anterior segment are acquired [(4)].

Our study documents that VA, astigmatic changes and corneal topography can follow ptosis and dermatochalasis correction surgeries in adults. In the current study, we compared the pre- and postoperative refractions of 20 eyes of 12 cases who underwent upper eyelid surgery for surgical management of ptosis and dermatochalasis. Pentacam imaging was used to analyze both anterior and posterior corneal surfaces, with quantitative outputs including CYL, K1, K2, Km, and CCT within a 12-mm diameter.

Cases aged 18–52 years were recruited. Ten eyes of five cases were diagnosed with dermatochalasis, the majority being females (80%). The ptosis group included 10 eyes of seven cases, with congenital cases accounting for 60% and acquired cases for 40%. Severity distribution showed mild ptosis in 20% and moderate ptosis in 60% of eyes. Most cases demonstrated fair (50%) to good (30%) levator function. Consequently, levator resection was performed in 80% of cases, while frontalis sling surgery was required in 20%.

Mean BCVA was 0.8 prior to surgery, compared to 0.6 at 1 month postoperatively (p = 0.001, statistically significant), and 0.9 at 3 months postoperatively (p = 1.000, statistically insignificant).

In agreement with the present study, **Simsek *et al.*** [(4)] documented that postoperative visual blurring was not clinically significant. Conversely, **Shao *et al.*** [(8)] reported that 5.7% of cases experienced subjective visual acuity (VA) changes one year after undergoing blepharoplasty and ptosis repair.

Our study showed that all cases (100%) had association with myopic astigmatism. We documented the preoperative astigmatism, 1 month postoperative and final three months postoperative astigmatism. The average preoperative astigmatism was 0.5 D while the average one-month postoperative astigmatism was 0.7 D. The difference was 0.2 D with *p-value* of 0.001 which was statistically significant.

The mean preoperative myopic astigmatism was 0.5, compared with 0.4 at three months postoperatively, yielding a difference of 0.1 that was not statistically significant (p = 0.119).

Our study corroborates the findings of **Simsek *et al.*** [(4)], in which 60% of 43 eyes exhibited a significant increase in corneal astigmatism at one-month post-surgery. By the third month, no significant changes were noted when compared to the first postoperative month. Similar to our observations, **Altin and Karadeniz** [(9)] demonstrated a statistically significant 0.22 diopter difference between preoperative and postoperative mean astigmatism at the one-month follow-up.

In accordance with our results **Kao *et al.*** [(10)] found an average decrease of 0.18 D in astigmatism following congenital ptosis surgery, which was not found statistically significant. In contrary to our study **Agrawal and Ravani** [(11)] found an average decrease of (0.43 D) in astigmatism following congenital ptosis surgery in 30 paediatric cases (4-12 years old), which was found statistically significant with *p-value* of < 0.05 at 3 months postoperative.

In our study corneal astigmatism axis showed transient statistically significant shift from (103.9±62.8) preoperative to (48.4 ±46.1) 1 month postoperative with *p-value* of 0.034, and showed statistically insignificant shift to (110.3±49.1) at 3 months postoperative with *p-value* of 0.342.

Our findings corroborate those of **Gingold *et al.*** [(12)], who reported no statistically significant variation in refractive error or toricity after acquired ptosis surgery, with relative stability in the astigmatic axis. Agreement was also observed with **Karabulut and Fazil** [(1)], who showed no significant differences in corneal astigmatism or axis three months postoperatively as assessed by Sirius.

Unlike our observations, **Zinkernagel *et al.*** [(2)] reported significant corneal topographic alterations three months after upper eyelid surgery, as measured with Orbscan, with 88% of cases in the ptosis group demonstrating astigmatism changes and 53% showing axis rotations of more than 10°.

Evidence suggests that astigmatic changes following ptosis surgery are transient, typically regressing within 6 to 12 months. Eyelid disorders and surgical manipulation of the eyelids are also known to affect the refractive state of the eye. Several studies have documented that periocular lesions exerting a mass effect contribute to alterations in corneal astigmatism [(4)].

At one month postoperatively, Pentacam measurements indicated no significant difference in mean K1 (43.2 ± 1.2 vs. 43.4 ± 1.5, p = 1.000) or mean KM (43.4 ± 1.2 vs. 43.7 ± 1.4, p = 1.000). Conversely, mean K2 exhibited a statistically significant change, increasing from 43.7 ± 1.1 to 45.4 ± 1.4 (p = 0.001).

At the postoperative third month, there was significant change in mean K1 (43.1 ± 1.2) and Km (43.3 ± 1.2) with *p-value* of 0.017 and 0.001 respectively, while mean K2 (43.5 ± 1.1) showed a statistically insignificant change with *p-value* 0.173 compared to the preoperative values.

In line with our study, **Sommer *et al.*** [13] observed that upper eyelid blepharoplasty produced a weak but statistically significant effect on central Kmax at 4 weeks after surgery. Concordantly, **Savino *et al.*** [3] investigated corneal topographic changes after ptosis repair and, using the Sirius device, documented reductions in average keratometry and corneal astigmatism, together with improved corneal symmetry and flattening of the superior cornea.

Our study closely aligns with the observations of **Dogan *et al.*** [14], who noted that K2 values were significantly altered one month after levator surgery, although the change did not persist at 3 and 6 months postoperatively.

Our study also agrees with **Youssef *et al.*** [15] who observed Mean avgK values significantly decreased at 3 months in comparison to preoperative. Our study disagrees with **Nalcı *et al.*** [16] who observed insignificant postoperative change in corneal keratometric parameters.

Our study disagrees with **Assadi *et al.*** [17] who reported substantial decrease in mean Steepest K ($P < 0.001$). K-min and K-max decreased but not significantly 6 months postoperatively by using Orbscan 3 (Bausch and Lomb). In the study done by **Sharifi *et al.*** [18] regarding topographic and tomographic measurements, the changes in indices were not significant except for the minimum keratometry index in Orbscan.

As regard CCT, our study showed that there was transient statistically significant change in mean CCT 1 month after surgery from (541.1 ± 22.2) to (529.3 ±14.2) with *p-value* 0.034. 3 months postoperative mean corneal CCT was (540.2 ± 20.2), which nearly was the same as preoperative mean CCT (541.1 ± 22.2) with statistically insignificant *p-value* of 1.000.

Our findings are consistent with those of **Savino *et al.*** [3], who reported no significant postoperative change in central corneal thickness. Similarly, our results align with **Karabulut and Fazil** [1], who also found no significant alteration in central corneal thickness after surgery.

Evidence from prior studies indicates that ptosis surgery may induce a mild increase in corneal dioptric power, with changes over 0.5 D potentially resulting in significant visual consequences that warrant preoperative discussion with cases. In contrast, other research has shown no statistically significant differences in corneal refraction or keratometry at six months following levator resection in adults. Brief subjective visual symptoms in such cases may be attributable either to postoperative eyelid position or to age-related lenticular changes and cataractogenesis [7].

Preoperative severity of ptosis serves as an important determinant of postoperative corneal astigmatism changes. Severe cases are associated with steepening of the inferior meridian, which undergoes the greatest flattening after surgery [17].

Mild cases of ptosis, on the other hand, result in steepening of the superior meridian, which then undergoes the greatest flattening following surgical correction [1].

Our results demonstrate that changes in eyelid position can impose pressure on the anterior cornea, altering its surface and producing topographic modifications that may affect visual function. While some changes—such as transient blurring, astigmatic variation, and K2 alterations—resolve by one-month, other parameters (K1 and KM) may persist up to three months. These latter changes, however, are statistically significant without being clinically relevant.

CONCLUSION

This study evaluated postoperative astigmatic and subjective VA changes following ptosis and blepharoplasty surgeries using Pentacam measurements obtained preoperatively, and at one and three months postoperatively. Transient statistically significant astigmatic changes were observed at one month, which resolved by the third postoperative month. Statistically significant topographic alterations were also documented; however, these were not translated into clinically significant changes in VA.

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