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Evaluation of upper blepharoplasty outcome – objective measurements and patient satisfaction

Procena rezultata hirurške korekcije gornjih kapaka – objektivno merenje i zadovoljstvo pacijenta

Jelena Nikolić*†, Marija Marinković*†, Mladen Jovanović*†, Ivana Mijatov*‡, Teodora Božić*§

***University of Novi Sad, Faculty of Medicine, Novi Sad, Serbia; University Clinical Center of Vojvodina, †Clinic for Plastic and Reconstructive Surgery, ‡Clinic for Maxillofacial Surgery, §Clinic for Anesthesiology, Intensive Care, and Pain Therapy, Novi Sad, Serbia**

Abstract

Background/Aim. Upper blepharoplasty is one of the most often performed aesthetic operations and is indicated for periorbital rejuvenation or correction of some functional problems. The aim of the study was to evaluate the outcome of this procedure and to assess patients' satisfaction and possibilities of objective measurement of operative results. **Methods.** A two-year prospective observational study was conducted among female patients who had upper blepharoplasty done by the same surgeon. Data were collected from medical documentation, questionnaire, and objective measurements conducted via standardized digital photographs taken before and two months after surgery. Tarsal platform show (TPS) and brow fat span (BFS) were measured at three points (P1, P2, P3) before and two months after the surgery. A questionnaire conducted before surgery and two months after it included general complaints considering upper eyelids (visual field narrowing, fallen eyelids, the sensation of heavy eyelids, raising head backward in order to enhance vision, headache), patients' assessment of eyelid asymmetry and an additional questionnaire after surgery included questions for the surgeon and patients concerning satisfaction with treatment outcome. **Results.** This study involved 50 female patients aged between 33 and 67 years (49.98 ± 8.6 years). There was a statistically significant difference in all points for TPS and BFS measurements before and after the operation. No significant asymmetries were noticed between eyes neither before nor after surgery. There was a statistically significant difference in operation success among 3 age categories in TPS-P1 (χ^2 = 13.089, df = 2, p = 0.001) and TPS-P2 (χ^2 = 8.386, df = 2, p = 0.015) with best results achieved in older patients (> 55 years). There was strong positive, statistically significant correlation between patient's and surgeon's satisfaction (r= 0.704, p = 0.002), as well as between patients' satisfaction and their age (r = 0.704, p = 0.002). **Conclusion.** Realistic expectations, adequate information about the surgery and possible complications, are essential to satisfied patients. Objective measurements correlate with patients' satisfaction and together with photographs can be a useful tool in communication with them.

Key words:
blepharoplasty, eyelids; patient satisfaction; treatment outcome; surgical procedures, operative; surveys and questionnaires.

Apstrakt

Uvod/Cilj. Blefaroplastika je jedna od najčešćih estetskih hirurških procedura koja je indikovana u cilju podmlađivanja ili rešavanja nekog funkcionalnog problema. Cilj studije bio je da se procene rezultati ove procedure, zadovoljstvo pacijentkinja i mogućnost objektivnog merenja rezultata. **Metode**. U ovu prospektivnu studiju bile su uključene pacijentkinje kojima je urađena korekcija gornjih kapaka u periodu od dve godine, od strane istog hirurga. Podaci su prikupljeni iz medicinske dokumentacije, upitnika i objektivnog merenja standardizovanih digitalnih fotografija koje je hirurg napravio pre operacije i dva meseca nakon operacije. Mereni su *tarsal platform show* (TPS) i *brow fat span* (BFS) u tri tačke (P1, P2 i P3), pre operacije i dva meseca nakon operacije. Anketa sprovedena pre operacije i dva meseca posle operacije bazirala se na upitniku sa pitanjima o najčešćim simptomima u vezi sa kapcima (smanjeno vidno polje, pali kapci, osećaj težine u kapcima, zabacivanje glave unazad kako bi se olakšalo gledanje, glavobolja); dva meseca posle operacije sprovedena je i dodatna anketa u cilju procene zadovoljstva hirurga i pacijentkinja ishodom operacije. **Rezultati.** Studijom je bilo obuhvaćeno 50 pacijentkinja životne dobi od 33 do 67 godina (49,98 ± 8,6). Nađena je statistički

Correspondence to: Jelena Nikolić, University of Novi Sad, Faculty of Medicine, Hajduk Veljkova 3, 21 000 Novi Sad, Serbia.
E-mail: JELENA.NIKOLIC@mf.uns.ac.rs

značajna razlika u sve tri tačke merenja za TPS i BFS pre i posle operacije. Nije postojala značajna asimetrija između levog i desnog oka ni pre, ni posle operacije. Postojala je značajna razlika u uspešnosti operacije kod tri starosne kategorije u rezultatima merenja za TPS-P1 (χ^2= 13,089, df = 2, p = 0,001) i TPS-P2 (χ^2 = 8.386, df = 2, p = 0,015), sa najboljim rezultatom postignutim kod starijih pacijentkinja (> 55 godina). Utvrđena je jaka pozitivna, statistički značajna korelacija između zadovoljstva pacijentkinja i hirurga (r = 0,704, p = 0,002), kao i između zadovoljstva pacijentkinja i njihove životne dobi (r = 0,704, p = 0,002). **Zaključak.** Realna očekivanja, adekvatna informisanost pacijentkinja o operaciji i mogućim komplikacijama su bitni za njihovo zadovoljstvo. Objektivna merenja koreliraju sa zadovoljstvom pacijentkinja, a zajedno sa fotografijama pre i posle operacije mogu biti korisno sredstvo u komunikaciji sa njima.

Ključne reči:
blefaroplastika; kapci; zadovoljstvo pacijenta; lečenje, ishod; hirurgija, procedure, operativne; ankete i upitnici.

Introduction

Upper blepharoplasty is one of the most often performed aesthetic operations in general. It usually involves resection of excess skin of eyelid, sometimes segment of orbicular muscle, and, if needed, reduction of retroseptal fat pads. Different adjuvant procedures can be added to conventional surgery in order to achieve better, aesthetically more pleasing results [1, 2]. There are no strict guides on how to resolve the aesthetic problem; every patient has to be analyzed individually and the operation planned, keeping in mind different surgical options and desired results. On the other hand, there are no universal beauty standards and procedures for precise evaluation of specific anatomical features, possibilities, and patients' desires.

Upper blepharoplasty procedure has a high rate of patient satisfaction, but in the light of social media pressure, expectations can be unrealistic, and the patient can be unsatisfied with the result as with any other aesthetic procedure [3]. Sometimes, surgeon's satisfaction with the outcome does not correlate with the patient's satisfaction and, therefore, objective measurements could be a useful tool in explaining to a patient what we have achieved with surgery. Moreover, objective measurements and standardized scales could allow the comparison of different techniques or establishing criteria for exclusion of a patient that could not benefit much from the surgery.

When we analyze upper eyelids, tarsal platform show (TPS) and brow fat span (BFS) are the key measurements. Changes in those parameters can simply illustrate what we have achieved with surgery. Besides these features, every patient has a different orbital bone structure, sometimes prominent eyebrow ridge, sometimes fatty periorbital region prone to edema. All these factors have to be analyzed as they will influence the final result and sometimes limit the possibilities of the surgery. Preexisting asymmetries should be noticed and discussed with patients as they are sometimes unaware of them. A surgeon is trying to reach a balanced appearance that will ultimately please the patient. Usually, it is not obliterated tarsal platform nor unnaturally elongated, less fluffy eyelid appearance, or hollow old-looking eye.

The aim of this study was to evaluate the outcome of upper blepharoplasty and to assess patient's satisfaction and possibilities of objective measurement of operative results.

Methods

Study protocol

This research was designed as a prospective observational study that included 50 consecutive patients who underwent upper eyelid blepharoplasty by the same surgeon during the period of two years, between October 2016 and October 2018, at the Clinic for Plastic and Reconstructive Surgery, Clinical Center of Vojvodina, Novi Sad, Serbia. The exclusion criteria were as follows: previous eyelid surgery or trauma, brow lift operation, hyper/ hypothyroidism, eyelid ptosis, neurotoxin treatment in less than 6 months before the surgery, facial nerve paresis, male gender (as there was only one male patient in this period).

Data were collected from medical documentation, questionnaire, and objective measurement conducted via standardized digital photographs taken before surgery and 2 months after surgery, during standard follow-up procedure. All photographs were taken with the patients in an upright position, primary gaze, frontal and lateral view, with frontal muscle fully relaxed. All measurements were conducted with photo size calibrated to 11.5 mm cornea diameter. All photographs, computer calibrations, and measurements were done by the same person. We measured TPS and brow fat span BFS at three points (P1, P2, and P3). TPF was defined as the distance between the upper eyelid margin and palpebral crease, and BFS as the distance between the upper margin of the brow to the palpebral crease with the patient gazing in the primary position. TPS and BFS were measured along the vertical meridian at three points (the center of the pupil – P1, lateral corneal limbus – P2, eyelid lateral canthus – P3) before and two months after the surgery (Figure 1).

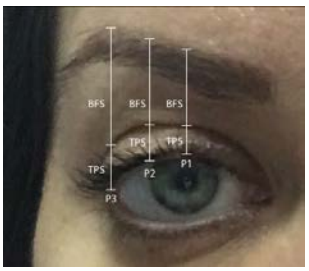

Fig.1 – Illustration of tarsal platform show (TPS) and brow fat span (BFS) measurements at three points (P1-center of the pupil, P2-lateral corneal limbus, P3-lateral canthus).

The patient survey was conducted using two questionnaires: one before operation considering eyelid asymmetry, problems and symptoms that bother patient and are connected to upper eyelids; and two months after surgery, considering patient's and surgeon's satisfaction with the overall outcome, improvement in symptoms, the perceived difference in eyelid symmetry. The overall result concerning patient's and surgeon's satisfaction was graded by Lickert's scale, where 0 was aesthetically poor/completely unsatisfied, and 5 was aesthetically excellent/completely satisfied.

Surgical technique

All blepharoplasties were done by a single surgeon in local anesthesia as a one-day surgery procedure. A marking pen was used to mark planned skin resection. After a local anaesthetic had been infiltrated in this area, redundant skin was resected. If there was redundant orbicular muscle, a narrow strip of muscle was separately resected. The orbital septum was opened in order to expose both retroseptal fat pads (nasal and central), which were evaluated and trimmed with cauterization if needed. Wound edges were closed with continuous nonabsorbable suture (nylon 6.0.) that involved skin-muscle-skin in order to better define supratarsal fold. The muscle was not sutured separately from the skin. Adhesive tapes were applied, and each patient was advised to cool upper eyelids during the first 48 hours with cold pads, protect eyes with sunglasses, clean the face with running water as usual, and use artificial tear eye drops if needed. The skin sutures were taken off after one week. After that, patients were advised to use silicone gel with SPF 50 for scar treatment and avoid exposure to the sun. They were scheduled for another control in two months.

Statistical analysis

Statistical analysis was performed with the software SPSS 20. The Kolmogorov-Smirnov test was used to examine whether the variables followed a normal distribution. Descriptive statistics were shown using mean, standard deviation, minimum and maximum values. The Wilcoxon test was used to determine the existence of statistically significant differences between two dependent samples for variables that did not follow a normal distribution. The Man-Whitney independent samples *t*-test was used to determine the existence of statistically significant differences between two independent groups for variables that did not follow a normal distribution. The Kruskal-Wallis test was used as a non-parametric tool to discover statistically significant differences in more than three independent groups. The Spearman correlation was used to measure the strength and direction of association between two ranked variables. All tests were performed on a 0.05 significance level.

Results

This study involved 50 female patients aged between 33 and 67 years (49.98 ± 8.6). Most of the patients (46%) belonged to the 45–55 age group, 22% had more than 55 years and 32% less than 45 years.

According to the results of the normality test for TPS and BFS measured before and two months after the operation, all variables displayed deviation from the normal distribution. As a consequence, non-parametric test was used in the remaining analysis. Descriptive statistics of all TPS points measured before and after the operation is shown in Table 1.

Table 1

Tarsal platform show (TPS) and brow fat span (BFS) measurements (in mm) at three points (P1, P2, P3) for upper eyelids (n = 100) before (pre op.) and two months after (post op.) upper blepharoplasty

Measurement*	Mean	SD	Minimum	Maximum	*p* (Wilcoxon test)
TPS-P1					
pre op.	1.080	1.3271	0.0	5.0	0.000
post op.	3.820	0.9307	2.0	6.0	
TPS-P2					
pre op.	0.800	1.0987	0.0	4.0	0.000
post op.	3.525	0.8858	2.0	5.0	
TPS-P3					
pre op.	0.89	1.222	0	4	0.000
post op.	3.360	0.8471	2.0	5.0	
BFS-P1			1		
pre op.	16.775	2.7810	0.0	29.0	0.000
post op.	14.98	2.482	10	25	
BFS-P2					
pre op.	18.27	2.957	12	30	0.000
post op.	16.130	2.5953	10.0	27.0	
BFS-P3					
pre op.	20.53	3.227	14	33	0.000
post op.	17.985	2.7000	12.0	30.0	

***For explanation see Figure 1; SD – standard deviation.**

The results of the testing difference in TPS and BFS for all three points between before and after the operation showed a statistically significant difference in all points before and after the operation (Table 1).

Furthermore, we assessed whether there was significant asymmetry comparing the left and right eye before and after the surgery. According to the results of the normality test for all points measured before and after operation of the left and right eye, a non-parametric test was used in the further analysis. Descriptive statistics of all TPS points measurements before and after the operation of the left and right eye are shown in Table 2.

The results of testing the statistical difference in points between the left and right eye before and after the operation are given in Table 3. According to the results, there was no difference between the left and right eye both before and after the operation.

Besides objective measurements presented in Table 3, patients were also asked about their perception of upper eyelid asymmetry before and after surgery. The distribution of patients according to answers is presented in Figures 2 and 3.

Table 2

Tarsal platform show (TPS) and brow fat span (BFS) measurements (in mm) at three points for left (L) and right (D) eyes (n = 50, each) before and after upper blepharoplasty

Measurement*	Before	After
	mean ± SD	mean ± SD
TPS-P1		
D	1.100 ± 1.3553	3.780 ± 0.9592
L	1.060 ± 1.3118	3.860 ± 0.9094
TPS-P2		
D	0.730 ± 1.0653	3.490 ± 0.9340
L	0.870 ± 1.1375	3.560 ± 0.8430
TPS-P3		
D	0.90 ± 1.329	3.300 ± 0.8806
L	0.88 ± 1.118	3.420 ± 0.8167
BFS-P1		
D	16.560 ± 2.7174	14.68 ± 2.453
L	16.990 ± 2.8544	15.28 ± 2.499
BFS-P2		
D	18.14 ± 2.983	15.910 ± 2.5906
L	18.40 ± 2.955	16.350 ± 2.6074
BFS-P3		
D	20.40 ± 3.301	17.830 ± 2.5387
L	20.66 ± 3.179	18.140 ± 2.8697

***For explanation see Fig. 1; SD – standard deviation.**

Table 3

Difference (in mm) between left and right upper eyelid before and after operation

Measurement*	Before	$p^{\dagger}$	After	$p^{\dagger}$
TPS-P1	1,227.5	0.867	1,172	0.571
TPS-P2	1,176.5	0.565	1,183	0.631
TPS-P3	1,212.5	0.77	1,174	0.583
BFS-P1	1,148.5	0.48	1,048.5	0.156
BFS-P2	1,174.5	0.60	1,110.5	0.331
BFS-P3	1,176	0.601	1,182.5	0.638

***For explanation see Figure 1.**
†Mann-Whitney *U* test (2-tailed).

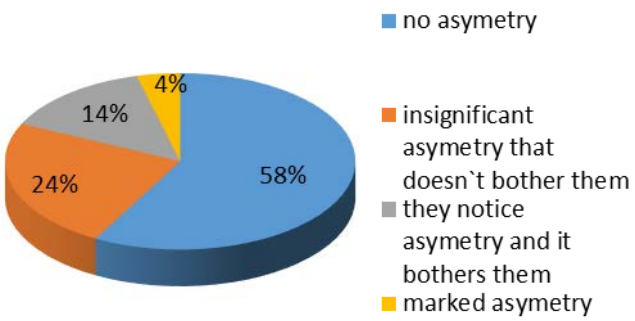

Fig. 2 – Patients' perception of upper eyelid asymmetry before surgery.

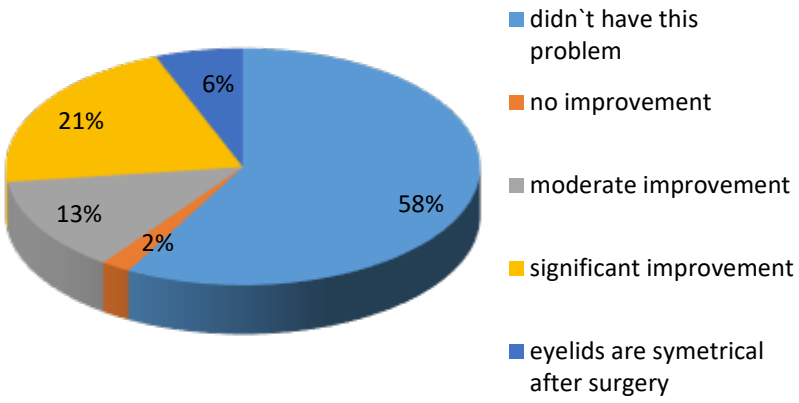

Fig. 3 – Patients' perception of achieved improvement in eyelid asymmetry after surgery.

Table 4

Difference (in mm) between points before and after operation by age groups of patients

Age (years)	Measurement*					
	TPS-P1	TPS-P2	TPS-P3	BFS-P1	BFS-P2	BFS-P3
33–45	2.5000	2.5313	2.3438	-1.8281	-2.2188	-2.5625
45–55	2.5543	2.5543	2.4022	-1.9674	-2.4130	-2.5543
> 55	3.4773	3.3636	2.7955	-1.3864	-1.4545	-2.5000

***For explanation see Fig. 1.**

Mean values of the differences before and after the operation at all points in different age groups of patients are listed in Table 4.

There was a statistically significant difference in the operation success between the 3-age categories in TPS-P1 (χ^2 = 13.089, df = 2, p = 0.001) and TPS-P2 (χ^2 = 8.386, df = 2, p = 0.015).

Major complaints considering upper eyelids before and after the surgery are presented in Figures 4 and 5.

Results of the survey presenting the patients' and surgeon's satisfaction with the overall result of blepharoplasty are presented in Figure 6. All patients as well as the surgeon were satisfied.

There is a strong positive and statistically significant correlation between the patients' and surgeon's satisfaction (r = 0.704, p = 0.002), and also between the patients' satisfaction and their age (r = 0.704, p = 0.002).

We calculated the absolute differences between preoperative and postoperative measurements of TPS at all points, as well as the mean value of these differences for each patient. With this quantity, we wanted to measure the objective achievement and compare it with the subjective satisfaction of the patients.

There was a positive and statistically significant

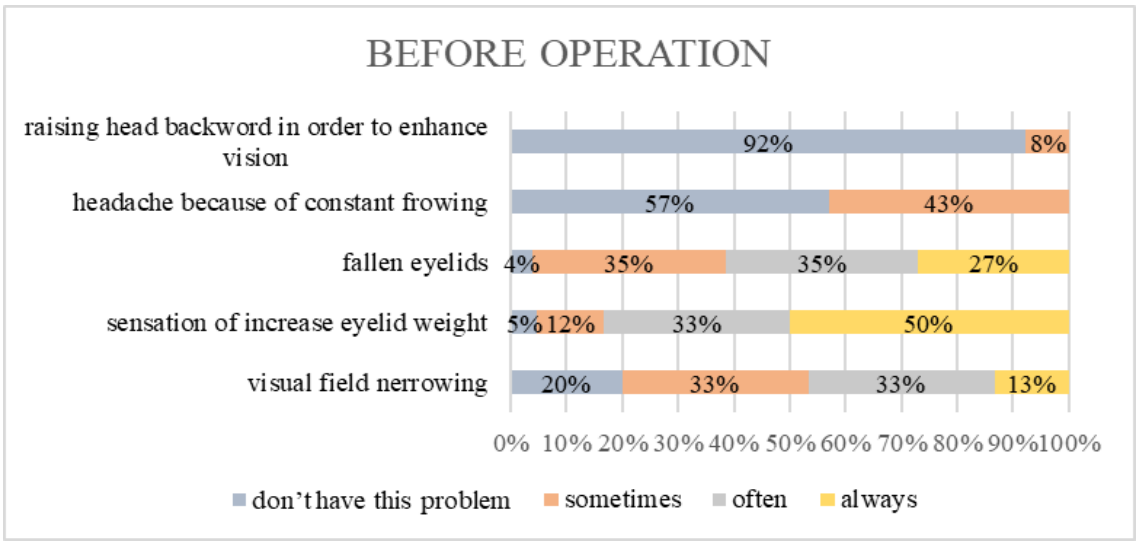

Fig. 4 – Preoperative complaints in the patient seeking upper blepharoplasty.

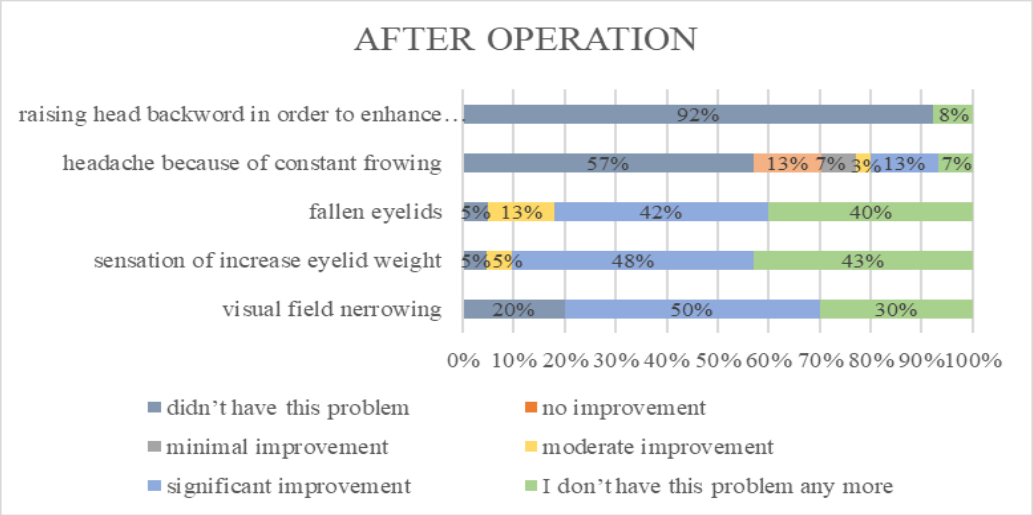

Fig. 5 – Postoperative changes in symptoms patients had before upper blepharoplasty.

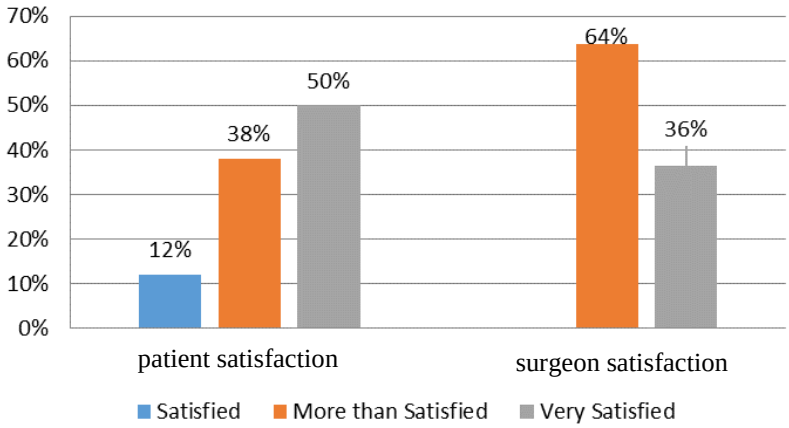

Fig. 6 – Patients' and surgeons' satisfaction with results of blepharoplasty.

correlation between the patients' subjective satisfaction and objective operation results (r = 0.498, p = 0.000). Similarly, there was a positive and statistically significant correlation between the surgeon's subjective satisfaction and objective operation results (r = 0.600, p = 0.000).

Discussion

As every face ages differently and some periorbital anatomical features can differ from patient to patient, there is no universal surgical solution for eyelid correction. Every plastic surgeon during his/her professional carrier changes technique in many ways influenced by new anatomical studies or new appealing techniques in order to find something that works well in his/her hands. After many publications, there is still a lack of consensus on the way we treat muscle in blepharoplasty – should we resect the orbicular muscle or not, if so, how much muscle should be resected, is it necessary to suture the muscle, how should we suture the skin, etc. [4, 5].

We don't believe in wide resection of the orbicular muscle and radical excision of fat pads in every patient, as the preservation of muscles and some amount of fat pads should give fullness to the eyelids and their youthful appearance. "Hollow eyes„ are one of the stigmas of blepharoplasty and sign of radical fat resection. These days, with a better understanding of the aging process and after detailed analyses of volume changes in aging face, we are more oriented to volume preservation and restoration than resection and forced tightening as it was done previously. If there is an obvious redundant muscle, we resect just a small strip of the muscle in order to avoid muscle fold formation. A similar practice is found in many other studies in literature [6–10]. If necessary, as part of primary or secondary blepharoplasty, restoring the fullness of the upper eyelid can be accomplished by different adjuvant techniques, such as fat grafting, medial fat pad transposition, imbrication of orbicular muscle, hyaluronic acid injections, etc. We have to keep in mind that the incidence of complications

(lagophthalmos, sluggish eyelid closer, dry eye syndrome) as presented by Kiang et al. [11] is expected to be lower in muscle-sparing techniques. As might be expected, not all studies agree with this finding. Before accusing muscle resection of a higher rate of complications, we have to classify patients into the same risk level groups considering nicotine consumption, exposition to ultraviolet (UV) rays, diabetes, and other factors that are expected to influence the rate of complications besides surgical technique. Saalabian et al. [12] demonstrated on a group of 387 patients that the extent of tissue resection had no statistically significant effect on the patients' satisfaction with the final result of upper eyelid surgery.

On the other hand, some authors are in favor of wide muscle resection as they consider skin and muscle as a single unit. According to them, redundancy in skin also reflects redundancy in muscle [13–15].

When arguing about aesthetic achievements related to muscle resection, we have to keep in mind the influence of muscle resection on brow position as all these components are closely connected. Widgerow [16] advocates that the resection of orbicular muscle is supposed to allow the frontal muscle advantage over antagonistic orbicular muscle and thus produce eyebrow elevation. This hypothesis gives a new perspective on the importance of muscle resection in the rejuvenation of the periorbital region. However, the authors did not give us any objective measurements of pre- and postoperative results; therefore, the real value of this undoubtedly interesting point cannot be assessed.

The upper eyelid crease is formed by the union of skin dermal component, deep aponeurosis of the *orbicularis oculi* muscle, the aponeurosis of the palpebral levator muscle, and the septum at the level of the upper tarsus. That is why we choose to close the wound by a continuous suture that involves the skin and fascial layer of the *orbicularis oculi* muscle together in order to promote scar formation that would better define the crease. Even when we did not resect the muscle, we made the same suture that attached skin edges to the underlining muscle. Different authors use different techniques, but this option gives good results, as confirmed by this study.

The measurings of TPS and BFS are usually used to compare two different techniques or evaluate the outcome of blepharoplasty. Figueiredo et al. [17] used it to evaluate brassiere sutures as an adjuvant procedure during upper eyelid surgery.

In this study, all patients had statistically significant improvement after surgery, and this improvement was verified by a change in TPS and BFS. This improvement was greatest in the older population. We expected to get such a result as skin excess is more pronounced in the older population, hence change in appearance and benefit from surgery is greatest. These patients were also most satisfied with the result. A strong positive correlation between patients' satisfaction and the age of the patients ($r = 0.704$, $p = 0.002$) was noticed after questionnaire analysis. Besides objective measurement and more evident changes after surgery in the older population, these patients are traditionally more objective and have more realistic expectations. They approach surgery with "real" problems, have many complaints that are pronounced, thus they feel significant relief after correction of eyelids. For them, skin excess is not just an aesthetical problem, but also often impairs their everyday functioning and diminishes their quality of life.

We also wanted to evaluate whether we managed to correct asymmetries in eyelids with surgery. However, the results of testing statistical difference in all points between the left and right eye before the operation did not show any significant difference; therefore, we could not expect to be able to measure improvement later on. This correlates with the results of the questionnaire, where 58% of patients did not perceive eyelid asymmetry, and 24% noticed insignificant asymmetry before the operation (Figure 2). Most of those who noticed asymmetry had moderate to significant improvement after the surgery (Figure 3).

Considering preoperative complaints, patients most often complained about the sensation of fallen eyelids, increased eyelid weight, and narrowing of the visual field. These symptoms were marked as "significantly improved" or "absent" after surgery (Figure 5). In our study, as in most studies in literature, upper blepharoplasty had a high rate of patients' satisfaction [18, 19]. This satisfaction also correlated with the surgeon's satisfaction with the final outcome (Figure 6).

As there was a positive and statistically significant correlation between patients' subjective satisfaction and objective operation results ($r = 0.498$, $p = 0.000$), our measurement proved to be a reliable and simple tool for estimating the final result. One more interesting role of objective measurements in eyelid surgery is the implementation of measurement criteria that could allow health insurance companies to limit falsification of medical necessity for upper blepharoplasty, which is often seen in practice [20]. Thus, it would be easy to separate patients who have just aesthetic problems from those entitled to health insurance coverage as they have some functional disability or important visual field narrowing caused by the change in upper eyelids.

Conclusion

When arguing about the achieved results, objective measurements (TPF and BFS), according to the before/after photos, can be a useful mean in approaching a patient after eyelid surgery. We are not seeking a single standardized solution for periorbital rejuvenation, and we are not trying to reach some imaginary goal, we are rather looking at this as a constant journey of improving ourselves as surgeons in order to be able to offer more and to have a satisfied patient in the end.

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