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The role of fractional carbon dioxide laser resurfacing in post-operative transconjunctival lower eyelid blepharoplasty

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***Abstract*---**Background: Transconjunctival blepharoplasty is the management of lower eyelid structures via the conjunctival approach and is usually applied to the cosmetic improvement of the lower eyelid using this approach. Aim and objectives: The study aimed to evaluate and compare the aesthetic result for residual fine wrinkles after transconjunctival lower eyelid blepharoplasty alone or combined with post-operative fractional CO2 laser. Subjects and methods: The present study was carried out on 20 patients with lower eyelid puffiness without skin redundancy just fine wrinkles who were selected from patients that were admitted to department of plastic and reconstructive surgery, AL-Azhar University hospitals. Results: Skin tightening and residual wrinkles improvement in group (A) show that 9(90.0%) were improved and 1(10.0%) were not improved while in group (B) 6(60.0%) were not improved and 4(40.0%) were worsen. There was highly statistically significant differences between groups where P<0.001 with better result in group (A) in comparing with group (B). Conclusion: Our results demonstrated that both lower eyelid transconjunctival blepharoplasty alone or with combination with postoperative fractional CO2 laser were safe and effective in the treatment of lower eyelid puffiness. Both of the investigated methods had comparable outcomes in terms of complications and satisfaction. Furthermore, fractional CO2 laser in patients with combined treatment presented more improvement in skin tightening and residual wrinkles resurfacing than in patients subjected for blepharoplasty alone, this highlights the significance of fractional CO2 laser if combined with lower eyelid transconjunctival blepharoplasty providing an alternative to transcutaneous blepharoplasty. More

comparative studies with larger sample size and long follow up are needed to confirm the current results.

Keywords---fractional Carbon Dioxide lASER, post-operative, transconjunctival blepharoplasty.

Introduction

The eyes have been called the window of the soul and there is no doubt that an esthetic upper face/eyelid complex frequently aged faster than the lower face and for this reason many patients from their late 30s may present for eyelid rejuvenation.[1] Changes in the eyelids and periorbital region have a significant impact on the signs of aging and often account for major concern for those seeking facial rejuvenation. An aging eyelid manifests various changes that include laxity of skin, orbital septum (OS), canthal tendons, and the orbicularis muscles. Prolapse of the orbital fat, development of malar festoons, crow's feet like radiations and periocular wrinkles are associated with changes. Over the decade the demand for restoration and rejuvenation of lower eyelids, either by noninvasive procedures such as laser resurfacing, dermal fillers, and chemical peeling or by more invasive procedures like lower eyelid blepharoplasty.[2] Transconjunctival blepharoplasty is the management of lower eyelid structures via the conjunctival approach and is usually applied to the cosmetic improvement of the lower eyelid using this approach.[3]

Transconjunctival approach is often also used for reconstructive surgery. The essence of this surgical procedure implies that there is no skin incision made when addressing the deeper structures of orbital fat, ligaments, and orbital septum. However, there are times when some degree of skin and tendon manipulation will be necessary during the transconjunctival blepharoplasty.[3] Carbon dioxide laser skin resurfacing has been used with success in recent years to address facial wrinkles. It has been particularly effective around the lower eyelids. They performed a prospective randomized clinical study to examine the effectiveness of transconjunctival blepharoplasty alone compared with transconjunctival blepharoplasty and CO2 laser skin resurfacing on the reduction of lower eyelid bulging and skin wrinkles.[4] The study aimed to evaluate and compare the aesthetic result for residual fine wrinkles after transconjunctival lower eyelid blepharoplasty alone or combined with post-operative fractional CO2 laser.

Materials and Methods

The present study was carried out on 20 patients with lower eyelid puffiness without skin redundancy just fine wrinkles that were selected from patients that were admitted to department of plastic and reconstructive surgery, AL-Azhar University hospitals. A written informed consent was obtained from all subjects and approval of the Ethics committee. This was a prospectively randomized study carried out on 20 patients who divided into 2 groups: Group (A) was subjected to lower eyelid transconjunctival blepharoplasty assisted by postoperative fractional CO2 laser for three sessions under local anesthesia. First session was started one

month postoperative with one month interval between each session. Group (B) was subjected for lower eyelid transconjunctival blepharoplasty alone.

Inclusion criteria: Age: the age between (30 _55 yrs), sex: both Sex are included and puffy lower eyelids without skin redundancy just fine wrinkles (fat excess).

Exclusion criteria: Eyelid trauma with subsequent tissue inflammation, allergy or wound, eyelid ugly scar, any other pathological condition that may alter eyelid tissues e.g any pigmented skin lesion, patients with ectropion or scleral show, patients with entropion, patient with related comorbidities eg. Myasthenia gravis, patient with bad general condition, patient has been subjected to previous lower eyelid skin resurfacing by fractional laser, patients with high intraocular pressure (glaucoma) and patients with collagen disease e.g Ehler Danlos syndrome.

Operational Design: All patients were subjected to the following:

History Taking:
Full clinical history**:** Personal history (Name, Age, address,...etc), complaint, patient expectation, history of present illness, past history and any systemic medical diseases e.g. diabetes mellitus.

General examination: Vital signs (Blood pressure, Temperature, Heart rate, Respiratory rate)**,** over view on the body systems and skin (e.g., scleroderma, facial changes (e.g. old scars). Ocular examination: By seeking ophthalmological consultation. Lower eyelid examination **:**Redundant skin, skin pigmentation, fat herniation, tear trough and scleral show**.** Global position: Ptosis and post traumatic enophthalmos, Forehead and eyebrow examination, Upper eyelid examination.
Photography (high resolution photography not less than 300 pixels) (Preoperative / one month postoperative/ two months postoperative/ three months postoperative): Antero-posterior, right, left and oblique and right, left and lateral.
Investigations: Complete blood picture (CBC): hemoglobin concentration (Hb %), red blood cells (RBCs), white blood cells (WBCs), platelet count. **Renal function test:** serum creatinine, blood urea and urine analysis. **Liver Test Profile:** Serum aspartate and alanine aminotransferases (AST and ALT), serum albumin, serum bilirubin, serum gamma-glutamyl transferase (GGT), prothrombin time and international normalized ratio (INR) and **random blood glucose level.**

Operative: Eye globe injury was avoided by using protectors of the cornea. In some cases we address the herniated fat through preseptal approach by incision which was done just below the inferior tarsal border and at the level of the first vascular arcade. The lid flap was elevated anterior to the septum after incising the conjunctiva.

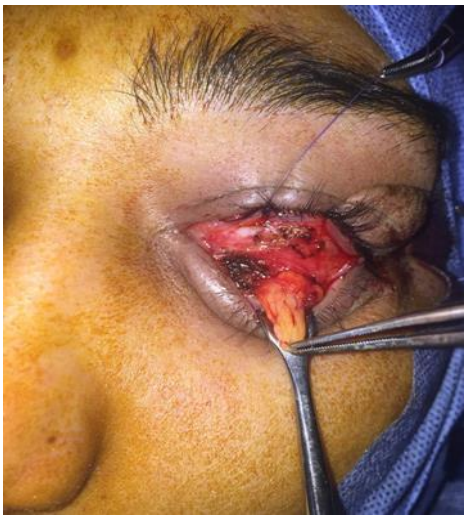

Figure (1): Showing intraoperative addressing of the herniated intraorbital fat compartments particularly (the central one) through preseptal approach.

The septum was divided so that we can reach orbital fat. Orbital fat was repositioned after subperiosteal dissection to ablate tear trough. In other patients the herniated fat has addressed postseptally by an incision almost 5 mm below the tarsal margin at the level the second vascular arcade without dividing the septum.

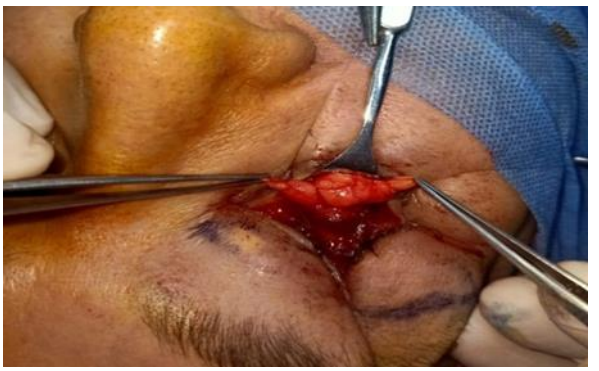

Figure (2): Showing intraoperative addressing of herniated orbital fat through postseptal approach.

We could reach orbital fat septal border and compartments could be exposed by doing two separate conjunctival incisions medially and laterally for nasal, central and lateral compartments respectively and then fat excision was done with precaution to avoid over resection to prevent hollow appearance the skin was then allowed to redrape.

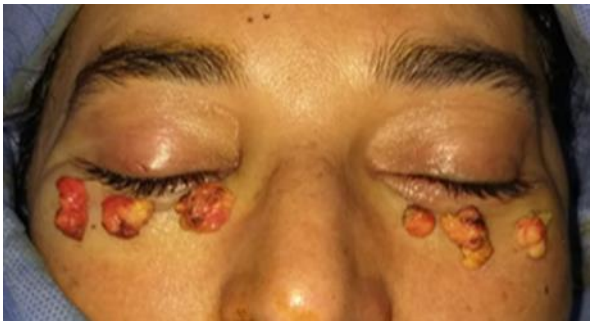

Figure (3): Intraoperative figure demonstrates the excised fat from middle aged woman with bilateral lower eyelid blepharoplasty.

Post-operative: All patients were instructed to follow a course of prophylactic systemic antibiotic, anti-inflammatory and topical antibiotic ointment. All patients were instructed to use cold compresses and/or ice for swelling control. Patients were also instructed to sleep with their heads elevated and avoid bending forward as this may exacerbate swelling and discomfort. Regarding group (A) they were subjected to the first laser session one month postoperative with one month interval between each session for three sessions.

Postoperative lower eyelid skin resurfacing: Skin resurfacing was done by fractional CO2 laser of ablative probe with power (32 to 45 kJ), density (12 to 18), first degree depth and one second interval.

About the LASER machine used for resurfacing: The machine we used is fractional CO2 LASER produced by Korean Daeshin Company.

Figure (4): Showing the LASER machine we used for postoperative skin resurfacing.

Statistical analysis of the data

Data were fed to the computer and analyzed using IBM SPSS software package version 20.0**. (**Armonk, NY: IBM Corp**).** Qualitative data were described using number and percent.The Kolmogorov-Smirnov test was used to verify the normality of distribution Quantitative data were described using range (minimum and maximum), mean and standard deviation. Significance of the obtained results was judged at the 5% level.

Ethical Consideration

Study protocol had been submitted for approval by Institutional Review Board, AL-Azhar University. Informed verbal consent had been obtained from each participant sharing in the study. Confidentiality and personal privacy had been respected in all levels of the study.

Results

Table (1): Comparison between two groups as regard to patient's age

Age	Group (A) (n = 10)	Group (B) (n = 10)	t	P Value
Min.-Max.	31-55	30-52	1.782	0.092
Mean±S.D	45.00±7.846	39.00±7.196		

U: Mann- Whitney test
p: p value for comparing between the two studied groups
*: Statistically significant at P <0.05

Age in Group (A) was ranged between 31-55 years with mean±S.D. 45.00±7.846 years while in Group (B) was ranged between 30-52 years with mean±S.D. 39.00±7.196 years. There were no statistically significant differences between groups where P=0.092. Table (1)

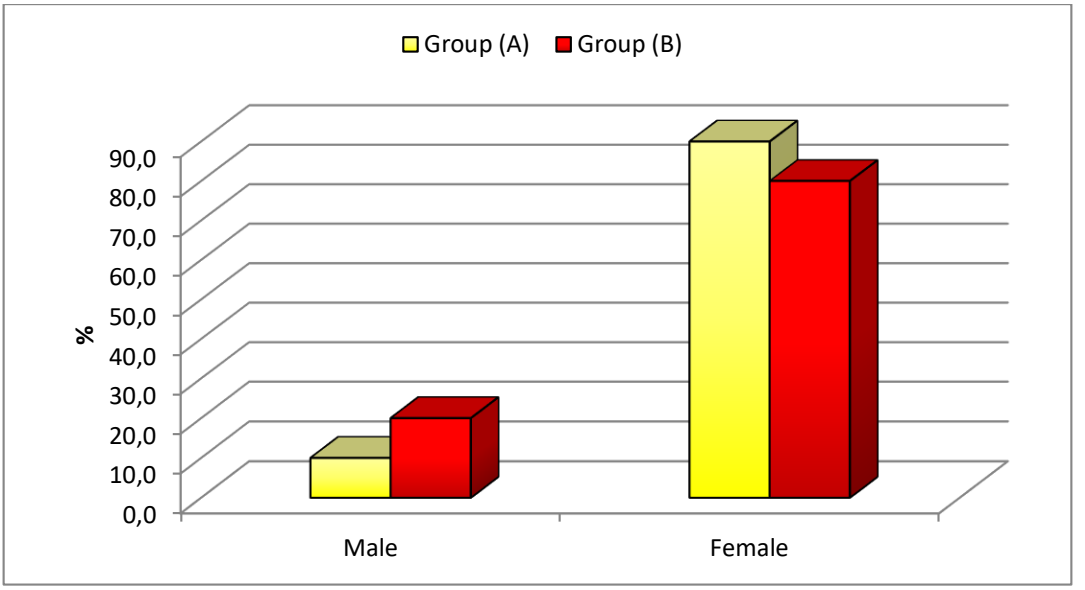

Figure (5): Comparison between two groups as regard to patient's sex

Sex in group (A) show that 1(10.0%) were male and 9(90%) were female while in group (B) 2(20.0%) were male and 8(80.0%) were female. There was no statistically significant differences between groups where P=1.000. Figure (2)

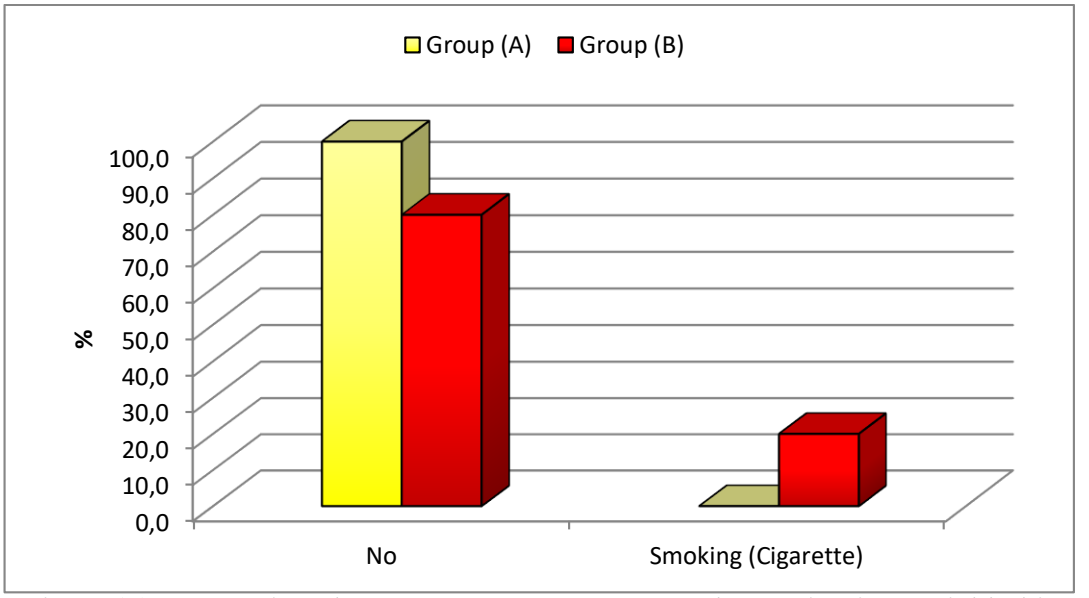

Figure (6): Comparison between two groups as regard to patient's Special habit

Special habit in group (A) show that 10(100%) didn't had special habit while in group (B) 8(80%) didn't had special habit and 2(20.0%) were smoker. There was no statistically significant differences between groups where P=0.474. Figure (3)

Table (2): Comparison between two groups as regard to patient's Complain

Complain	Group (A) (n = 10)		Group (B) (n = 10)		P Value
	No.	%	No.	%	
Bilateral lower eyelid puffiness	10	100	10	100	1.000
Bilateral upper eyelid redundant skin	3	30.0	0	0	1.000
Xanthelasma	1	10.0	0	0	1.000

p: p value for comparing between the two studied groups
*: Statistically significant at P <0.05

Complain in group (A) show that 10(100%) had Bilateral lower eyelid puffiness, 3(30.0%) had Bilateral upper eyelid redundant skin and 1(10.0%) had Xanthelasma while in group (B) 10(100%) had Bilateral lower eyelid puffiness. There was no statistically significant difference between groups. Table (2)

Table (3): Comparison between two groups as regard to patient's complications

Complications	Group (A) (n = 10)		Group (B) (n = 10)		P Value
	No.	%	No.	%	
No	8	80.0	6	60.0	0.043*
Incomplete correction	2	20.0	0	0	

Increased peri-ocular wrinkles	0	0	4	40.0	
Total	10	100	10	100	

p: p value for comparing between the two studied groups
*: Statistically significant at P <0.05

Complications in group (A) show that 2(20.0%) had incomplete correction while in group (B) 4(40%) had Increased peri-ocular wrinkles. There was statistically significant differences between groups where P=0.043. Table (3)

Table (4): Comparison between two groups as regard to patient's Patients satisfaction

Patients satisfaction	Group (A) (n = 10)		Group (B) (n = 10)		P Value
	No.	%	No.	%	
Effective	4	40.0	2	20.0	0.325
Mild	1	10.0	2	20.0	
Moderate	1	10.0	4	40.0	
Very effective	4	40.0	2	20.0	
Total	10	100	10	100	

p: p value for comparing between the two studied groups
*: Statistically significant at P <0.05

Patients satisfaction in group (A) show that 4(40.0%) were effective, 1(10.0%) were mild, 1(10.0%) were moderate and 4(40.0%) were very effective while in group (B) 2(20.0%) were effective, 2(20.0%) were mild, 4(40.0%) were moderate and 2(20.0%) were very effective. There was no statistically significant differences between groups where P=0.325. Table (4)

Table (5): Comparison between two groups as regard to patient's Skin tightening and residual wrinkles improvement

Skin tightening and residual wrinkles improvement	Group (A) (n = 10)		Group (B) (n = 10)		P Value
	No.	%	No.	%	
Improved	9	90.0	0	0	<0.001*
Not Improved	1	10.0	6	60.0	
Worsen	0	0	4	40.0	
Total	10	100	10	100	

p: p value for comparing between the two studied groups
*: Statistically significant at P <0.05

Table (5): Comparison between two groups as regard to patient's Skin tightening and residual wrinkles improvement Skin tightening and residual wrinkles improvement in group (A) show that 9(90.0%) were improved and 1(10.0%) were not improved while in group (B) 6(60.0%) were not improved and 4(40.0%) were worsen. There was highly statistically significant differences between groups

where P<0.001 with better result in group (A) in comparing with group (B). Table (5)

Case (1):
A female pt. 34 years with bilateral lower eyelid puffiness. subjected for lower eyelid transconjunctival blepharoplasty assisted by postoperative fractional CO2 LASER for successive 3 sessions with one month interval.

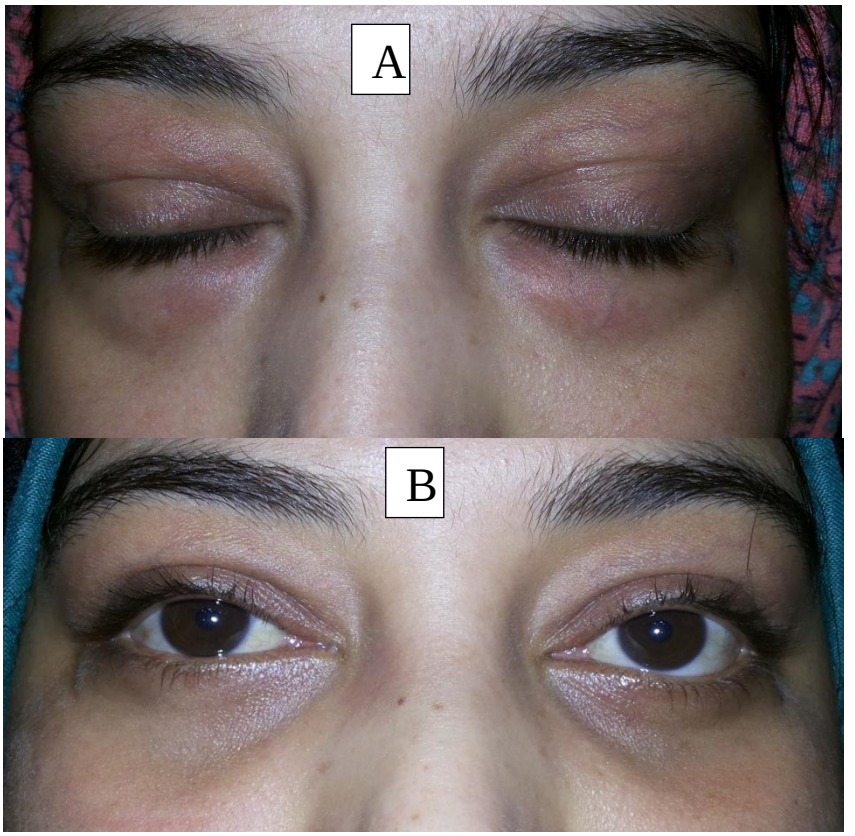

Figure (7): Showing Pre-operative A-P view (A) and Late postoperative A-P view (B) after submission for three fractional CO2 LASER sessions with one month interval**.**

A female pt. 30 years with bilateral lower eyelid puffiness. subjected for lower eyelid transconjunctival blepharoplasty alone.

Preoperative

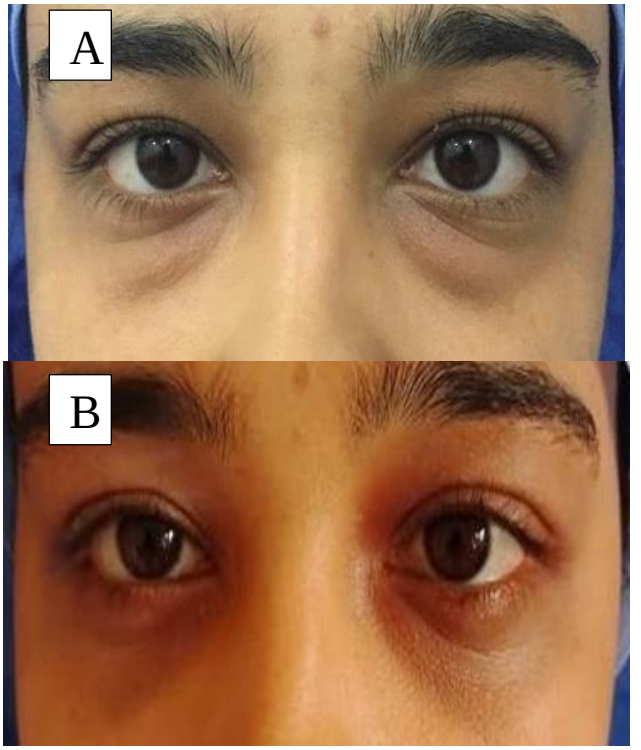

Figure (8): Pre-operative A-P view (A) and postoperative A-P view (B) for a case with bilateral lower eyelid puffiness which has been subjected to transconjunctival blepharoplasty alone.

Discussion

Lower eyelid fat bulging (LEFB), commonly referred to as 'baggy lower eyelids' is frequently observed in adults as a major sign of aging.[5] This prospective randomized study was conducted in department of plastic and reconstructive surgery, AL-Azhar University hospitals. This study was conducted on 20 patients with lower eyelid puffiness without skin redundancy just fine wrinkles; the patients were randomized into two groups: Group (A) was subjected for lower eyelid transconjunctival blepharoplasty alone. While group (B) was subjected to lower eyelid transconjunctival blepharoplasty assisted by postoperative fractional CO2 laser for three sessions under local anesthesia. First session to be started one month postoperative with one month interval between each session.

Regarding the demographic data of the studied groups, the current study showed that Group (A) age was ranged between 31-55 years and mean±S.D. 45.00±7.846 years with 9(90%) were females while in Group (B) was ranged between 30-52 years and mean±S.D. 39.00±7.196 years. with 8(80.0%) were females. There were no statistically significant differences between groups as regard age and sex (p>.05)

The current study was in agreement with the randomized clinical trial by Carter et al., [6] aimed to study the effect of transconjunctival blepharoplasty alone compared with transconjunctival blepharoplasty and CO2 laser skin resurfacing on lower lid bulging and wrinkles. the study enrolled 24 patients underwent blepharoplasty alone and 20 cases underwent simultaneous blepharoplasty and laser resurfacing. There were no statistically significant differences between groups as regard demographics.

The current study showed that two patients in group (B) were smoker. Literature reported that Extent of aging is determined by internal factors related to genetics, skin pigmentation, and skin thickness as well as external factors such as sun exposure, smoking, environmental, and nutritional status.[7]

In the current study regarding complain we found that in group (A) 10(100%) had Bilateral lower eyelid puffiness, 3(30.0%) had Bilateral upper eyelid redundant skin and 1(10.0%) had Xanthelasma while in group (B) 10(100%) had Bilateral lower eyelid puffiness without statistically significant difference between groups. The study by Carter et al., [6] reported that all cases had lower lid bulging and wrinkles. The studied groups were comparable as regard preoperative characteristics. Also, Griffin et al., [8] reported that all cases had lower lid dermatochalasis the studied groups were comparable as regard preoperative complain. Kim et al., [9] stated that all cases had bilateral lower eyelid puffiness. In the current study regarding complications, we found that in group (A) there was 2(20.0%) had incomplete correction while in group (B) 4(40%) had Increased peri-ocular wrinkles. There were statistically significant differences between groups where P=0.043

Our results were supported by Carter et al., [6] who reported that Complications were transient in nature and included threesubjects with an allergic dermatitis after laser resurfacing and six subjects with mild postinflammatory skin hyperpigmentation. The hyperpigmentation resolved with use of topical hydroquinones and sunscreen. No subject had lower lid retraction, lateral canthal rounding, or hypopigmentation of the skin develop after surgery.

The study by Kotlus et al., [10] reported that no serious complications were noted but 1 patient exhibited a minor unilateral dehiscence of the surgical wound (less than 2 mm gap) after suture removal at 7 days that spontaneously resolved without adverse sequelae. All patients exhibited erythema of the resurfaced areas at 1 week. There were no instances of infection, delayed reepithelialization, scarring, or hyperpigmentation. Erythema and lagophthalmos were absent in all subjects at the 1-month examination.

Also, Balzani et al., [11] reported that Side effects were mild,patients reported minor crusting and oozing that resolvedwithin 48 to 72 h, and edema (1–2 days) and moderatepostoperative erythema resolved within 4 days. As well, Toyos, [7] reported that Patients reported minimal discomfort during the procedure and minor discomfort afterward, controlled with oral nonsteroidals. Side effects were mild, with subjects reporting crusting, oozing, and edema that resolved within 10 days.
In the current study Patients satisfaction in group (A) show that (40.0%) were effective, 1(10.0%) were mild, 1(10.0%) were moderate and 4(40.0%) were very

effective while in group (B) 2(20.0%) were effective, 2(20.0%) were mild, 4(40.0%) were moderate and 2(20.0%) were very effective. There was no statistically significant difference between groups where P=0.325.

Regarding skin tightening and residual wrinkles improvement in group (A) show that 9(90.0%) were improved and 1(10.0%) were not improved while in group (B) 6(60.0%) were not improved and 4(40.0%) were worsen. There were highly statistically significant differences between groups where P<0.001 with better result in group (A) in comparing with group (B). Our results were supported by Carter et al., [6] who reported that Transconjunctival blepharoplasty alone resulted in an improvement in lower lid bulging in 92% of subjects, whereas lower lid wrinkling worsened in 46%. When transconjunctival blepharoplasty was performed with simultaneous CO2 laser resurfacing, or with CO2 laser resurfacing 2 months later, a statistically significant improvement in wrinkles occurred (chi square = 20.625; P< 0.0005).

Also, Griffin et al., [8] reported that Transconjunctival laser blepharoplasty with simultaneous laser skin resurfacing resulted in improvement ofthe bulging of the lower lid in 18 of 20 (90%) patientsand all subjects had a statistically significantimprovement in the appearance of periorbital wrinkles (p < 0.001). There was a 72.5% reduction in the appearance of the wrinkles. However, the study by Kim et al., [9] Reported that patient satisfaction was overall high, with 363 (85.6%) very satisfied and 48 (11.3%) satisfied with the aesthetic outcome of lower eyelid laser resurfacing. They concluded that Ablative carbon dioxide laser resurfacing of the lower eyelids can be a useful tool in the armamentarium of the experienced oculoplastic surgeon, with excellent aesthetic results, high patient satisfaction, and low complication rates as adjunctive or monotherapy. Proper and timely management of postoperative complications is essential to maximizing successful cosmetic outcomes.

Also, Kotlus et al., [10] reported that All patients exhibited improvement of upper eyelid rhytidosis as rated by the independent observer. Eleven patients exhibited 1 grade of improvement, 12 patients had 2 grades of improvement, 6 patients had 3 grades of improvement, and 1 patient exhibited 4 grades of improvement. The mean improvement was 42% ± 18%. In agreement with our findings, Balzani et al., [11] reported that most of them (60 %) showed good satisfaction with the effect of treatment. The 20 % of patients have deemed respectively excellent and fair satisfactory treatment. No subject rated satisfaction level as “poor. The study by Toyos, [7] demonstrated the safety and efficacy of noninvasive continuous wave fractional CO2 laser in thetreatment of mild and moderate upper eyelid dermatochalasis.

Conclusion

Our results demonstrated that both lower eyelid transconjunctival blepharoplasty alone or with combination with postoperative fractional CO2 laser were safe and effective in the treatment of lower eyelid puffiness. Both of the investigated methods had comparable outcomes in terms of complications and satisfaction. Furthermore, fractional CO2 laser in patients with combined treatment presented more improvement in skin tightening and residual wrinkles resurfacing than in

patients subjected for blepharoplasty alone, this highlights the significance of fractional CO2 laser if combined with lower eyelid transconjunctival blepharoplasty providing an alternative to transcutaneous blepharoplasty. More comparative studies with larger sample size and long follow up are needed to confirm the current results.

Conflict of interest: *no conflicts of interest.*

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