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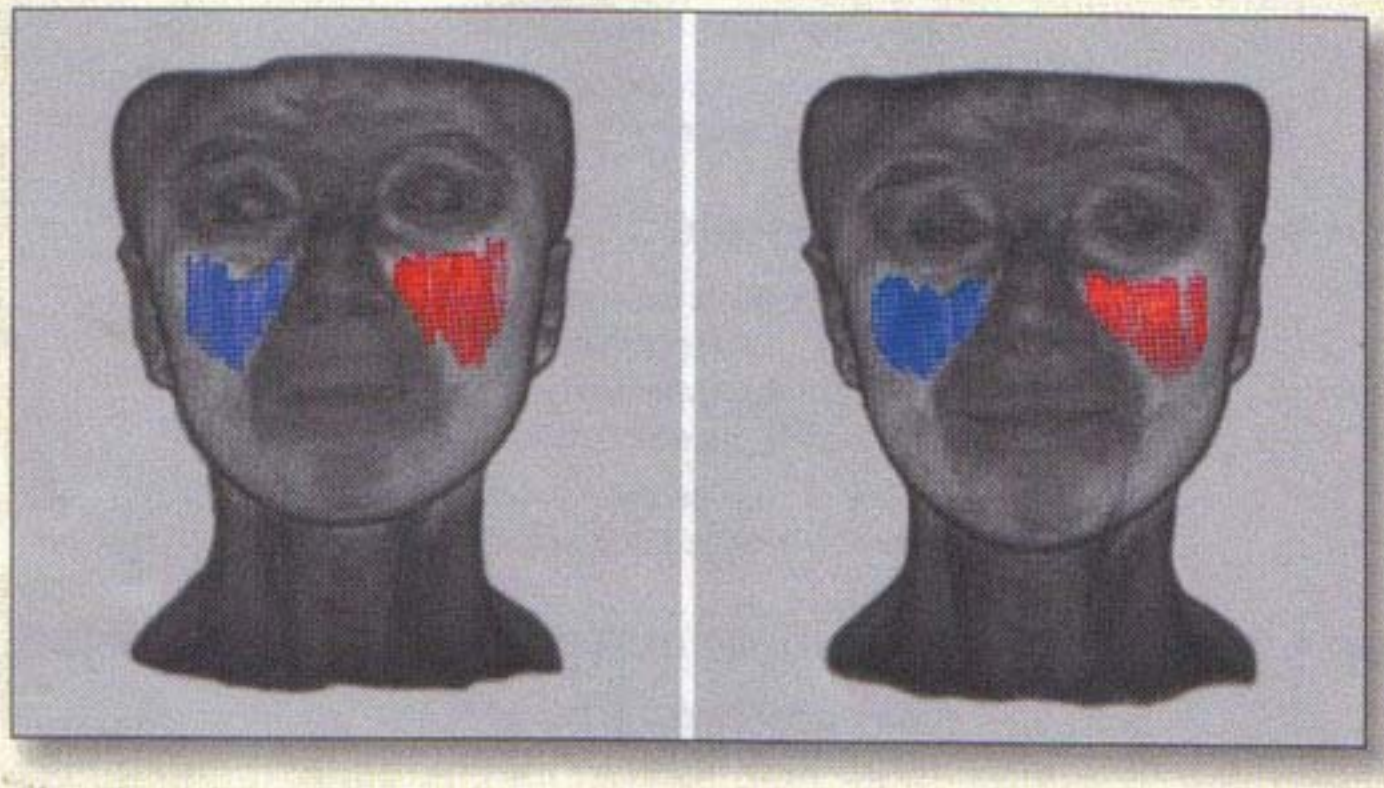

Malar fat volume: neutral (left) and smiling (right). See page 140.

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Hematoma Rates in Drainless Deep-Plane Face-lift Surgery With and Without the Use of Fibrin Glue

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Objective: To determine the rate of hematoma formation in drainless deep-plane rhytidectomy and compare it with the rate using the same technique with the use of fibrin glue.

Methods: This is a retrospective review of 605 patients (78 male and 527 female) who, over a 6-year period, underwent deep-plane face-lift surgery (n=544) or lateral superficial musculoaponeurotic system (SMAS)ectomy (n=61) by the senior author (S.S.R.) without the use of surgical drains. One hundred forty-six consecutive patients underwent rhytidectomy without fibrin tissue glue, and the following 459 consecutive patients were sprayed with fibrin glue under the flap prior to flap closure. Pressure dressings were used on all patients for 24 hours.

Results: None of the patients in either group had major or expanding hematomas requiring operative intervention. In the group of patients treated without fibrin glue (n=146), there were 5 minor, nonexpanding hematomas, all managed by needle aspiration. This is a minor hematoma rate of 3.4%. In the fibrin glue group (n=459), there were 2 hematomas, for a rate of 0.4%. Using a Fisher exact test, we found a statistically significant decrease in the hematoma rate from 3.4% to 0.4% ($P=.01$). Male patients had a higher hematoma rate than female patients, and only men had significantly fewer hematomas when fibrin glue was applied ($P=.01$). All 7 hematomas were recognized in the first 24 hours after surgery. Of the 7 patients with hematomas, 2 (29%) had emesis in the recovery room despite medication.

Conclusions: The use of fibrin glue demonstrates a significant decrease in the rate of hematoma formation. Fibrin glue may benefit male more than female patients. If meticulous hemostasis and pressure dressings are used, drains are not necessary. The prevention and prompt treatment of postoperative nausea may also help prevent hematoma formation.

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HEMATOMA FORMATION REmains the most common major complication after face-lift surgery. Hematomas can lead to tissue ischemia, prolonged facial edema, hyperpigmentation, reoperation, and patient dissatisfaction. The incidence of hematoma ranges from 0.2% to 8.1%. Existing literature that documents the rate of hematoma formation after face-lift surgery includes the use of drains in the surgical site.[1-29] Drains can malfunction, introduce infection into the wound, leak, become misplaced, and entail extra incision and scarring. They create tracts at the site of removal, necessitate painful extraction, and risk injury to vessels on removal. Increased nursing is required for drains. In the past, the use of drains was routinely advised. Surgeons have recently been omitting the use of drains in face-lift surgery.

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The use of fibrin glue may help eliminate the necessity of surgical drains after face-lift procedures. By closing and sealing the dead space, fibrin glue has been shown to decrease postoperative drain output, hematoma rates, and ecchymosis. Marchac and Sandor[27] had demonstrated a statistically significant decrease in the rate of major hematoma formation, ecchymosis, and edema when fibrin glue was used. The control group in their study had drains inserted. Kamer and Nguyen[30] had decreased hematoma and seroma rates with the use of fibrin glue, but this did not reach statistical significance. In their study, the non–fibrin glue group also had drains inserted. The studies by Marchac and Sandor,[27] Kamer and Nguyen,[30] and Marchac and Greensmith[31] demonstrated relative safety in the omission of drains if fibrin sealant is used. Oliver et al[32] performed a prospective, randomized, double-blind trial to demonstrate a decrease in surgical drain output on the

Table 1. Patient and Surgical Characteristics

Characteristic	Group 1, Non–Fibrin Glue (n=146)	Group 2, Fibrin Glue (n=459)
Patient		
Age range, y	39-78	37-79
Age, mean, y	52	51
Male, %	12.3	13.1
Surgical, %		
Formal SMAS platysmal flap	92	89
Lateral	8	11
Submentoplasty	22	25
Revision cases	19	35

Abbreviation: SMAS, superficial musculoaponeurotic system.

side of the face that was treated with fibrin glue. The sides of the face that were treated with fibrin glue had a median drainage of 10 mL, and the control side had a median output of 30 mL.[32] Fezza et al[33] had similar results with the use of fibrin glue.

Since 1915, fibrin sealant has been used in a variety of medical applications. Fibrin sealant is a nontoxic, physiologic hemostatic agent partially derived from human plasma. It consists of human fibrinogen, human thrombin, and bovine aprotinin. These ingredients stimulate the natural process of healing by simulating clot formation at the final phase of coagulation.[34,35] This creates a fibrin matrix with structured strands that are more effectively cross-linked by factor XIIIa, which forms a stronger clot. After the clot is formed, the bovine apoprotinin component, which is an antifibrinolytic agent, reduces the rate of clot lysis by exogenous plasmin. The fibrin network is thought to reduce the amount of postoperative bleeding by sealing capillary vessels and adhering raw surfaces to each other. The glue is not indicated for stopping heavy arterial bleeding.[36] With an improved purification method, it has also had an improved safety profile against viral and bacterial contamination.[37,38]

Previous studies included the use of surgical drains in the control group, which may have confounded the results. To our knowledge, this is the first study on deep-plane rhytidectomy that compares the drainless fibrin glue closure with a drainless control group.

METHODS

This is an institutional review board–approved retrospective review of 605 patients who underwent deep-plane face-lift surgery or a lateral superficial musculoaponeurotic system (SMAS)ectomy by the senior author (S.S.R.) from January 2001 to January 2007. Group 1 comprised 146 consecutive patients who underwent face-lift surgery without fibrin tissue glue. The following group of patients, group 2, comprised the following 459 consecutive patients who were sprayed with fibrin glue under the flap prior to flap closure. All 605 face-lift procedures were performed without the use of drains. There were no exclusion criteria for the patients. Male and female patients were both included in the study. Smokers and patients who had received previous face-lift surgery were not excluded.

All the procedures were performed by the senior surgeon (S.S.R.). Patients in the review underwent either a formal deep-plane composite flap consisting of skin, SMAS, and malar fat pad undermining and elevation, or a lateral SMASectomy. For those undergoing a formal deep-plane composite flap, the deep plane was dissected anteriorly and inferiorly to the marionette lines and jowl areas. Superiorly, the dissection was made over the zygomatic muscles to the nasolabial folds. The deep-plane ledge was then pulled and attached in a posterior-superior direction. For patients undergoing lateral SMASectomy, subcutaneous elevation was performed toward a point midway between the zygomatic arch and nasolabial folds. A lateral strip of SMAS was removed from an imaginary line parallel to the nasolabial fold from the ear lobule superiorly toward the zygoma. The neck was addressed similarly in all patients by lifting the posterior border of the platysma and attaching it with horizontal mattress sutures to the mastoid periosteum. After multiple checks of hemostasis and skin tailoring, closure was performed. In group 2, before final closure of the incision, Tisseel Fibrin Glue (Baxter Healthcare Corp, Deerfield, Illinois) was sprayed on the raw dissected surfaces through the sideburn, preauricular, and postlobule incisions. After the Tisseel glue was sprayed, gentle external pressure was applied to the flaps with moist gauze for 3 minutes while avoiding shearing. Three layers of gauze were applied, and a surginet dressing was placed. Pressure dressings were maintained on all patients for 24 hours. For each patient, the purchase cost of Tisseel from Baxter Healthcare Corp was $210.

The patients' records were examined for major hematomas (an expanding collection containing ≥20 mL of blood) and minor hematomas (containing <20 mL of blood). Of those patients who had hematomas, the location of the hematoma was recorded. The medical charts were also examined for the timing of hematoma formation and any postoperative events such as emesis.

RESULTS

There were 78 male and 527 female patients in this review. The patient and surgical characteristics between the 2 groups are given in **Table 1**. Groups 1 and 2 had similar age ranges and mean ages and had a similar distribution of men and women. A total of 544 patients underwent deep-plane face-lift surgery, and the other 61 patients, lateral SMASectomy. Submentoplasty was performed in 145 patients (24%). There were 188 cases of revision face-lift procedures. There is a noticeable difference in the percentage of revision cases between the 2 groups owing to the gradually increased referrals of revision face-lift surgery to the senior surgeon during this period.

The incidence of major and minor hematomas is given in **Table 2**. There were no major hematomas in any of the patients in either group. In group 1, 5 of the 146 patients experienced a unilateral minor hematoma (<20 mL, nonexpanding). In group 2, 2 of 459 patients experienced a unilateral minor hematoma. These were all managed by aspiration with a large-bore needle. Using a Fisher exact test, we found a significant decrease in the hematoma rate from 3.4% to 0.4% ($P=.01$). In group 1, 4 of 5 minor hematomas were in male patients. In group 2, 1 of 2 minor hematomas was in a male patient. Among the male patients, there was a statistically significant difference in hematoma rates between groups 1 and 2 ($P=.01$) (Table 2). Among female patients, there was no significant differ-

Table 2. Incidence of Hematomas and Distribution of Hematomas Between Sexes

Variable	Group 1, Non–Fibrin Glue, No./Total No. (%) (n=146)	Group 2, Fibrin Glue, No./Total No. (%) (n=459)	*P* Value (Fisher Exact Test)
Incidence of Hematomas			
Major hematomas (≥20 mL)	0/146	0/459	No difference
Minor hematomas (<20 mL)	5/146 (3.42)	2/459 (0.44)	.01
Distribution of Hematomas Between Sexes			
Men	4/18 (22.2)	1/60 (1.7)	.01
Women	1/128 (0.8)	1/399 (0.3)	.43

ence between hematoma rates ($P=.43$). There was an even distribution of the minor hematomas between the preauricular (group 1, n=2; group 2, n=1) and postauricular (group 1, n=3; group 2, n=1) regions. All hematoma cases occurred in patients without prior face-lift surgery. When nonrevision cases were evaluated independently, a statistically significant difference in hematoma rates was found between the 2 groups ($P=.02$).

All 7 hematomas were recognized in the first 24 hours after surgery. Of the 7 patients with hematomas, 2 (29%) had emesis in the recovery room despite medication. One patient was in group 1, and the other was in group 2.

COMMENT

The use of fibrin glue demonstrates a significant decrease in the rate of minor hematoma formation. Hematoma rates of 3.4% (without fibrin glue) and 0.4% (with fibrin glue) in patients in whom surgical drains were not used fall within the major hematoma rate of 0.2% to 8.1% observed in patients in whom drains were used.[1-29] In their study, Marchac and Sandor[27] had a major hematoma rate of 9% in patients treated without fibrin glue and with the placement of surgical drains. They also had a 2% incidence of major hematomas in patients treated with fibrin glue and without the placement of surgical drains. Their incidence of minor hematomas was 8% to 9% in both groups, which did not achieve a statistically significant difference. The patients who received fibrin glue did not have pressure dressings applied, whereas all patients in our study did have pressure dressings.[27] Major hematomas did not occur in our study, and the incidence of minor hematomas (3.4%) was not only less but also demonstrated a significantly decreased hematoma rate with the use of fibrin glue (0.4%). This suggests that fibrin glue can decrease the formation of minor hematomas. When combined with pressure dressings, fibrin glue traps and limits the spread of bleeding and creation of pockets. Previous studies have also shown a decrease in ecchymosis and edema.[31,33] Fezza et al[33] demonstrated that patients not only had a statistically significant decrease in bruising but also had a faster recovery and were able to return to normal functioning earlier than the control group. Tisseel glue is not significantly different from any other fibrin sealant. The different fibrin glue products vary in methods of production but rely on the same physiologic process.

As expected, there was a higher hematoma rate in male patients. The male patients who received fibrin glue had a significantly decreased hematoma rate. The female hematoma rate was not significantly changed. Fibrin glue may benefit male patients more than female patients. However, there may have not been enough hematomas in female patients to demonstrate a significant difference for women who received fibrin glue.

In previous studies, the groups that did not receive fibrin glue had drains.[27,30-33] To our knowledge, this is the first study that compares 2 groups in which fibrin glue was and was not used. A strength of the study is its isolation of fibrin glue as the major variable factor in the operation. This study also has a larger sample size when compared with previous studies. A weakness of the study is that the time when group 2 underwent surgery occurred after the time when group 1 underwent surgery. The learning curve of the senior surgeon may have been a confounding factor. However, the senior surgeon did not make any changes in instruments used, suture material, bipolar cautery settings, pressure dressings, nor the general approach to surgery. The only significant factor that changed was the addition of fibrin glue. This does not discount the fact that there were no major hematomas in group 1 and that there was a minor hematoma rate in the non–fibrin glue group, which fell to the rate seen for major hematomas.

The lack of major hematomas and low rate of minor hematomas is aided by meticulous hemostasis and careful placement of pressure dressings. Fibrin glue is not a replacement for meticulous hemostasis. The results of this study support the literature demonstrating that surgical drains are not necessary. In a previous review of the use of tissue glue without drains, the authors experienced small fluid collections requiring aspiration but no major hematomas.[39,40] Perkins et al[41] did not find a significant difference in hematoma rates in 222 patients who underwent face-lift surgery with or without the placement of drains. Another retrospective study also found that drainage alone does not reduce the incidence of postoperative hematomas.[42] A recent prospective randomized controlled trial found no difference in postoperative hematoma rates when drains were omitted but did find increased bruising in the group treated without

drains.[43] This difference in ecchymosis was contrary to 2 previous studies.[31,33] Drain placement is undesirable for both the surgeon and the patient. For the patient, it is unsightly and may necessitate an extra incision and cause more pain. Drains often malfunction by plugging, leaking, and slipping out. Drains are also a known source of infection. However, many surgeons are uncomfortable with the omission of drains. They seek an extra source of protection against hematoma formation. Fibrin glue can give this added protection.

Pressure dressings remained on the patients for 24 hours. This may have helped prevent the formation of major hematomas and decrease the rate of minor hematomas. All hematomas developed in the first 24 hours, which indicates that this is the time of greatest risk. Pressure dressings were eliminated in previous studies that included the use of fibrin glue, which had higher rates of both minor and major hematomas.[27,31] Pressure dressings may be uncomfortable for the patient, but this is an added level of security against hematoma formation.

While fibrin glue is used in a variety of medical procedures, face-lift surgery is an elective procedure, and use of a material derived from blood products has theoretical risks. These include the transmission of human immunodeficiency virus, hepatitis B and C virus, and human T-cell leukemia/lymphoma virus. However, a large study on infection of recipients of 20 000 U of blood revealed zero disease transmissions.[44] Autologous fibrin glue can be used, but it is expensive and its production requires time and trained personnel. Cost- and time-effective methods of preparing fibrin glue material from autologous blood are being developed.

Postoperative emesis occurred in 2 of the 7 patients with minor hematoma formation. Whether the emesis led to the formation of these hematomas is unclear, but increased venous pressure is a factor in the development of hematomas. Adequate prevention and treatment of postoperative nausea should be a significant consideration in all operations, especially in those that can compromise a flap.

In conclusion, the use of fibrin glue demonstrates a significant decrease in the rate of hematoma formation. The use of fibrin glue may be more advantageous for male than for female patients. Surgical drains are not necessary for the prevention of hematomas. The prevention and prompt treatment of postoperative nausea may also help reduce the risk of hematoma formation. Hematomas after face-lift surgery can have devastating consequences. If meticulous hemostasis is achieved and the appropriate amount of pressure dressings are placed, the risk of major and minor hematomas can be decreased. Fibrin glue gives an added advantage to help prevent hematomas.

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