



Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

JPRAS Open

journal homepage: www.elsevier.com/locate/jpra



The use of Fibrin Sealants in Reducing Drain Output in Abdominoplasty: Is it Useful?

G. Pieretti, A. Gubitosi, V. Mazzarella*, M. Cimmino, G. Lanzano, R. Grella, G.A. Ferraro, E. Grella

Plastic Surgery Unit, Multidisciplinary Department of Medical-Surgery and Dental Specialities, Università degli Studi della Campania "Luigi Vanvitelli", Piazza Luigi Miraglia, 80138 Naples, Italy

ARTICLE INFO

Article history:

Received 18 January 2024

Accepted 2 June 2024

Available online 6 June 2024

Keyword:

abdominoplasty
postbariatric surgery
fibrin sealant
fibrin glue
drain output
bleeding
exudation

ABSTRACT

Background: Abdominoplasty is a common surgical procedure in which excess abdominal skin and fat are reduced to improve body contouring. Fibrin sealant has been proposed to reduce postsurgical bleeding and exudation. In this study, we evaluated whether there was a significant statistical difference in surgical output between the use of fibrin glue and its nonuse in abdominoplasty surgery, specifically in reducing bleeding and exudation.

Material and methods: A retrospective chart review of 68 postbariatric abdominoplasty patients (58 females, 10 males) was performed. We divided the patients into Group A (30 cases, 44%), in which we used fibrin sealant, and Group B (38 cases, 56%), in which we did not use fibrin glue. We calculated the total amount of liquid in suction drainages until the day of their removal. Statistical analysis included the independent *t*-test with a significance level of 0.05.

Results: The average drainage output in Group A was 620.0 ± 375.0 mL, whereas in Group B, it was 500.0 ± 290.0 mL. Results indicate an insignificant correlation between the use of fibrin glue and the amount of liquid in the surgical drains ($t = 1.52$, $p = 0.13$). The result is not significant at $p < .05$ according to the independent *t*-test.

* Corresponding author: Vincenzo Mazzarella, Plastic Surgery Unit, Multidisciplinary Department of Medical-Surgical and Dental Specialities, Università degli Studi della Campania "Luigi Vanvitelli", Piazza Luigi Miraglia, 80138 Naples, Italy. +393356968593.

E-mail address: vinc.mazzarella@gmail.com (V. Mazzarella).

Conclusion: The use of fibrin sealant surely has a high value in all surgical branches to reduce postoperative complications, but in our study, we did not find any advantages in its use for reducing surgical drain output in abdominoplasty patients.

© 2024 Published by Elsevier Ltd on behalf of British Association of Plastic, Reconstructive and Aesthetic Surgeons.

This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

Introduction

Abdominoplasty is a common surgical procedure where excess abdominal skin and fat are reduced to improve body contouring. By the late 1970s, abdominoplasty techniques evolved into a standardized procedure involving uniform treatment of the soft tissue layers and transitioning from combined vertical and horizontal incisions to one form of a low transverse incision. The introduction of suction-assisted lipectomy (SAL) in the 1980s added a new dimension to abdominal contour surgery.^{1–3}

The popularity of abdominoplasty has increased because of the rise in bariatric surgery, which is recognised as a successful method for losing weight.^{4,5}

It is known that 80%–96% of patients who experience massive weight loss after bariatric surgery suffer from skin excess. The most common region for skin excess is the abdomen, followed by the thighs, arms, and breasts.^{6–8}

In the last decade, the demand for abdominal contouring surgery in patients who have undergone massive weight loss has increased tremendously as a result of rise in bariatric surgery.⁹ However, abdominoplasty is associated with a significant risk of developing complications, such as seroma, which occurs in around 5%–30% of patients.^{10,11} In recent years, many authors have demonstrated an increasing number of complications.^{9,12,13} This phenomenon is partially linked to the dramatic increase in bariatric procedures, as obesity is a known risk factor for complications after abdominoplasty.¹⁴ As a matter of fact, patients with BMI > 30 kg/m² have a higher complication rate compared to non-obese patients (BMI < 30 kg/m²).¹⁵ Other risk factors that increased the rate of complications include smoking, hypertension, and previous abdominal surgery.^{16–18}

To reduce postsurgical bleeding and exudation, different authors have used several haemostatic techniques.^{19,20} Topical haemostatic agents have been used in surgery with varying degrees of success. These agents include oxidized cellulose, absorbable gelatine sponges, microfibrillar collagen, and fibrin seals.²¹ Fibrin sealants have become effective instruments in the care of surgical patients, and used not only for haemostasis but also for wound healing and drug delivery.²² Fibrin sealants have numerous applications, such as serving as biological adhesives in surgical procedures.²³ The key biological property of human fibrin glue is its ability to facilitate haemostasis by mimicking the advanced phases of the coagulation cascade. This is followed by the reparative processes of fibrosis and angiogenesis due to the activation of growth factors, attraction of fibroblasts, and promotion of their replication. Fibrin glue has been used for approximately 20 years in various surgical areas and in a wide variety of clinical applications.²⁴ There are specific on-label indications for the use of commercial fibrin sealants. There is also extensive literature supporting the use of fibrin sealants in a wide variety of off-label applications. The surgical fields that can benefit from the effects of human fibrin glue are numerous: liver and biliary surgery, bowel and proctologic surgery, thyroid and breast surgery, abdominal wall hernias, fistulas, and difficult wounds surgery. The daily use of human fibrin glue improves surgical outcomes in many fields of general surgery^{20,22–24} and plastic surgery.^{25–27} However, there are a few contrary reports^{28–31} and very few that suggest that fibrin glue should be used with caution in humans.^{32–34}

The aim of the present study is to evaluate whether there was a significant statistical difference in reducing postsurgical bleeding and exudation between abdominoplasty patients who use and who did not use fibrin glue, as measured by the amount of surgical drain output. Additionally, we aimed to

Table 1
Demographic data between the two groups.

	Fibrin Sealant		Difference (α : 0.05)	All (n: 68)
	Yes (n: 30)	No (n: 38)		
Age, years				
Mean \pm SD	41.5 \pm 11.0	36.5 \pm 10.0	p:0.065*	38.5 \pm 10.5
Median	40	34		36
Mode	34,40,56,59	45		45
Weight, kg				
Mean \pm SD	86.5 \pm 22.0	79.0 \pm 15.0	p:0.202*	81.0 \pm 18.0
Median	80	80		80
Mode	80	75		80
BMI, Kg/m ²				
Mean \pm SD	35.0 \pm 9.5	33.5 \pm 8.5	p:0.147*	35.0 \pm 9.0
Median	33	31		32
Mode	33	33		33
Sex, n			p:0.096**	
Male	2	8		10
Female	28	30		58
Surgical Drain Output, ml				
Mean \pm SD	620.0 \pm 375.0	500.0 \pm 290.0	p:0.133*	550.0 \pm 335.0
Median	515	420		470
Mode	300	300-390		300
Drain Standing, days				
Mean \pm SD	4.5 \pm 1.5	4.5 \pm 1.0	p:0.859*	4.5 \pm 1.5
Median	4	4		4
Mode	3	3		3
Hospitalization, days				
Mean \pm SD	4.5 \pm 1.5	4.5 \pm 1.0	p:0.859*	4.5 \pm 1.5
Median	4	4		4
Mode	3	3		3

* Independent t-test (α : 0.05).** chi-square test (α : 0.05).

determine whether the use of fibrin glue could reduce hospitalization days, as patients are discharged upon removal of the drains.

Materials and Methods

A retrospective chart review on 78 postbariatric abdominoplasty patients (67 females, 11 males) was conducted and registered at the University of Campania “Luigi Vanvitelli”, Department of Medical and Dental Specialties, Plastic Surgery Unit, Naples, Italy. The Local Institutional Review Board deemed the study exempt from review given the use of diagnostic and surgical procedures included in the gold standard of postbariatric reconstructive surgery and the nature of the retrospective study.

Exclusion factors of the study included all defects of muscle-aponeurotic plane except rectus diastasis.

Ten out of 78 patients were excluded from the study because two of them presented umbilical hernia, six had laparocoele, and two had inguinal hernia. Data collected included age, sex, weight, BMI, application of fibrin sealant, surgical drain output, hospitalization days.

Patients were divided into two groups (Table 1): Group A (30 cases, 44%), in which fibrin sealants were directly applied on the tissue. Group B (38 cases, 56%), in which fibrin glue was not used. The choice of whether to use fibrin glue or not was made at the discretion of the surgeon, following the same treatment in hemostasis in both groups. Then, we calculated the total amount of the liquid contained in the suction drainage until the day of its removal.

This surgery is performed under general anesthesia with the patient in a dorsal decubitus, and perioperative antibiotic prophylaxis is administered to all patients preoperatively. Following the pre-operative markings, the incision is made from one iliac spine to another on the suprapubic line. This

incision extends to the muscular plane to reach the fascia. The upper flap detachment started from the prepubic line to reach the xiphoid and costal region, following the muscle fascia plane. The aim of the detachment is to allow the upper flap to easily reach the prepubic line. The navel is incised by a periumbilical incision and detached from its skin connections while remaining connected to the fascial plane. An adequate hemostasis is performed. All patients presented a diastasis of rectus muscles, which was repaired through plication of the rectus abdominis aponeurosis without opening the muscle fascia. This reinforcement of the abdominal wall begins at the xiphoid process and extends down to the pubis using a continuous monofilament absorbable suture.

Then, the navel is repositioned. The final positioning of the navel is subsequently done through an incision made in the upper flap, which has been lowered on the midline to the desired height. At this time, in Group A, we used Tisseel® 10 mL (fibrinogen/aprotinin/human thrombin/calcium chloride/factor XIII), nebulized with O₂ under the upper flap and distributed on the muscle fascia plane. In all patients, Jackson-Pratt drains (measure 14) were inserted, with their exit occurring at the level of the pubis. All patients wear a compressive garment for at least 40 days.

In the postoperative phase, we assessed the volume of the liquid in milliliters present in the surgical drains each day during hospitalization until their removal. These data are reported in Table 1 with mean, median, and mode of each group. Patients are normally discharged when there is no risk of immediate complications and the production of surgical drainage fluid is less than 40 mL per day and then we proceed to their removal.

Then, we compared the mean of the amount in ml of the content present in the drainages of the two groups to understand if in Group A (with use of fibrin glue) there was a significant reduction of surgical drain output than Group B (without fibrin glue) and therefore the reduction of bleeding and exudation.

Statistical analysis included the independent *t*-test with a significance level of 0.05.

Results

A total of 68 patients underwent postbariatric abdominoplasty. Exclusion factors of the study included all defects of muscle-aponeurotic plane except rectus diastasis. The mean (\pm SD) age of all patients in the sample was 38.5 ± 10.5 years. The mean BMI of this group of patients was 35.0 kg/m^2 . The sample population included 10 males and 58 females (Table 1).

Thirty procedures involved the application of fibrin sealant (Group A). The mean age in Group A was 41.5 ± 11.0 years, with an average BMI of 35.0 kg/m^2 . Two males and 28 females composed Group A. The remaining 38 patients (Group B) underwent abdominoplasty without the application of fibrin sealant. The mean age for Group B was 36.5 ± 10.0 years, with an average BMI of 33.5 kg/m^2 . Eight males and 30 females composed Group B.

The average surgical drain output in patients receiving fibrin sealants was 620.0 ± 375.0 mL following abdominoplasty. Patients who did not receive fibrin sealant produced an average drainage output of 500.0 ± 290.0 mL days postoperatively.

Regarding postoperative complications, four cases of wound dehiscence (two in Group A and two in Group B) were treated in an outpatient manner, without the need of further surgery.

Results indicate an insignificant correlation between the use of fibrin glue and the amount of liquid in the surgical drains ($t = 1.52$, $p = 0.13$). This result is not significant at $p < 0.05$, with independent *t*-test.

When comparing demographic data between the two groups, no statistically significant differences were observed in average age and BMI (Table 1).

Discussion

As one of the most performed procedures in the field of plastic surgery—despite being burdened by various complications—abdominoplasty has been of considerable interest in the study of techniques and methods of execution in the last years, to ensure better and safer results.^{9,35,36}

In the literature, there are few articles that report on complications, such as seroma formation and the amount of postoperative drainage that are favorable to the use of fibrin glue; however, a meta-analysis did not show any benefit.

In a comparative study of 60 patients, Toman et al. established that the use of slow-reacting, low-dose fibrin glue has a protective effect against the formation of seroma following abdominoplasty and that the amount of postoperative drainage was significantly lower in patients who had received fibrin glue.³⁷

In a retrospective chart analysis of 65 patients, Johnson C Lee et al. established that fibrin sealants were a useful addition during surgical wound closure and significantly decreased seroma formation in patients undergoing postbariatric abdominoplasty.³⁸

In a clinical trial of 56 patients, R Fernandez Lobato et al. established that Patients in the Tissucol group developed less local morbidities (hematomas or abscesses; $p < 0.01$), had a shorter mean hospital stay ($p < 0.01$), and required less wound care.²³ In a meta-analysis review of 15 studies (1824 patients), Ben Ardehali et al. established that abdominoplasty with application of fibrin glue was similar to standard abdominoplasty in terms of seroma development.³¹

In this study, we evaluated whether there was a significant statistical difference between the use or not of fibrin glue in patients who had undergone abdominoplasty surgery by reducing the amount of liquid contained in the suction drainages until the day of their removal and therefore the reduction of postsurgical bleeding and exudation. The use of fibrin sealants has not only a hemostatic goal, as it contains growth factors, attracts fibroblasts, and promotes their replication, fibrosis, and angiogenesis. All these factors are useful for improving wound healing and reducing postoperative complications. Although extended Jackson-Pratt drain placement may be associated with an increased risk of infection, we believe that this risk is offset by the benefits of removing exudate, which may cause seroma formation and a more noxious complication. We selected 68 patients (58 females, 10 males) with a mean age of 39 years (range: 19–63), who had received abdominoplasty surgery and divided them in two groups: one in which we used fibrin sealants (Group A) and one in which we did not use fibrin glue (Group B). The choice of whether or not to use fibrin glue was made at the discretion of the surgeon after using the same treatment in hemostasis in both groups. Then, we measured the total amount of surgical drain output until the day of its removal. Finally, we compared the mean of the amount in mL of surgical drains to determine if there was a statistically significant difference. Results indicate an insignificant correlation between the use of fibrin glue and the amount of liquid in the drains ($t = 1.52$, $p = 0.13$). The result is not significant at $p < 0.05$ with independent t -test.

Conclusions

In the literature, various studies have analyzed the use of fibrin sealants in surgery; however, a meta-analysis did not show any significant benefit. In our study, the results of independent t -test ($t = 1.52$, $p = 0.13$) showed an insignificant correlation between the use of fibrin sealants and the amount of liquid in the drains. The result is not significant at $p < 0.05$. While, the use of fibrin sealants has a significant value across surgical branches for reducing postoperative complications, but in our study we did not observe advantages in its use for reducing the risk of bleeding and exudation. So, fibrin glue has a high cost associated with it and since the results of our study did not produce a reduction in the risk of postsurgical bleeding and exudation using fibrin glue, its application is not justified for this type of surgery if a good hemostasis and a good detachment are carried out during surgery. Moreover, as patients are discharged upon removal of surgical drainages and since it appears that fibrin glue does not reduce surgical drain output, we can assume that the use of fibrin glue in abdominoplasty does not impact the duration of hospital stay. In this study, we considered the total amount of surgical drain output, without distinguishing between serum and blood. Moreover, our patients are mainly overweight patients. In addition, our study is retrospective, with no obvious reason for the use or nonuse of fibrin glue, with only one outcome measurement. Therefore, it would be interesting to study the use of fibrin glue in a larger population and evaluate if there are differences in the type of drainage fluid (more blood or more serum). Additionally, further research to evaluate its effects on other complications, such as cellulitis, fat necrosis, and wound dehiscence would help

determine the cost-effectiveness of the application, given our focus on surgical drain output in the present study. Finally, a prospective, blinded study in a larger study population including the effects of fibrin, given other wound-healing variables such as medications, comorbidities, and nutritional status would prove the results of our study.

Compliance with Ethical Standards

Funding: No funding was received for this study.

Conflict of interests: All authors declare they have no kind of conflict of interest.

Ethics: Ethical approval has been exempted by our Institution because the surgical procedure performed is in line with current guidelines. Written informed consent was obtained from all participants.

References

- Matarasso A. Abdominoplasty. *Clin Plast Surg.* 1989;16:289.
- Matarasso A. Abdominoplasty: A system of classification and treatment for combined abdominoplasty and suction-assisted lipectomy. *Aesthetic Plast Surg.* 1991;15:111.
- Matarasso A. Abdominoplasty: Evaluation and techniques in abdominal contour surgery. In: Newman MH, ed. *Plastic surgery educational foundation instructional courses.* Chicago, IL: Mosby; 1993:1–17.
- Buchwald H, Avidor Y, Braunwald E, et al. Bariatric surgery: a systematic review and meta-analysis. *JAMA.* 2004;292:1724–1737.
- Busetto L, Dixon J, De Luca M, et al. Bariatric surgery in class I obesity: a Position statement from the International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO). *Obes Surg.* 2014;24(4):487–519. doi:10.1007/s11695-014-1214-1.
- Björserud C, Olbers T, Fagevik Olsén M. Patients' experience of surplus skin after laparoscopic gastric bypass. *Obes Surg.* 2011;21:273–277.
- Kitzinger HB, Abayev S, Pittermann A, et al. After massive weight loss: patients' expectations of body contouring surgery. *Obes Surg.* 2012;22:544–548.
- Kitzinger HB, Pittermann A, Abayev S, et al. The prevalence of body contouring surgery after gastric bypass surgery. *Obes Surg.* 2012;22:8–12.
- Staalesen T, Olsén MF, Elander A. Complications of abdominoplasty after weight loss as a result of bariatric surgery or dieting/postpregnancy. *J Plast Surg Hand Surg.* 2012 Dec;46(6):416–420.
- Neaman KC, Hansen JE. Analysis of complications from abdominoplasty: a review of 206 cases at a university hospital. *Ann Plast Surg.* 2007 Mar;58(3):292e8.
- Ricciardi C, Gubitosi A, et al. Health technology assessment through the sixsigma approach in abdominoplasty: scalpel vs electrosurgery. *Medical Engineering and Physics.* 2021;93:27–34.
- American Society of Plastic Surgeons, 2004 National Plastic Surgery Statistics, American Society of Plastic Surgeons, 2005, <http://www.plasticsurgery.org/publiceducation/2005Statistics.cfm>.
- Rogliani M, Silvi E, Labardi L, Maggiulli F, Cervelli V. Obese and nonobese patients: complications of abdominoplasty. *Annals of Plastic Surgery.* 2006;57(3):336–338.
- Vastine VL, Morgan RF, Williams GS, et al. Wound complications of abdominoplasty in obese patients. *Annals of Plastic Surgery.* 1999;42(1):34–39.
- Coon D, Gusehoff A, Kannan N, et al. Body mass and surgical complications in the postbariatric reconstructive patient: analysis of 511 cases. *Ann Surg.* 2009;249:397–401.
- Shermak MA, Rotellini-Coltvet LA, Chang D. Seroma development following body contouring surgery for massive weight loss: risk factors and treatment strategies. *Plast Reconstr Surg.* 2008;122:280–288.
- Au K, Hazard W, Dyer A, et al. Correlation of complications of body contouring surgery with increasing body mass index. *Aesthetic Surg J.* 2008;28:425–429.
- Momeni A, Heier M, Bannasch H, Stark GB. Complications in abdominoplasty: a risk factor analysis. *J Plast Reconstr Aesthet Surg.* 2009;62:1250–1254.
- Gubitosi A, Ruggiero R, et al. Fibrin sealant in general surgery. Personal experience and literary review. *Ann Ital Chir.* Mar-Apr 2014;85(2):153–158.
- Katkhouda N. New hemostatic agents in general open and laparoscopic surgery. *Surg Technol Int.* 2004;13:65–70.
- González HD, Figueras Felip J. Topical hemostatic devices in surgery: Between science and marketing. *Cir Esp.* 2009;85(Suppl 1):23–28.
- MacGillivray TE. Fibrin sealants and glues. *J Card Surg.* 2003;18(6):480–485.
- Fernández Lobato R, García Septiem J, Ortega Deballon P, Martín Lucas FJ, Ruíz de Adana JC, Limones Esteban M: Tissucol application in dermolipectomy and incisional hernia repair. *Int Surg.* 2001;86(4):240–245.
- Gubitosi A, Ruggiero R, Docimo G, Avenia N, Villaccio G, Esposito A, Foroni F, Agresti M. Hepatic cirrhosis and groin hernia: binomial or dichotomy? Our experience with a safe surgical treatment protocol. *Ann Ital Chir.* 2011;82(3):197–204.
- Pilone V, Vitiello A, Borriello C. The use of a fibrin glue with a low concentration of thrombin decreases seroma formation in postbariatric patients undergoing circular abdominoplasty. *Obes Surg.* 2015 Feb;25(2):354–359.

26. Langer S, et al. Fibrin glue as a protective tool for microanastomoses in limb reconstructive surgery. *GMS Interdiscip Plast Reconstr Surg DGPW*. 2015 Dec 15;4:Doc14.
27. Chen K, et al. The Use of Fibrin-based Tissue Adhesives for Breast in Reconstructive and Plastic Surgery. *Curr Top Med Chem*. 2019;19(32):2985–2990.
28. Cirocchi R, Santoro A, Trastulli S, Farinella E, Di Rocco G, Vendettuali D, Giannotti D, Redler A, Coccetta M, Gullà N, Boselli C, Avenia N, Sciannameo F, Basoli A. Meta-analysis of fibrin glue versus surgery for treatment of fistula-in-ano. *Ann Ital Chir*. 2010;81(5):349–356.
29. Nordentoft T, Rømer J, Sørensen M. Sealing of gastrointestinal anastomoses with a fibrin glue-coated collagen patch: A safety study. *J Invest Surg*. 2007;20(6):363–369.
30. Neuss H, Raue W, Koplin G, Schwenk W, Reetz C, Mall JW. A prospective randomized trial: the influence of intraoperative application of fibrin glue after radical inguinal/iliac lymph node dissection on postoperative morbidity. *Eur J Surg Oncol*. 2009;35(8):884–889 Epub 2008 Nov 17.
31. Ben Ardehali, et al. A Meta-Analysis of the Effects of Abdominoplasty Modifications on the Incidence of Postoperative Seroma. *Aesthet Surg J*. 2017 Oct 16;37(10):1136–1143.
32. Seifert J, Klause N, Stobbe J, Egbers HJ. Antibodies formed against fibrin glue components and their circulatory relevance. *J Invest Surg*. 1994;7(2):167–171.
33. Oswald AM, Joly LM, Gury C, et al. Fatal intraoperative anaphylaxis related to aprotinin after local application of fibrin glue. *Anesthesiology*. 2003;99:521–523.
34. Busuttill RW. A comparison of antifibrinolytic agents used in hemostatic fibrin sealants. *J am coll surg*. 2003;197:1021–1028.
35. American Society of Plastic Surgeons, 2004 National Plastic Surgery Statistics, American Society of Plastic Surgeons, 2005, <http://www.plasticsurgery.org/publiceducation/2005Statistics.cfm>.
36. Rogliani M, Silvi E, Labardi L, Maggiulli F, Cervelli V. Obese and nonobese patients: complications of abdominoplasty. *Annals of Plastic Surgery*. 2006;57(3):336–338.
37. Toman N, et al. Fibrin glue and seroma formation following abdominoplasty. *Chirurg*. 2007 Jun;78(6):531–535. doi:10.1007/s00104-007-1310-z.
38. Lee Johnson C, et al. The effect of fibrin sealant on the prevention of seroma formation after postbariatric abdominoplasty. *the Canadian journal of plastic surgery*. 2012;20(3):178–180.