ORİJİNAL ARAŞTIRMA ORIGINAL RESEARCH

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The Importance of Levator Function in Determining the Levator Resection Surgery Results for Blepharoptosis Patients

Blefaroptozisli Olgularda Levator Rezeksiyonu Ameliyatı Sonuçlarını Belirlemede Levator Fonksiyonunun Önemi

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ABSTRACT Objective: To compare the results of external levator resection in the upper eyelid blepharoptosis patients who have moderate and good levator function (LF). **Material and Methods:** This is a prospective study of 57 patients who had undergone levator resection from January 2015 to May 2016. LF was graded before surgery as moderate (5-10 mm) and good (10-15 mm) on the basis of the eyelid excursion. Preoperative and postoperative detailed information including age, gender, etiology, side, marginal reflex distance 1 (MRD1) change, operating time, cosmetic outcome and reoperations were recorded. Postoperative measurements at the 6th month visit was used for comparison. **Results:** The patient group consisted of 24 females (42.1%), 33 males (57.9%) with a mean age of 46.33 (range:7-79) years. Of the surgical procedures 77.1% (44/57) had good LF, 22.9% (13/57) had moderate LF. The age of the patients who had good LF was statistically significantly lower than the patients who had moderate LF (p=0.020). The operation time for the patients with good LF was statistically significantly lower than the patients who had moderate LF (p=0.001). MRD1 change and reoperation rate between two groups were not statistically significant (p>0.05). For the good LF patients, the final cosmetic outcome was statistically significantly good (p=0,012). **Conclusion:** For the blepharoptosis patients with good LF, the operation time is shorter and the final cosmetic outcome is better than the moderate LF blepharoptosis patients. As a conclusion, this study figured out the relevance of the preoperative assessment of LF in planning the surgical strategy for the treatment of blepharoptosis.

Keywords: Eyelid diseases; blepharoptosis

ÖZET Amaç: Orta ve iyi derecede levator fonksiyonuna (LF) sahip üst kapak blefaroptozis hastalarında eksternal levator rezeksiyon sonuçlarını karşılaştırmak. **Gereç ve Yöntemler:** Ocak 2015-Mayıs 2016 tarihleri arasında blefaroptozis nedeni ile eksternal levator rezeksiyonu yapılan 57 hastanın değerlendirildiği prospektif bir çalışmadır. LF ameliyat öncesinde göz kapağının hareketine göre orta (5-10 mm) ve iyi (10-15 mm) olarak derecelendirildi. Yaş, cinsiyet, etyoloji, göz kapağı kenar-refleks uzaklığı 1 (KRU1) değişimi, ameliyat süresi, kozmetik sonuç ve reoperasyonların bulunduğu preoperatif ve postoperatif ayrıntılı bilgiler kaydedildi. Karşılaştırma için 6. aydaki kontrol muayenesinde elde edilen postoperatif ölçümler kullanıldı. **Bulgular:** Hasta grubu, yaş ortalaması 46,33 (aralık: 7-79) yıl olup, 24 kadın (%42,1), 33 erkek (%57,9) hastadan oluşmaktaydı. Cerrahi girişimlerin %77,1'inde (44/57) iyi LF, %22,9'unda (13/57) orta derecede LF vardı. İyi düzeyde LF olan hastaların yaşı, orta LF sahip olan hastalardan istatistiksel olarak anlamlı derecede düşüktü (p=0,020). İyi LF'na sahip hastaların ameliyat süresi, orta düzeyde LF'na sahip hastalardan istatistiksel olarak anlamlı derecede düşüktü (p=0,001). KRU1 değişikliği ve iki grup arasındaki reoperasyon oranı istatistiksel olarak anlamlı değildi (p>0,05). İyi LF'na sahip hastalar için kozmetik sonuç istatistiksel olarak anlamlı derecede iyi idi (p=0,012). **Sonuç:** İyi LF olan blefaroptozis hastalarında operasyon süresi daha kısadır ve nihai kozmetik sonuç orta dereceli LF olan blefaroptozis hastalarından daha iyidir. Sonuç olarak, bu çalışma blefaroptozisde cerrahi plan yapılırken ameliyat öncesi LF'nin önemini göstermektedir.

Anahtar Kelimeler: Göz kapağı hastalıkları; blefaropitozis

Blepharoptosis is a disease where the upper eyelid cannot be lifted normally because of congenital or acquired impairment in the levator function (LF). The method of surgical technique is decided by the severity of ptosis, LF, and the preference of the surgeon. An anterior levator resection is the method of choice in severe ptosis with moderate or good LF which is more than 4 mm.[1-16] A frontalis suspension surgery is the method when LF is under 4 mm.[1-5] Additionally, the amount of levator muscle resection can be determined by preoperative LF.[7-9]

The outcome of external levator resection procedure has varied in previous reports with reported success rates of 70% to 95% with the reoperation rates 8.7% to 12%.[4, 6-9,11-18] Blepharoptosis surgery is a challenging procedure in oculoplastic practice and more complicated even for some cases. There are factors influencing the surgical success, one of which is the LF. In the literature, there are studies evaluating the factors that affect the surgical success.[6,7,8,11,16-18]

Our study aims to prospectively compare the patients who have had external levator resection with moderate or good LF. We evaluated the predictive value of LF in marginal reflex distance 1 (MRD1) change, the operation time, cosmetic outcome and reoperation rate following the surgery.

MATERIAL AND METHODS

This prospective study included 57 patients (24 women and 33 men) who presented with blepharoptosis to the oculoplastic department. Levator resection surgery was performed from January 2015 to May 2016. Surgeries were performed by one oculoplastic surgeon (IBS), who used a standard technique, at a single center. The study was conducted in compliance with the principles of the Declaration of Helsinki and complies with the policies of the local institutional review board.

In all patients, preoperative biomicroscopic evaluation of anterior and posterior segment and visual acuity measurements were performed. Detailed history including ophthalmologic and systemic complaints was obtained from patients referring with blepharoptosis. Information included age, gender, etiology, preoperative and postoperative marginal reflex distance 1 (MRD1), MRD 1 change, operating time from skin incision to wound closure, cosmetic outcome and reoperation. Postoperative follow-up visits scheduled on the 1st day, 1st week and 1st, 3rd and 6th months after surgery. All patients underwent preoperative and postoperative photography. Postoperative measurements at the 6th month visit was used for comparison.

Inclusion criteria were blepharoptosis requiring surgical correction and moderate to good levator function (LF). Exclusion criteria were levator muscle function less than 5 mm, floppy eyelid syndrome, history of prior ptosis, concomitant eyelid or brow surgery, cases with neurogenic and mechanical ptosis. LF was assessed by measuring total upper eyelid excursion from extreme downgaze and up gaze while pressing over the patient's eyebrow to prevent the action of the frontalis. LF was graded before surgery as moderate (5-10 mm) and good (10-15 mm) on the basis of the eyelid excursion. According to the etiology of ptosis, it was examined in 3 groups as congenital, involutional and trauma origin. For the involutional ptosis clinical examination revealed a disinsertion or dehiscence of the levator aponeurosis from the tarsus.

Cosmetic outcome was graded on the basis of final eyelid position, symmetry and eyelid crease, on a scale of good, moderate and poor. Cosmetic results were considered good when final eyelid is in desired level, symmetric with the other eyelid, with good eyelid contour and crease. If there is a problem with one of these parameters, cosmetic score was moderate. If outcome was not satisfactory and need reoperation, cosmetic outcome was poor.

Surgical Method: The patients with ptosis was performed external levator resection. Surgeries were performed under local anesthesia except in the pediatric group who underwent surgery under general anesthesia. In addition to this, infiltrative local anesthesia was applied to the upper lid with subcutaneous infiltration of 0.6 to 1 ml of 2% lidocaine with 1:100.000 units of epinephrine. A central upper eyelid skin crease incision was marked at the natural crease 8-10 mm from the ciliary margin.

After opening the orbicularis muscle and the orbital septum, the preaponeurotic fat pad was retracted to see the levator aponeurosis. The levator aponeurosis was excised and sutured to the tarsus with 3 temporary 6-0 vicryl® (polyglactin) sutures. The suture was adjusted until the height and contour were optimal, after which the suture was tied and the skin was closed with 6-0 vicryl® (polyglactin) suture.

Statistical Analysis: For the statistical evaluation of the data, NCSS (Number Cruncher Statistical System) 2007 (Kaysville, Utah, USA) software was used. Measurable data of our study were presented as mean± SD. The range of the variable data was measured using a Mann Whitney U test. When comparing the two groups, quantitative data were analyzed with independent samples using a Mann Whitney-U test. Intergroup quantitative data were analyzed using a Wilcoxon Signed Ranks test. Qualitative data were analyzed using a Pearson chi-square test, Fisher's exact test, Yates' continuity correction test and Fisher Freeman Halton test. A P-value of 0.01 and 0.05 was taken to be statistically significant.

RESULTS

The study was conducted between January 2015 and May 2016 with a total of 57 cases which were 24 of women (42%) and 33 (57.9%) of men. The ages of the patients participating in the study ranged from 7 to 79 years with a mean of 46.32 ± 22.38 years. The age of patients with good LF was 45.77± 22.18 while the age of patients with moderate LF was 54.11± 20.57. Therefore, the age of patients with good LF statistically significantly lower than those with moderate LF (p=0.020, p<0.05) (Figure 1). There was no statistically significant difference between the sex distributions of cases according to LF (p>0.05). Patient demographics are summarized in Table 1.

A total of 44 of 57 eyelids (77.1%) had good LF, while 13 eyelids (22.8%) had moderate LF. When evaluating the time for each procedure, the mean time from the beginning of the procedure to wound closure was 28.07±4.97 minute in good LF group, 34.23±3.44 minute in moderate LF group. The operation time of the patients with good LF was significantly lower than patients with moderate LF (p=0.001, p<0.01) (Figure 2).

Mean preoperative and postoperative MRD1 change was 2.45±0.66 mm in good LF group and 2.15±0.69 mm in moderate LF group. There was no statistically significant difference between MRD1 changes of cases according to LF (p>0.05). Four patients (9.1%) who have good LF and 4 patients (30.8%) who have moderate LF need reoperation. According to LF, there was no statistically significant difference between reoperation rates (p> 0.05).

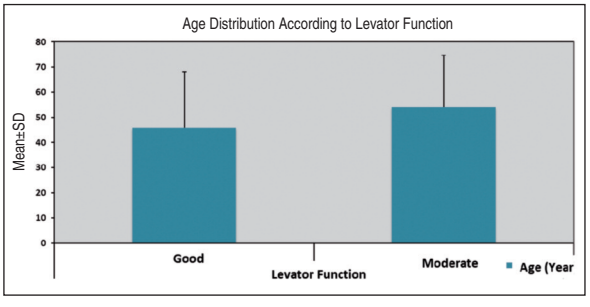

FIGURE 1: Age distribution of the blepharoptosis patients according to levator function.

TABLE 1: Patient demographics related to levator function.

			Levator Function		*p*
		Total	Good (n=44)	Moderate (n=13)	
Age (Year)	Mean±SD	46,33±22,38	45,77±22,18	54,11±20,57	[a]**0,020***
	Min – Max	7 – 79 (39)	8-79 (35)	20-80 (62)	
		n (%)	n %	n %	
Sex	Female	24 (42,1)	20 (45,5)	4 (30,8)	[b]**0,534**
	Male	33 (57,9)	24 (54,5)	9 (69,2)	

[a]Mann Whitney U Test, [b]Yates Continuity Correction Test

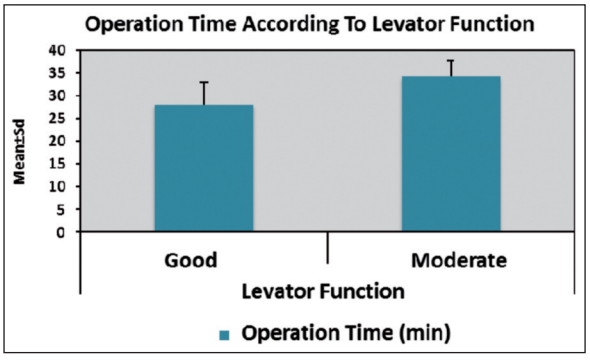

FIGURE 2: Operation time of the blepharoptosis patients according to levator function.

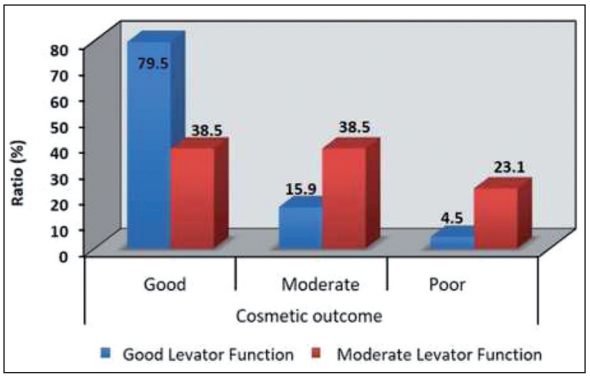

FIGURE 3: Distribution of cosmetic results as; good, moderate and poor after levator resection operation, according to levator function.

Patients who have good LF had a better cosmetic outcome than patients who have moderate LF; good cosmetic outcome was 79.5% for good LF group and 38.5% for moderate LF group. Additionally, lower percentage of the patients of good LF group attained a poor outcome (4.5%) as compared with patients of moderate LF group (23.1%). There was a statistically significant difference between cosmetic outcome distributions according to LF (p=0.013, p<0.05). The good rate of cosmetic outcome of patients with good LF was significantly higher than those with moderate LF (p=0.012; p<0.05) (Table 2, Figure 3).

According to etiology, in the good LF group; 54.5% of patients had congenital and 45.5% of patients had involutional ptosis whereas in the moderate LF group; 76.9% of patients had congenital, 15.4% of patients had involutional and 7.7% of patients had traumatic ptosis. A statistically significant difference was found between the etiologic distributions of the cases according to LF (p=0.041, p <0.05). The rate of involutional etiology of cases with good levator function (45.5%) was significantly higher than those with moderate levator function (15.4%) (p=0.049, p<0.05) (Table 2, Figure 4).

TABLE 2: Evaluation of operation time, MRD1 (Margin Reflex Distance 1) change, reoperation rate, cosmetic result and etiology according to levator function (LF).

			Levator Function		*p*
		Total	Good LF (n=44)	Moderate LF (n=13)	
Operation time (min)	Mean±SD	29,47±5,32	28,07±4,97	34,23±3,44	[a]**0,001****
	Min-Max (Median)	20-40 (30)	20-35 (25)	30-40 (35)	
MRD1 Change	Mean±SD	2,39±0,68	2,45±0,66	2,15±0,69	[a]**0,198**
	Min-Max (Median)	1-4 (2)	1-4 (2)	1-3 (2)	
			n (%)	n (%)	
Reoperation	**No**	49 (86,0)	40 (90,9)	9 (69,2)	[c]**0,070**
	Yes	8 (14,0)	4 (9,1)	4 (30,8)	
Cosmetic Result	**Good**	40 (70,2)	35 (79,5)	5 (38,5)	[d]**0,013***
	Moderate	12 (21,1)	7 (15,9)	5 (38,5)	
	Poor	5 (8,8)	2 (4,5)	3 (23,1)	
Etiology	**Congenital**	34 (59,6)	24 (54,5)	10 (76,9)	[d]**0,041***
	Involutional	22 (38,6)	20 (45,5)	2 (15,4)	
	Traumatic	1 (1,8)	0 (0,0)	1 (7,7)	

[a]Mann Whitney U Test
[c]Wilcoxon Signed Ranks Test
*p<0.05
**p<0.01

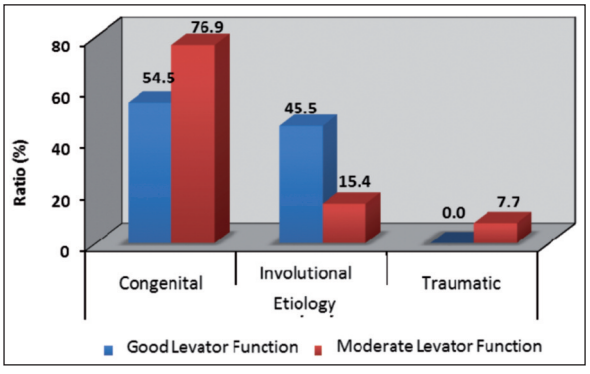

FIGURE 4: The etiologic classification of the blepharoptosis patients according to levator function.

DISCUSSION

Levator resection is an effective procedure for the cases with some levator function. This is a complex operation requiring a detailed knowledge of eyelid anatomy to establish good eyelid position. Additionally, the surgery involves dissection of the layers of the eyelid, is time consuming and requires patient participation.[1-6,15,19] In our study, for the patients with blepharoptosis, LF was found to be a predictive factor after levator resection operations. Surgical results showed that, the operation time was shorter and the final cosmetic outcome was better for patient with good LF compared to the moderate LF blepharoptosis patients.

Mcculley et al. evaluated 828 patients who underwent levator resection operation for acquired good function blepharoptosis retrospectively.[6] Reoperation rate was 8.7% in this large sample of patients. They found a statistically significant difference in LF and blepharoptosis severity as measured by MRD between patients with a postoperative desired outcome and those who underwent reoperation for undercorrection.

Nuhoglu et al. studied 69 eyes of 65 patients who underwent anterior levator resection. They grouped and compared their patients with perfect LF (10-15 mm), good LF (9-10 mm) and moderate LF (5-8 mm).[7] Their postoperative success rates were 84.6%, 84%, and 71% respectively. The success was statistically significantly lower in the moderate LF group.

Abrishami et al. studied 136 patients with LF more than 4 mm with a success rate of 78.7% after the levator resection operation.[8] They did not find any correlation between surgical success and parameters including age, sex, levator function, preoperative value of MRD1 and lid fissure. In a report by Jordan and Anderson on 228 congenital blepharoptosis cases of levator resection, the undercorrections were associated with the lower LF patients.[16] Cates and Tyers reported that, for the congenital blepharoptosis patients preoperative LF was found to be the most significant predictor of surgical outcome for levator resection procedure.[17]

All but one of those are similar with our study: preoperative LF can be predictive value for surgical outcome. We found that the final cosmetic outcome was statistically significantly good for the good LF patients compared with the moderate LF ones. Lower percentage of the patients with good LF attained a poor outcome (4.5%) when compared to the patients with moderate LF (23.1%).

In a study of Ranno et al, they evaluated 63 involutional ptosis patients who had standard length or small incision levator resection surgery.[18] They grouped the patients according to their LF; moderate (5-10 mm) and good (over 10 mm). They found that the surgical success rate in patients with moderate LF was lower when using a small incision surgery. They explained this situation as, in patients with moderate levator function, the levator complex usually is displaced more posteriorly, a better exposure of the Whitnall ligament is preferred and lateral attachments ideally should be released. This is also an explanation for the operation time in our study. The operation time for the moderate LF patients was statistically significantly higher than the good LF patients. For the cases with moderate LF, dissection have to be done a lot, lateral attachments have to be released. The length of levator muscle aponeurosis excision have to be done much more than good LF patients. At the end of the operation the eyelid height must be checked and adjusted when the patient is sitting. All these procedures are time consuming therefore, when a patient has lower LF, we must be careful about the dissection and adjustment of the eyelid.

In the study of Goncu et al, after levator resection surgery they observed a significant improvement in grade of LF.[19] They explained this

with mechanical improvement provided by excision of dystrophic tissue, shortening of muscle, and relieving some abnormal dystrophic attachments of the levator complex. Also, Baker et al, explained that LF improvement in the same way as Goncu et al.[20] In our study, there was no statistically significant difference between the good and moderate LF patients for MRD1 changes and reoperation rates. This shows that with good operation techniques and good levator muscle dissection we can get good results also for moderate LF patients.

Abrishami et al. studied 136 patients with LF more than 4 mm. Mean LF was lower in congenital (9.7±3.8 mm) as compared to acquired blepharoptosis cases (11.0±3.6 mm).[8] In our study, we also found that for the patients with the moderate LF; 76.9% of patients had congenital, 15.4% of patients had involutional blepharoptosis. A statistically significant difference was found between the etiologic distributions of the cases according to LF.

Limitation of our current study is the patient selection criteria; the etiology of the patients who underwent levator resection was congenital or involutional blepharoptosis. For the congenital ptosis patients, LF is generally low and sometimes the muscle can be infiltrated with fat. So, this issue can diminish the success of the operations for patients with moderate LF.

As a conclusion, this study figured out the relevance of the preoperative assessment of LF in planning the surgical strategy for the treatment of blepharoptosis. LF can affect the cosmetic outcome, reoperation rates and operation time. Therefore, for the blepharoptosis patients with lower LF, the surgeon must be careful about the dissection of the levator aponeurosis and adjustment of the eyelid.

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Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *İlke Bahçeci Şimşek;* ***Design:*** *İlke Bahçeci Şimşek;* ***Control/Supervision:*** *İlke Bahçeci Şimşek;* ***Data Collection and/or Processing:*** *İlke Bahçeci Şimşek;* ***Analysis and/or Interpretation:*** *İlke Bahçeci Şimşek;* ***Literature Review:*** *İlke Bahçeci Şimşek, Zeynep Parlakgüneş;* ***Writing the Article:*** *İlke Bahçeci Şimşek, Zeynep Parlakgüneş;* ***Critical Review:*** *İlke Bahçeci Şimşek, Zeynep Parlakgüneş.*

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