

Does Suture Material and Technique Really Matter? Lessons Learned From 800 Consecutive Blepharoplasties

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Objectives: The purpose of this study was to evaluate established suture materials and techniques for blepharoplasty closure and evaluate for any differences in rates of complications between these groups.

Study Design and Methods: This was a prospective study of a large sequential series of patients undergoing upper blepharoplasty who were treated by the same senior author over a 5-year period. Patients were assigned one of four techniques for closure of the incision based on the senior author's experience. After 6 weeks, rates of complications and revisions were noted and addressed. Satisfaction rates were noted at 3 months.

Results: In the group whose incisions were closed with running subcuticular polypropylene (Prolene), 5 (2.5%) presented with milia, and 11 (5.5%) had a standing cone deformity (SCD). Use of running cutaneous locked Prolene resulted in 8 patients (17%) with milia and 2 patients (4.4%) requiring revision of a SCD. Use of a running 6-0 plain gut suture resulted in 12 patients (6.7%) with milia and 5 patients (2.8%) with unsightly scarring. In the group whose incisions were closed with running 6-0 fast-absorbing gut, 10 patients (2%) presented with milia, and there were no scar revisions. There were statistically significant differences between the groups with respect to formation of milia, scarring, and persistent erythema ($P < .008$).

Conclusions: Blepharoplasty is a safe and effective procedure that can be performed successfully with several established techniques. In our experience, closure with two interrupted 6-0 Prolene sutures and a running

6-0 fast-absorbing gut resulted in the lowest rates of complications and revisions.

Key Words: Blepharoplasty, complications, suture material, incisions, scarring, milia.

Laryngoscope, 117:981–984, 2007

INTRODUCTION

Blepharoplasty is one of the most common procedures employed for facial rejuvenation and beautification. It can be a highly successful surgical procedure when performed for the right patients but is not without risk. Complications are usually infrequent but include edema; infection; asymmetry secondary to excessive or insufficient excision of skin, muscle, or fat; and unsightly scarring. Other complications include lagophthalmos, exposure keratopathy, canthal webbing, ectropion, ptosis, chemosis, and xerophthalmia.¹ It has been demonstrated that eyelid complications such as ptosis of the upper eyelid or lagophthalmos and scarring are the most common during blepharoplasty.²

Despite the fact that scarring is among the most common complications associated with blepharoplasty, a review of the literature reveals a paucity of information on the techniques and materials used for the closure of blepharoplasty incisions. It appears that the selection of technique and material relies largely on surgeon's personal preference, and not on any scientific or clinical basis.^{3,4} We undertook a prospective randomized study that evaluated outcomes associated with established suture techniques for closure of blepharoplasty incisions in more than 800 patients. Patients were selected for one of four established techniques for incision closure at the discretion of the senior author. We evaluated whether the choice of closure technique and suture material plays a role, if any, in complications involving the eyelid fold, and present lessons learned during our 5-year experience.

MATERIALS AND METHODS

Study Design

This prospective nonrandomized study was performed over a 5-year period in a private practice setting. During this time, 866 patients were enrolled and data were collected. On extensive preoperative evaluation, patients who met the standard criteria

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Editor's Note: This Manuscript was accepted for publication February 20, 2007.

Presented at the Combined Sections Meeting of the Triological Society, Marco Island, Florida, February 14–18, 2007.

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DOI: 10.1097/MLG.0b013e31804f54bd

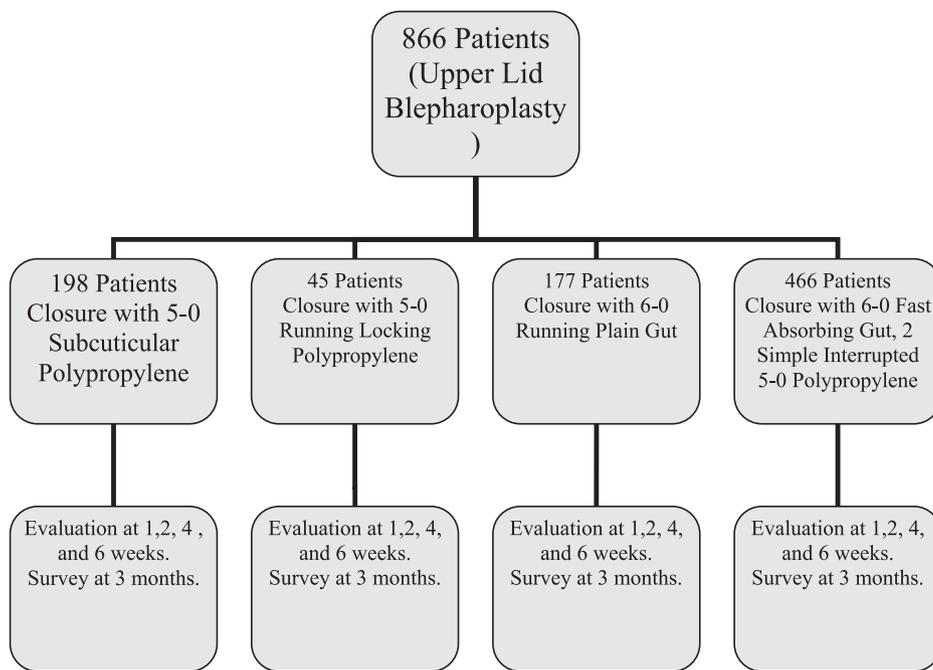


Fig. 1. Summary of study design.

for cosmetic upper lid blepharoplasty were asked to participate in the study.

Screening of candidates included evaluation of the brow and careful review of medical and ophthalmologic histories. On completing the preoperative evaluation, including photodocumentation, and obtaining patient consent to participate in the study, patients were assigned one of four established techniques for incision closure based on the senior author's experience. These included a running subcuticular 5-0 Prolene suture (group 1), a running-locking cutaneous 5-0 Prolene suture (group 2), a running cutaneous 6-0 plain gut suture (group 3), and two interrupted 6-0 Prolene sutures (for the ends of the incision) along with a running 6-0 fast-absorbing gut suture (group 4). The study is summarized in Figure 1.

Each patient underwent upper eyelid blepharoplasty with a similar technique employed by the senior author (described below). The length of the incision, method of handling eyelid skin and soft tissue, and time of surgery were kept as similar as possible among patients. However, depending on the preference of the senior author, the orbital septum was either incised with subsequent fat removal or cauterized with needlepoint unipolar cautery.

Patients underwent extensive perioperative and postoperative evaluation, along with photodocumentation, at 1, 2, 4, and 6 weeks postoperatively. Nonabsorbable sutures were removed at 5 days, and absorbable sutures were allowed to resorb. Complications and revision rates were noted and tabulated. Each patient was verbally surveyed for satisfaction 3 months postoperatively.

Outcome Measures

The main outcome measures of this study included incisional erythema, suture marks, wound infections, milia, standing cone deformity (SCD), unacceptable scarring (hypertrophic scarring and scar unevenness), and dehiscence. Persistent lagophthalmos, ptosis, xerophthalmia, and upper eyelid anomalies were also evaluated.

Data Analysis

Analysis of categorical data were performed with the χ^2 technique. The level of statistical significance was set at $P < .008$ (0.05/number of groups analyzed).

Surgical Technique

The patients were marked preoperatively in the standing position, after skin pinch test, to evaluate for redundancy. At that time, the decision was made by the senior author whether to remove upper eyelid fat, based on upper eyelid appearance in the lateral, medial, upper and lower gaze positions. Approximately 2 to 3 mL of 1% lidocaine with 1:100,000 epinephrine was infiltrated subcutaneously. After adequate time for hemostasis, a standard incision for upper blepharoplasty was made 2 to 3 mm below the apparent supratarsal fold with a #15 blade, and a strip of skin was excised. Muscle deemed to be redundant was also resected.

The septum was then either simply cauterized using unipolar needlepoint cautery or buttonholed to expose the nasal and medial fat pads. If necessary, fat was excised with needle-point cautery. Hemostasis was obtained. The incisions were then closed with one of the four methods and suture types outlined above. No dressing was applied to the incisions.

RESULTS

Over a 5-year period, a total of 866 upper blepharoplasties were performed, most in conjunction with other aesthetic procedures. The study included 749 women and 117 men. The average patient age was 52, and the age range was 32 to 86 years. All major ethnicities were represented in this study, although the majority of patients were Caucasian American.

Of the 198 patients who had closure with a running subcuticular Prolene (group 1), 5 (2.5%) presented with milia, and 11 (5.5%) had a standing cone deformity (SCD) which required revision. A running cutaneous locked Prolene was used in 45 patients (group 2), which resulted in 8 patients (17%) with milia and 2 patients (4.4%) requiring revision of a SCD. Of the 177 patients closed with a running 6-0 plain suture (group 3), 12 patients (6.7%) developed milia and 5 patients (2.8%) had unsightly scarring; no patients developed SCD, and no patients underwent scar revision. Of the 446 patients closed with two

TABLE I.
Incidence of Complications Associated With Blepharoplasty 6 Weeks Postoperatively.

Type of Suture (No. of Patients)	Milia	SCD	Scarring	Erythema	Suture Marks	Major Hematoma	Minor Hematoma	Infection	Dehiscence
5-0 Subcuticular Prolene (198)	5 (2.5%)	11 (5.5%)	0 (0%)	4 (2%)	0 (0%)	0 (0%)	2 (1%)	0 (0%)	0 (0%)
5-0 Running-locking Prolene (45)	8 (17%)	2 (4.4%)	0 (0%)	1 (2.2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
6-0 Running-plain gut (177)	12 (6.7%)	0 (0%)	5 (2.8%)	16 (9%)	3 (1.6%)	0 (0%)	1 (0.5%)	0 (0%)	0 (0%)
6-0 Running-fast absorbing gut, 5-0 simple interrupted Prolene (466)	9 (2%)	0 (0%)	1 (0%)	10 (2.1%)	2 (0.4%)	0 (0%)	2 (0.4%)	0 (0%)	0 (0%)

SCD = standing cone deformity.

interrupted 6-0 Prolene sutures and a running 6-0 fast-absorbing gut suture (group 4), 10 patients (2%) presented with milia, and there were no scar revisions; no cases of SCD were noted.

The rates of persistent erythema were 2%, 2.2%, 9%, and 2.1% in groups 1, 2, 3, and 4, respectively. Of all 866 blepharoplasties, 5 patients developed hematomas which required surgical intervention. One patient developed xerophthalmia requiring treatment after revision of a SCD.

There were no infections noted or injuries to the globe, levator, or extraocular muscles and no cases of postoperative ptosis. Transient lagophthalmos was relatively common, but there were no cases of persistent lagophthalmos 4 weeks postoperatively. These results are summarized in Table I.

After analysis, there appeared to be a statistically significant difference between groups when evaluating for milia. Groups 1 and 4 both had lower than expected rates of milia, whereas groups 2 and 3 had higher than expected rates. The absolute difference between observed and expected values was greater in group 4 than in group 1. There appeared to be a statistically significant difference between groups 3 and 4 with respect to scarring, with group 4 having less scarring than expected and group 3 having more scarring than expected.

A statistically significant difference in erythema was also observed between groups. Incidence of erythema in groups 1, 2, and 4 approximated 2% compared with 9% in group 3. With the use of χ^2 , groups 1, 2, and 4 had fewer than expected cases of erythema when compared with group 3. The absolute difference between expected and observed complication rates was highest for group 4.

There appeared to be no statistically significant differences between groups 1 and 2 with respect to SCDs. There were no statistically significant differences between groups 3 and 4 with respect to suture marks. Likewise, there was no demonstrable statistical difference among groups 1, 3, and 4 with respect to minor hematomas. Statistical findings are summarized in Table II.

Of the 866 patients, 568 were surveyed at 3 months. Seventy-four percent of patients stated that they were highly satisfied with their results. Twenty-one percent of patients reported that they were satisfied with their results. Five percent reported that they were unsatisfied with their results.

DISCUSSION

Incisions can be closed with a variety of nonabsorbable and absorbable suture materials, and with the use of different techniques such as simple, running, running-locking, and subcuticular closure. Alternatively, wounds can be approximated with tissue glues such as cyanoacrylate or with adhesive tape.⁵ At the present time, the preferences of the surgeon appear to be based on clinical success and prior experience, and not on clinical or animal studies.

Wound management, whether during blepharoplasty or any other surgery, deals with the timing, suture materials, and techniques for closure.⁶ It has been demonstrated that different areas of the body require specialized closure techniques with specific suture materials. For example, surgical dictum holds that incisions subject to a high amount of shear and distracting forces, such as joints, should be closed with a permanent nonabsorbable suture in a running-locking fashion. Incisions in areas such as the neck are not subject to shear forces as great as joints and, as a result, do not require as much reinforcement.

Surprisingly, there is a paucity of literature dealing with incisional closure in blepharoplasty, and in facial incisions more generally. From what we could identify in the medical literature, this issue was first addressed prospectively by Guyuron in 1992, followed by Scaccia in 1994.^{7,8} In 2006, Alam performed a randomized study evaluating excisions and incisions on extremities.⁹ Each of these studies involved a comparison of absorbable and nonabsorbable sutures. In this study, we compared different varieties of absorbable sutures (fast-absorbing and plain gut) and nonabsorbable suture techniques (running-locking and subcuticular) to achieve results with better practical application.

TABLE II.
Findings After Statistical Analysis With χ^2 Technique.

Complication	Groups Included	P Value
Milia	1, 2, 3, 4	2.70148E-07
SCD	1, 2	0.764943882
Scarring	3, 4	0.002106052
Erythema	1, 2, 3, 4	0.000160389
Suture marks	3, 4	0.10267088
Minor hematoma	1, 3, 4	0.664404261

SCD = standing cone deformity.

This study demonstrates that there are distinct advantages and disadvantages to using different suture materials during blepharoplasty. Because sutures (both absorbable and nonabsorbable) are usually composed of foreign material, they may contribute to the susceptibility of wound infection.⁶ Absorbable sutures can cause significant inflammation and erythema during the process of degradation, although they do not require removal. Non-absorbable sutures have the advantage of less tissue reactivity, but they may create significant discomfort in some patients on removal. Although prior comparisons of nonabsorbable and absorbable sutures demonstrated no significant differences in erythema, scarring, suture marks, scar hypertrophy, infection, or tissue necrosis,⁷ we sought to verify these results in a large series of patients and obtain statistical data from which conclusions can be drawn.

Milia and standing cone deformities were the most common minor complications associated with blepharoplasty in our study. In group 1 patients, 5 (2.5%) presented with milia, and 11 (5.5%) had a standing cone deformity (SCD) that required revision. Scaccia reported a higher rate of milia formation (7.5%) after using the same suture.⁸ No SCDs were found in his study, presumably due to the interrupted sutures placed at the lateral ends of the incisions. Interestingly, in group 4 no cases of SCD were observed.

In our study, nearly equal rates of milia formation were observed in group 1 (2.5%) and group 4 (2%). Similarly, Scaccia observed no significant difference in milia formation after using a permanent subcuticular and an absorbable skin suture.⁸ Although no difference was observed in the rates of milia, after statistical analysis the absolute difference between expected and observed milia was greatest in group 4. This suggests that although both types of sutures (subcuticular Prolene and fast-absorbing gut) have rates of low complications, closure with fast-absorbing gut decreases that complication rate even more.

Interestingly, higher rates of milia (6.7%) were observed with a running 6-0 plain suture and a running cutaneous locked Prolene (17%), when compared with either a subcuticular closure or a running closure with fast-absorbing gut suture. These findings were also statically significant. Plain gut retains 50% of its tensile strength at 15 days, although this is quite variable. By contrast, polypropylene (Prolene) exhibits no changes in tensile strength.⁶

Rates of SCDs requiring revision were highest in the running subcuticular group (5.5%), as well as in the running-locking Prolene group (4.4%), although these differences in groups were not statistically significant. However, it appears that using a simple suture at the lateral and medial ends of the incision decreases the tendency for a SCD.

Erythema and scarring appear to be significantly associated with plain gut suture versus other sutures.

This is an interesting finding, as we have noticed in our clinical experience that plain gut results in more scarring and persistent erythema than other absorbable sutures. Although not specifically studied, erythema appeared to occur more likely with use of Neosporin ointment. Presumably, the persistent erythema caused by plain gut suture is a result of delayed and variable breakdown. To correct for this problem, we began using fast-absorbing gut suture, producing superior results.

Finally, although not specifically surveyed, patient pain appeared to be greater with removal of subcuticular sutures than with removal of running-locking Prolene or interrupted Prolene sutures.

CONCLUSIONS

In this study, we present a large series of patients who have undergone blepharoplasty of the upper eyelid. We have observed significant differences between suture materials and techniques with respect to milia formation, erythema, and scarring. It seems that a fast-absorbing gut suture along with two interrupted Prolene sutures yielded the best results and the lowest rates of complications. Although we do not necessarily recommend that surgeons change suture preferences based on our results, we offer these findings for consideration and further study. Whether the results of this study can be applied to other areas of the face remains to be seen.

Acknowledgments

The authors thank Dr. Robert Glade for his help with statistical analysis.

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