

THE COSMETIC AND FUNCTIONAL OUTCOMES OF COMBINED SURGERY FOR PERIOCCULAR AGING; CHANGES IN VISUAL FIELD AND CORNEAL TOPOGRAPHY

PERİOKÜLER YAŞLANMA İÇİN YAPILAN KOMBİNE CERRAHİNİN KOZMETİK VE FONKSİYONEL SONUÇLARI; GÖRME ALANI VE KORNEA TOPOGRAFİSİNDEKİ DEĞİŞİKLİKLER

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ABSTRACT

AIM: To evaluate the visual field and corneal topographic findings which occur with combined surgeries in patients who have other involuntional periocular changes in association with dermatochalasis.

Material and Method: Eighty eyelids of 40 patients were included in the study and the subjects were divided into 2 groups as additional eyelid pathology (Group 1) and additional eyebrow ptosis (Group 2). In the preoperative and postoperative 3rd month, Margin Reflex Distance-1 (MRD-1), corneal parameters obtained by high base topography device and visual field findings obtained by a visual field device were recorded and detailed ophthalmologic examination was performed.

RESULTS: A mean elevation of 0.5 mm was observed in the MRD-1 values in both groups. Postoperatively, a marked reduction was observed in the rate of observing scotoma in the visual field and in MD and PSD values ($p < 0.001$) in both groups. Among the corneal topography data, no significant change was observed in the anterior chamber depth and astigmatism axis, whereas a statistically significant increase was found in the strenght of refractivity of the most flat (K1), the most steep meridian (K2) ($p < 0.05$). The postoperative astigmatism value was significantly higher in Group 1 ($p < 0.001$) while the increase in Group 2 was not statistically significant ($p = 0.599$).

CONCLUSIONS: More successful functional and cosmetic outcomes can be obtained following combined surgeries directed to different pathologies in involuntional eyelid and eyebrow changes.

Keywords: corneal topography, dermatochalasis, eyebrow ptosis, margin reflex distance, visual field defect

ÖZET

AMAÇ: Dermatoşalazisle birlikte bulunan diğer senil perioküler değişiklikleri olan olgularda kombine cerrahi ile ortaya çıkan görme alanı ve kornea topografik bulgularını değerlendirmek.

GEREÇ VE YÖNTEM: Çalışmaya 40 hastanın 80 göz kapağı dahil edildi ve olgular ek göz kapağı patolojisi (Grup 1) ve ek kaş pitozu (Grup 2) olarak 2 gruba ayrıldı. Ameliyat öncesi ve sonrası 3. ayda Marjin Refleks Mesafesi-1 (MRD-1), yüksek bazlı topografi cihazı ile elde edilen kornea parametreleri ve görme alanı cihazı ile elde edilen görme alanı bulguları kaydedildi ve ayrıntılı oftalmolojik inceleme yapıldı.

BULGULAR: Her iki grupta MRD-1 değerlerinde ortalama 0.5 mm'lik yükselme gözlemlendi. Ameliyat sonrası her iki grupta görme alanında skotom varlığında ve MD ve PSD değerlerinde belirgin azalma ($p < 0.001$) gözlemlendi. Kornea topografisi verileri arasında ön kamara derinliğinde ve astigmatizma ekseninde anlamlı bir değişiklik gözlenmezken; en düz (K1), en dik meridyen (K2) kırılma gücünde istatistiksel olarak anlamlı artış tespit edildi ($p < 0.05$). Postoperatif astigmatizma değeri preoperatif döneme göre Grup 1'de anlamlı olarak daha yüksek ($p < 0.001$), Grup 2'de ise bu artış istatistiksel olarak anlamlı değildi ($p = 0.599$).

SONUÇ: Senil göz kapağı ve kaş değişikliklerinde farklı patolojilere yönelik uygulanan kombine cerrahiler sonrasında daha başarılı fonksiyonel ve kozmetik sonuçlar elde edilebilir.

Anahtar Kelimeler: dermatoşalazis, kapak aralığı mesafesi, kaş ptozisi, kornea topografisi, görme alanı

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Geliş Tarihi / Submitted : Nisan 2020 / April 2020

Kabul Tarihi / Accepted : Ocak 2021 / January 2021

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This study was approved by the ethics committee of Ankara Training and Research Hospital (Ankara, Turkey, date: 25.05.2010- clinical trial number: 3032) and it conforms to the principles of the Declaration of Helsinki.

INTRODUCTION

Dermatochalasis is occurrence of excess eyelid skin in relation with age and it is frequently associated with herniation of the orbital adipose tissue (1). Periorbital changes which occur with aging include baggy eyelids or sagging of the skin without bagging, rounding of the lateral cantal angle, eyebrow ptosis, horizontal lower eyelid laxity, ectropion, entropion, filled eyelids related with herniation of orbital fat and eyelid ptosis (1,2).

Dermatochalasis may lead to severe cosmetic problems in addition to significant anatomic and functional disorders (3). Other involuntional eyelid pathologies accompanying dermatochalasis may increase functional visual disorder. Upper visual field loss is one of the common functional indications of upper eyelid blepharoplasty (4). In patients with large adipose tissue herniation, changes in corneal curvature related with the pressure exerted by the adipose tissue on the cornea have been reported to lead to changes in the patient's level of vision (5).

In our study, we aimed to demonstrate visual field and corneal topography findings which may occur secondary to involuntional periorbital changes associated with dermatochalasis and the changes in these findings which occur as a result of combined surgeries.

MATERIAL AND METHODS

This study was approved by the ethics committee of Ankara Training and Research Hospital (Ankara, Turkey, date: 25.05.2010- clinical trial number: 3032) and it conforms to the principles of the Declaration of Helsinki. In our study, 80 eyes of 40 patients who presented to our clinic with dermatochalasis and additional involuntional eyelid and eyebrow pathology between May 2010 and February 2014 and underwent combined surgery were evaluated. The patients who underwent intraorbital surgery which might have affected anterior segment

parameters, who had any corneal pathology which could affect corneal morphology (corneal dystrophy, keratitis, corneal ectasis etc.) and who had additional diseases which might affect the visual field (glaucoma, intracranial or orbital mass) were excluded from the study. Informed consent was obtained from all subjects who were included in the study after explaining the content and objective of the study.

Complete ophthalmic examination was performed in all patients. Margin Reflex Distance-1 (MRD-1), upper lid crease height, levator function, eyelid laxity and tear function tests were evaluated. Humphrey perimeter (model 750; Humphrey-Zeiss, San Leandro) was used to evaluate visual field findings. Presence or absence of scotoma in the upper visual field, localization of scotoma, the lowest decibel value, median deviation (MD), pattern standard deviation (PSD) values were recorded. Corneal topography measurement was performed using Pentacam (Oculusinc.Germany) device which operated with Scheimpflug visualization principle. The mean central corneal thickness (CCT), anterior chamber depth, astigmatism value, astigmatism axis, the keratometry values of the flattest (K1) and the most vertical (K2) meridians were recorded.

The patients included in the study were divided into two groups according to the surgeries performed for involuntional changes in the eyelid (Group 1) and eyebrow (Group 2) in addition to superior eyelid blepharoplasty. The cases with additional pathology and underwent additional surgery in Group 1 were shown on **Table-1**. Internal browpexy was performed in addition to blepharoplasty in patients who had eyebrow ptosis together with dermatochalasis in Group 2.

The changes in the preoperative and postoperative (postoperative 3rd month) values of MRD-1, visual field and corneal topography findings were compared.

Table 1. Additional pathology and surgery in Group 1

Additional pathology	Number of patients	Additional surgery
Upper eyelid dermatochalasis + Senile aponeurotic ptosis	9	Upper eyelid blepharoplasty + Aponeurotic levator tucking
Upper and lower eyelid dermatochalasis + Fat prolapse	3	Upper and lower eyelid blepharoplasty + Fat excision
Upper and lower eyelid dermatochalasis + Ptosis	2	Upper and lower eyelid blepharoplasty + Orbicular muscle sling
Upper eyelid dermatochalasis + Benign eyelid neoplasm	2	Upper eyelid blepharoplasty + Eyelid neoplasm excision
Upper and lower eyelid dermatochalasis + Ectropion	1	Upper and lower eyelid blepharoplasty + Lateral retinacular sling

Statistical Analysis

The data were analyzed using SPSS for Windows 11.5 package program. Shapiro Wilk, Student's t, Mann Whitney U, Fisher's Exact, Dependent t and Wilcoxon Signed-rank test was used to statistical analyses. A p value of ≤ 0.05 was considered statistically significant.

RESULTS

The mean age of 17 male and 23 female patients included in the study was 57.5 ± 12.0 (17.0-75.0) years. In Group

1, 12 of 19 patients were female and 7 were male and the mean age was 53.0 ± 14.5 (17.0-75.0) years. In Group 2, 11 of 21 patients were female and 10 were male and the mean age was 63.0 ± 8.8 (45.0-71.0) years.

No difference was found between the two groups in terms of gender and age ($p < 0.05$). The changes in the preoperative and postoperative values of MRD-1, visual field findings were shown on **Table-2** and corneal topography findings on **Table-3**.

Table 2. Preoperative and postoperative MRD-1 values and findings obtained with visual field test

	Preoperative	Postoperative	P
MRD-1 (mm)			
All subjects	3.00 \pm 0.65	3.50 \pm 0.38	<0.001
Group 1	3.00 \pm 0.90	3.50 \pm 0.48	<0.001
Group 2	3.00 \pm 0.25	3.50 \pm 0.24	<0.001
Visual field defect (n, %)			
All subjects	74 (92.5)	60 (75)	<0.001
Group 1	36 (94.7)	28 (73.7)	0.003
Group 2	38 (90.5)	32 (76.2)	0.012
Scotoma localization (%)	None / upper / upper temporal	None / upper / upper temporal	
All subjects	6.3/43.8/50.0	25.0/42.5/32.5	0.018
Group 1	4.3/61.7/14.9	14.9/48.9/10.6	0.073
Group 2	9.5/11.9/78.6	23.8/26.2/50.0	0.012
MD (dB)			
All subjects	4.33 \pm 2.54	2.73 \pm 2.02	<0.001
Group 1	4.74 \pm 2.67	2.33 \pm 2.37	<0.001
Group 2	4.16 \pm 2.44	2.86 \pm 1.65	<0.001
PSD (dB)			
All subjects	3.61 \pm 2.63	2.07 \pm 1.87	<0.001
Group 1	3.58 \pm 2.74	2.06 \pm 2.24	<0.001
Group 2	3.61 \pm 2.55	2.08 \pm 1.45	<0.001

MRD-1: margin reflex distance-1; MD: median deviation; PSD: pattern standard deviation

Table 3. Preoperative and postoperative findings obtained with corneal topography

	Preoperative	Postoperative	p
Anterior chamber depth (mm)			
All subjects	2.82 \pm 0.52	2.80 \pm 9.91	0.954
Group 1	2.99 \pm 97.64	2.92 \pm 0.54	0.078
Group 2	2.76 \pm 0.44	2.77 \pm 13.69	0.211
Astigmatism axis (degree)			
All subjects	79.60 \pm 48.57	84.90 \pm 53.41	0.784
Group 1	79.60 \pm 47.71	80.15 \pm 58.12	0.912
Group 2	84.00 \pm 49.19	86.90 \pm 48.76	0.861
Astigmatism value (diopters)			
All subjects	0.40 \pm 0.59	0.50 \pm 0.67	0.002
Group 1	0.30 \pm 0.67	0.50 \pm 0.81	<0.001
Group 2	0.50 \pm 0.51	0.60 \pm 0.51	0.599
K1 (diopters)			
All subjects	43.00 \pm 1.43	43.00 \pm 1.45	0.012
Group 1	42.60 \pm 1.27	42.80 \pm 1.27	0.018
Group 2	43.15 \pm 1.52	43.30 \pm 1.56	0.007
K2 (diopters)			
All subjects	43.40 \pm 1.40	43.60 \pm 1.40	0.012
Group 1	43.15 \pm 1.36	43.55 \pm 1.44	<0.001
Group 2	43.65 \pm 1.34	43.65 \pm 1.38	0.004

K1: flattest meridian ; K2: steepest meridian

Margin Reflex Distance-1 (MRD-1)

A statistically significant increase was found in the MRD-1 level in the postoperative period in all patients and in both groups compared to the preoperative period ($p < 0.05$). No statistically significant difference was found between the two groups in terms of MRD-1 values in the preoperative ($p = 0.816$) and postoperative periods ($p = 0.211$).

Visual Field Findings

Visual field defect: The visual field defect was significantly decreased in postoperative period in both Group 1 and Group 2 ($p = 0.003$, $p = 0.012$). Visual field defect was similar in both groups in preoperative and postoperative periods ($p > 0.05$). Preoperatively scotoma was localized mostly in the upper quadrant in Group 1 and upper temporal quadrant in Group 2, while it was localized mostly in the upper quadrant in both groups. While the localization of scotoma was changed statistically significantly in Group 2 ($p = 0.012$), no significant change was observed in Group 1 ($p = 0.073$).

Median deviation (MD), pattern standard deviation (PSD) values: When the postoperative MD and PSD values were compared with the preoperative values, a statistically significant reduction was observed in all subjects and in both groups ($p < 0.001$) and this reduction was similar in both groups ($p = 0.224$).

Corneal Topographic Findings

The mean anterior chamber depth (ACD): There was no significant difference between the two groups in terms of preoperative ($p = 0.340$) and postoperative ACD values ($p = 0.568$). No statistically significant change was observed in the postoperative period in all subjects and in both groups compared to the preoperative period ($p > 0.05$).

The mean axis of astigmatism: The changes in the axis in the postoperative period in all subjects and within the groups were not statistically significant ($p > 0.05$).

The mean astigmatism value: A significant difference was found between the two groups in terms of preoperative astigmatism value ($p = 0.036$), while no significant difference was found in terms of postoperative astigmatism value ($p = 0.831$). When the preoperative and postoperative astigmatism values in all patients and within the groups were compared, a significant increase was found in all patients ($p = 0.002$) and in Group 1 ($p < 0.001$), while the increase in Group 2 was found to be insignificant ($p = 0.599$).

The mean dioptric power in the flattest meridian (K1): A significant increase was found in the postoperative K1 values in all subjects and in both groups ($p < 0.005$).

The mean dioptric power in the steepest meridian (K2): A significant increase was found in the postoperative K2 values in all subjects and in both groups ($p < 0.005$).

DISCUSSION

To obtain better cosmetic and functional outcomes after blepharoplasty careful preoperative evaluation should be performed and an appropriate surgical plan should be made (6). Appropriate combined surgeries provide a younger facial appearance compared to blepharoplasty alone (7).

Pathologies including levator aponeurosis detachment and atrophy are the most common cause of ptosis in senile patients who need blepharoplasty because of dermatochalasis (2). Correction of ptosis and dermatochalasis in combination will provide a more accurate cosmetic and functional outcome and increase patient satisfaction. Otherwise, eyelid height asymmetry will be prominent and adverse cosmetic outcomes will be obtained as a result of removed excess skin following blepharoplasty performed alone (2). Brown and Puttermann (8) reported that they provided an additional 0.4-1 mm elevation in the eyelid margin in patients underwent blepharoplasty in combination with conjunctival Müller resection (CMR) compared to the patients underwent blepharoplasty alone. In our study, it was found that the MRD-1 value increased by 0.5 mm averagely in all subjects in the postoperative period compared to the preoperative period.

In preoperative evaluation, eyebrow position should be assessed carefully, because it will affect the surgery to be performed. Recognition and elimination of eyebrow ptosis may eliminate the need for blepharoplasty by providing stretching of the upper eyelid skin upwards. Performing blepharoplasty alone in individuals with eyebrow ptosis causes an increase in eyelid ptosis and may lead to a worse cosmetic appearance by converging the eyelash margin and eyebrow (9-11). Correction of eyebrow ptosis is more important especially in asymmetric cases, because blepharoplasty without correction of eyebrow ptosis would render eyebrow asymmetry more prominent (2). In this current study, a mean increase of 0.5 mm was found in MRD-1 in 21 patients who underwent blepharoplasty combined with eyebrow ptosis surgery in Group 2. The patients were satisfied with the postoperative cosmetic outcome and eyebrow symmetry was provided.

Lid laxity in the lower eyelid, bagging and sagging in the cheek and nasolabial sulcus depression should be evaluated preoperatively and combined surgery should be planned if necessary. Ectropion and scleral show may develop in the postoperative period in patients with horizontal lower eyelid and lateral and medial canthal tendon laxity. In order to prevent this, procedures including horizontal full layer shortening and lateral and medial canthal tendon sling surgery or lateral and medial canthal tendon shortening should be performed during blepharoplasty surgery (2).

Massry et al. (11) reported that they performed subperiosteal fat reposition in 30 patients, preperiosteal

fat reposition in 24 patients and lateral canthal sling surgery in 27 patients in addition to transconjunctival lower eyelid blepharoplasty and observed no lid malposition or severe complication in the postoperative period and all patients reported that they were satisfied with the postoperative cosmetic outcome. Hudalogo et al. (12) performed additional fat resection in 91% of 248 patients in whom they performed lower eyelid blepharoplasty, trichloroacetic acid peeling in 62%, temporal tarsoraphy in 31% and lateral cantopexy in 18% and reported that revision was needed in 6 patients. When lower eyelid blepharoplasty is performed in association with correction of any accompanying anatomic problem, the function of the orbicular muscle is maintained, complications occur with a lower rate and need for revision is observed with a lower rate in contrast to what is assumed. Lateral canthal sling surgery used in selected cases increases the tonus of the lower lid and decreases the possibility of development of lid malposition in the future (13). In our study, combined blepharoplasty was performed in the upper and lower lids in 8 patients. Among these patients, fat excision was performed in three, orbicular muscle sling surgery was performed in two and lateral retinacular sling surgery was performed in one. In the postoperative period, no lid malposition or severe complication was observed and all patients were satisfied with the postoperative cosmetic outcome.

The most common functional indication of blepharoplasty surgery is upper visual field defects occurring as a result of sagging due to excess skin tissue in the upper eyelid (13). Accompanying eyelid and eyebrow ptosis change the amount of this defect. Visual field defect arising from eyelid and eyebrow malposition has been investigated in many studies (13). Doğan et al. (14) reported that the reduction in the number of absolute scotoma in patients divided into 2 groups according to the MRD-1 level objectively showed the improvement in visual field. Cahill et al. (15) found upper visual field defect with a rate of 24% in patients with mild ptosis and with a rate of 64% in patients with severe ptosis reaching up to the pupil area. It has been detected in our study that the postoperational visual field defect significantly dropped down from 94.7% to 73.7% in patients with eyelid pathology additional to dermatochalasis ($p=0.003$), and from 90.5% to 76.2% in patients with eyebrow ptosis additional to dermatochalasis ($p=0.012$).

When Hacker et al. (16) compared the preoperative MRD-1 levels and the improvements in upper visual field after blepharoplasty, they found that improvement in the upper visual field was dramatically greater in the patients with a lower preoperative MRD-1. In our study, a 0.5 mm increase was found in the MRD value after surgery in Group 1, whereas this increase was found to be averagely 1.3 mm in 9 patients who underwent eyelid ptosis surgery in addition to blepharoplasty in Group 1.

Kosmin et al. (13) reported that visual field defect

developed frequently in the upper temporal quadrant and less frequently in the upper nasal quadrant in subjects with dermatochalasis and this defect might be confused with glaucomatous visual field defect by combining with the blind spot in some subjects and improvements in MD and PSD values were found after blepharoplasty surgery. In our study, it was observed that the scotoma location slid from upper temporal quadrant to upper quadrant after the surgery. In Group 1 composed of patients with eyelid pathology, ptosis was present equally in whole eyelid before surgery, the visual field defect was evident at upper quadrant because the excess tissue was eliminated by surgery, and postoperative scotoma localization did not change ($p=0.073$). In Group 2 composed of lateral eyebrow ptosis, there was visual field defect at upper temporal quadrant because of the skin sagging which was more in temporal side, and it was detected that the postoperative scotoma localization has changed and this change was significant ($p=0.012$).

The effects of dermatochalasis on visual field should be kept in mind in presence of upper visual field defect especially in patients with suspicious glaucoma or in patients who are being followed up because of glaucoma and the test should be repeated by elevating the eyelid if necessary (13). In our study, a statistically significant reduction was found in the postoperative MD and PSD values in all subjects and in both groups ($p<0.001$) and this reduction was similar in both groups ($p=0.224$).

Contact between the eyelid and cornea is affected by the change in the contour and weight of the eyelid and this leads to change in the corneal curvature (17). There are some studies which show that there is a correlation between eyelid anomalies (hemangioma, ptosis etc.) and astigmatism (18,19). Meriam et al. (18) reported that astigmatic change occurred with a high rate and steep occurred in the vertical meridian in 15% of the subjects in the postoperative period in the congenital ptosis group and they associated this with compression on the superior part of the globe caused by elevation of the lid and steep in that meridian. Brown et al. (17) showed that an increase of less than 1 dioptre in astigmatism occurred in 90% of the subjects in whom blepharoplasty was performed, steep in the vertical meridian occurred in 2/3 subjects and all changes stabilized in a mean period of 3 months and become in accordance with the rule in the subjects whose vertical axis changed. Zinkernagel et al. (5) reported that significant corneal curvature changes occurred in the subjects in whom large fat resection was performed in combination with ptosis and blepharoplasty and small and insignificant changes which would not affect the level of vision occurred in the subjects in whom blepharoplasty was performed without large fat resection. Doğan et al. (14) found that significant increase occurred in the postoperative astigmatism values and an increase in the refractive power in the vertical meridian occurred especially in the subjects whose MRD was below 2 mm.

A significant increase in K1 and K2 values in both groups ($p < 0.05$) and astigmatism value in Group 1 ($p < 0.05$), a non-significant increase in Group 2 ($p = 0.59$) were detected in this study. We considered these results to be related to the tension occurring in loose periocular tissue after blepharoplasty and surgery applied for eyelid involuntional malpositions and surgery for eyebrow ptosis. In particular, we attributed the more significant increase of corneal astigmatism value in group 1 than group 2 to the fact that this postoperative tension was more distinct in involuntional eyelids pathologies compared to eyebrow ptosis which were additional to dermatochalasis.

As a weak point of our study was the fact that we did not form subgroups of eyelid pathologies providing to demonstrate and emphasize the need for combined surgery; and we did not make comparison between those subgroups. However, eyelid pathologies were examined as a whole in our study, because patients had pathologies with different severities and localizations and the number of patients was not sufficient for statistical data if they had been examined as subgroups.

CONCLUSION

In our study, it was found that significant change occurred in the MRD-1 level, presence of scotoma, MD, PSD values among the parameters obtained with visual field test and in astigmatism, K1 and K2 values among the parameters obtained with corneal topography, whereas no significant change occurred in anterior chamber depth and astigmatism axis in all subjects in the postoperative period. The increase in the MRD-1 value and decrease in MD and PSD values in our patients following blepharoplasty operation demonstrate the improvement in visual field. As stated in the literature, corneal curvature changes which were not visually very significant and which could be identified only with corneal topography and resulting astigmatic changes were observed in our study.

To get more successful results functionally and cosmetically, the right definition should be done for involuntional eyelid and periorbital pathologies in the patients admitting because of dermatochalasis and combined surgery should be applied for these various physiopathologies.

ACKNOWLEDGEMENTS

Financial support: The authors declare to have not received specific grant from any funding agency in the

public, commercial or not-for-public sectors

Conflict of interest: The authors declare that they have no conflict of interest

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Ankara Eđt. Arş. Hast. Derg. (Med. J. Ankara Tr. Res. Hosp.), 2021 ; 54(1) : 1-6

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