



Quilting Sutures and Suction Drains in Preventing Postoperative Complications in Gynecomastia Surgery

Fernando Campos Moraes Amato¹ · Miguel Sabino Neto¹ · Marcelo Moraes Trincado¹ · Paulo Maranhão Gusmão Pincovsky de Lima¹ · Laís Uyeda Aivazoglou² · Fernanda Garozzo Velloni² · Gabriel de Almeida Arruda Felix¹ · Lydia Masako Ferreira¹



Received: 29 January 2025 / Accepted: 8 April 2025

© Springer Science+Business Media, LLC, part of Springer Nature and International Society of Aesthetic Plastic Surgery 2025

Abstract

Introduction Gynecomastia is characterized by enlarged breast tissue in men and is often caused by genetic or endocrinological disorders, cancer, or medication use, with idiopathic causes being the most common. If no clinically treatable cause is identified and the condition persists for more than two years, surgical treatment is indicated. This typically involves adenectomy with or without liposuction and resection of excess skin when necessary. Major complications include hematoma, seroma, infection, and dehiscence. Quilting sutures, as previously described in abdominoplasty, can minimize dead space and reduce hematoma and seroma formation.

Objective This study aimed to compare the efficacy of quilting sutures and suction drains in preventing hematoma and seroma formation after adenectomy for gynecomastia.

Methods Thirty-eight gynecomastia patients eligible for adenectomy were randomized into two groups: one with intraoperative quilting sutures (Group 1) and another with vacuum drains (Group 2). The patients were followed up postoperatively using clinical examinations and ultrasonography. Fluid collection > 10 mL was drained when necessary.

Results Eight patients in Group 1 (40%) and five in Group 2 (28%) developed fluid collections, with no significant difference between the groups. No surgical correction was

required for hematoma or seroma. Suction drains seem to give better results regarding seroma, but with no statistical difference.

Conclusion This study showed no difference in the use of drains or quilting sutures to prevent seromas or hematomas in the correction of gynecomastia.

Level of Evidence II This journal requires that authors assign a level of evidence to each article. For a full description of these Evidence-Based Medicine ratings, please refer to the Table of Contents or the online Instructions to Authors www.springer.com/00266.

Keywords Gynecomastia · Suction drainage · Suture technique · Seroma · Hematoma

Introduction

Gynecomastia is defined as an increase in breast tissue in men, affecting either glandular or fatty tissue, or both [1–3]. The condition is most prevalent during puberty, affecting up to 65% of males aged 14–15 years, although it persists in only 7.5% of cases after the age of 17 years [4, 5]. According to the American Society of Plastic Surgeons, in 2023, surgery for the correction of gynecomastia corresponds to almost 20% of all plastic surgeries in men in the USA, with more than 54% performed in patients aged 17–34 years, being the second most common surgery in this age group after liposuction [6]. Its incidence declines significantly post-adolescence, with adult gynecomastia being less prevalent and associated with specific etiologies [7].

Gynecomastia may occur due to hormonal imbalances during both the neonatal and adolescent periods. In adults, it may occur during andropause or due to obesity, which is

✉ Fernando Campos Moraes Amato
fernando@amato.com.br

¹ Division of Plastic Surgery, Federal University of São Paulo, Rua Botucatu, 740 – 2° andar, Vila Clementino, São Paulo, SP, Brazil

² Department of Radiology, Federal University of São Paulo, São Paulo, SP, Brazil

characterized by increased aromatization of testosterone to estrogen. Other etiologies include decreased testosterone production, increased estrogen levels, and androgen insensitivity, which are often associated with genetic or endocrinological disorders, medications, and licit or illicit drug use. However, idiopathic cases remain the most common [3, 5, 7–15].

Several classification methods have been proposed for this condition [16–19]. Simon classification is one of the most widely used systems for categorizing gynecomastia, providing a clear framework based on the degree of breast enlargement and skin redundancy. It includes four distinct grades: Grade I refers to small, visible breast enlargement without skin redundancy. Grade IIA describes moderate breast enlargement without skin redundancy, whereas Grade IIB accounts for moderate enlargement with skin redundancy. Grade III is characterized by marked breast enlargement with significant skin redundancy, resembling a pendulous female breast. This classification is valued for its clinical relevance, guiding both diagnosis and treatment planning, while facilitating effective communication with patients [17]. An accurate etiological diagnosis is critical for excluding treatable causes. Surgical treatment is indicated when the condition persists for over two years without a clinically treatable cause, typically involving adenectomy with or without liposuction and, if necessary, skin excision [16, 18, 20–26].

The major surgical complications include hematoma, seroma, infection, and dehiscence. Quilting sutures, used in other procedures such as abdominoplasty, may reduce dead space and associated complications, providing an alternative to vacuum drains, often deemed uncomfortable by patients [27–35]. This study aimed to compare early postoperative complications in patients with gynecomastia undergoing adenectomy with quilting sutures or vacuum drains.

Methods

This interventional, randomized, longitudinal, prospective clinical study was approved by the Ethics Committee of the Federal University of São Paulo (protocol: 40070414.3.0000.5505/1151061). Surgeries were conducted under general anesthesia at Hospital São Paulo, Unifesp, from January 2013 to March 2016, involving 38 patients randomized into two groups using www.randomization.com.

All surgeries employed Webster's adenectomy technique, involving subcutaneous mastectomy with glandular excision via an infra-areolar arcuate incision. Liposuction or skin resection was performed, when necessary. All

patients were adequately informed of the risks and procedures associated with the use of quilting sutures and drains.

In Group 1 ($n = 20$), eight adhesion stitches with 3-0 Vicryl were placed in a circular pattern without drains (Fig. 1). In Group 2 ($n = 18$), vacuum drainage with Hemovac 4.8 was used, exteriorized along the anterior axillary line, without quilting sutures. Drains were removed when the output was < 30 mL/d.

The diagnosis of the collections was performed in two ways: (1) clinical examination at routine postoperative follow-up and (2) ultrasonography performed 14–21 days postoperatively. Fluid collections greater than 10 mL and/or presenting clinical symptoms (i.e., pain, discomfort, or fluctuations) were aspirated and reassessed within seven days.

Statistical Analysis

Data were analyzed using SPSS Statistics software version 29 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize demographic and clinical characteristics. The Chi-squared test compared categorical variables, while the Student's *t*-test analyzed continuous variables such as body mass index (BMI). Logistic regression analysis was performed to evaluate the predictors of fluid collection (seroma) after gynecomastia surgery. The dependent variable was the presence of seroma, and the independent variables included age, BMI, liposuction, skin excision, and surgical group (quilting suture vs. drains). Statistical significance was set at $P < 0.05$.

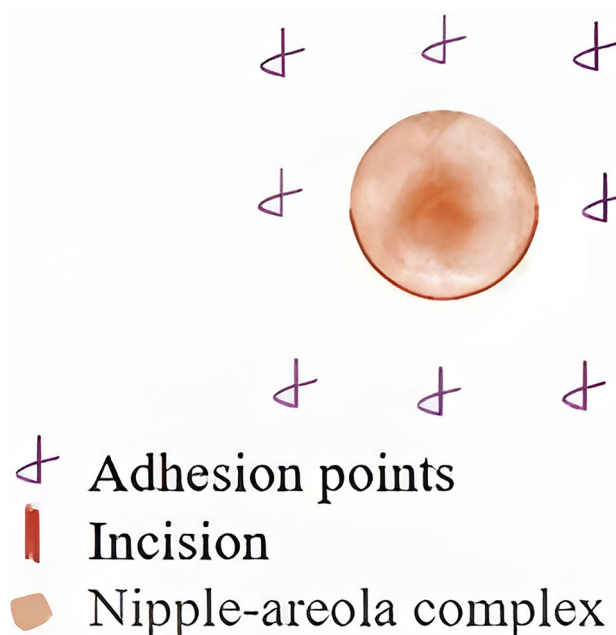


Fig. 1 Arrangement of adhesion points (8) in Group 1

Results

This study included 38 patients diagnosed with gynecomastia who were randomized into two groups: Group 1 (quilting sutures) and Group 2 (drains). The mean age of the patients was 23.1 years (SD \pm 9.9) in Group 1 and 28.6 years (SD \pm 10.5) in Group 2. The mean body mass index (BMI) was 25.2 kg/m² (SD \pm 3.1) in Group 1 and 25.7 kg/m² (SD \pm 4.2) in Group 2. No significant differences in age or BMI were observed between the two groups.

Logistic regression revealed that age (Exp(B) = 0.846, P = 0.045) and BMI (Exp(B) = 1.554, P = 0.011) were significant predictors of fluid collection. Specifically, higher BMI increased the likelihood of fluid accumulation, while older age reduced it. Liposuction and skin excision did not significantly affect fluid collection (P = 0.261 and P = 0.949, respectively). The group variable (quilting suture vs. drains) also showed no significant effect on seroma (P = 0.193). Regarding fluid collection, eight patients in Group 1 (40%) and five patients in Group 2 (28%) developed postoperative fluid collection. Suction drains appear to offer better results in reducing seroma formation; however, no statistically significant difference was found between the two groups. None of the patients required surgical intervention for hematoma or seroma formation.

In terms of other complications, the incidence of asymmetry, altered scars, and need for reapproach were similar across both groups. The rates of these complications were comparable, indicating that both postoperative management methods were equally effective in preventing these complications.

Gynecomastia was idiopathic in 76% (n = 29) of the patients, with other causes including medications (n = 4, including steroids, antidepressants, antiretroviruses, and antiepileptics), chronic diseases (n = 3, comprising chronic kidney disease, suprarenal tumor, and leukemia), and Klinefelter syndrome (n = 2). Liposuction and skin resection were performed in 44.7% and 21.1% of cases, respectively.

Regarding the development of hematoma, both groups experienced one case of this complication. In Group 1, the hematoma was associated with suture dehiscence and drainage through the surgical wound. This patient underwent a reapproach to repair the dehiscence and correct any irregularities, although this was not treated as an emergency surgical revision. In Group 2, one patient developed an early hematoma with a clogged drain. This was successfully managed by flushing the drain without the need for immediate puncture. Additionally, one patient in Group 1 required subsequent surgery to address scar retraction,

which involved subincision and liposuction. For a detailed summary of the clinical and demographic characteristics of the study sample, please refer to Table 1.

Figures 2 and 3 illustrate different types of gynecomastia addressed in this study, with corresponding preoperative and postoperative documentation for each case.

Discussion

Surgical correction of gynecomastia, like any procedure, entails risks of complications such as hematoma, seroma, scarring, and altered sensitivity. Despite rigorous hemostasis, hematoma may arise from extensive tissue dissection, whereas seromas result from lymphatic disruption and dead space creation [27, 36–39]. The observed association between BMI and seroma formation highlights the importance of preoperative patient assessment and risk stratification. Higher BMI may predispose patients to complications due to increased adipose tissue, emphasizing the need for tailored surgical techniques in this subgroup [27, 40–42].

While drains are commonly used in various surgical procedures to reduce seroma and hematoma formation and to enable early diagnosis and treatment of complications, our study found no significant reduction in the incidence of these issues [30, 43–47]. Steele et al, in a retrospective study, showed no difference regarding the development of complications, when using or not a drain in adenectomy surgeries in gynecomastia. In addition, other studies have shown no relationship between the use of drains and an increase in postoperative complications [48]. However, the applicability of quilting sutures in several surgeries, such as abdominoplasty and latissimus dorsi flaps for breast reconstruction and rhytidectomy, has already been demonstrated [32–35]. However, little is known about its effectiveness in adenomastectomy for gynecomastia correction.

Despite these findings, other factors should be considered when attempting to achieve optimal outcomes. Surgical techniques for correcting gynecomastia vary according to the clinical presentation of the patient and the surgeon's preference to establish a better surgical treatment with less chance of complications [49]. Quilting sutures may appeal to patients seeking to avoid drains and minimize discomfort and scarring [29, 31, 45]. This technique may improve postoperative recovery, particularly in younger or more active patients [50]. However, its effectiveness relative to drains may depend on the surgeon's experience and the surgical context.

In this study, liposuction and skin resection were considered potential factors influencing postoperative fluid collection. These variables were included in the logistic

Table 1 Clinical and demographic characteristics of the study sample

Variable	Drains group N = 18	Quilting sutures group N = 20	P value
Mean age, mean (SD)	23.1 (9.9)	28.6 (10.5)	0.109 ^a
BMI (kg/m ²), mean (SD)	25.2 (4.2)	25.7 (4.2)	0.706 ^a
Number of follow-up consultations, n (%)	5.5	5.0	0.740 ^a
Side operated, n (%)			0.687 ^b
Bilateral	14 (77.8%)	17 (85%)	
Right	2 (11.1%)	3 (15%)	
Left	2 (11.1%)	0 (0%)	
Simon classification, n (%)			0.825 ^b
I	1 (5.6%)	0 (0.0%)	
IIa	12 (66.7%)	14 (70.0%)	
IIb	3 (16.7%)	4 (20.0%)	
III	2 (11.1%)	2 (10.0%)	
Liposuction, n (%)	10 (55.6%)	7 (35%)	0.203 ^c
Skin resection, n (%)	4 (22.2%)	4 (20%)	0.999 ^b
Collection, n (%)	5 (27.8%)	8 (40%)	0.428 ^c
Need for puncture, n (%)	4 (22.2%)	8 (40%)	0.239 ^c
Asymmetry, n (%)	3 (16.7%)	2 (10%)	0.652 ^b
Altered scar, n (%)	5 (27.8%)	3 (15%)	0.438 ^b
NAC complications, n (%)	2 (11.1%)	0 (0%)	0.217 ^b
Reoperation, n (%)	1 (5.6%)	4 (20%)	0.344 ^b

BMI body mass index, SD standard deviation

^aStudent's *t*-test

^bFisher's exact test

^cChi-squared test

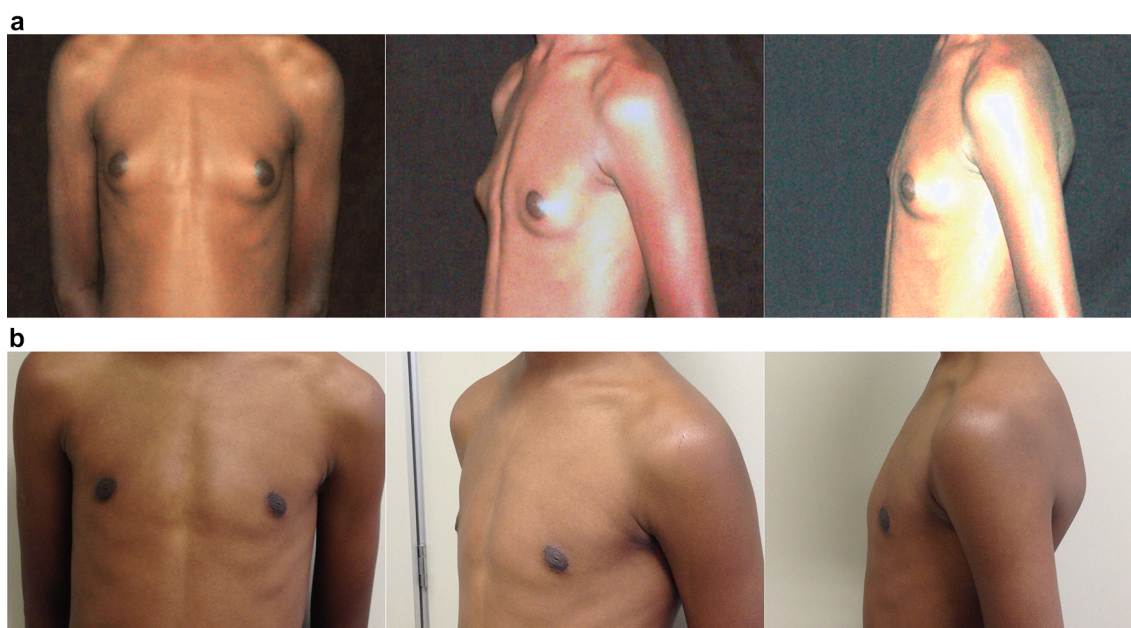


Fig. 2 A 14-year-old male, Simon IIa, underwent adenectomy without skin resection. **a** preoperatively, **b** 6 months postoperatively



Fig. 3 Patient Simon III underwent adenectomy with bilateral skin resections. **a** Preoperative and **b** 6 months postoperatively

regression analysis; however, they did not show a statistically significant effect on fluid accumulation. This suggests that although these techniques may have an impact on surgical outcomes, they were not significant predictors of seroma formation in this cohort.

Although no statistical difference was found between the groups regarding the incidence of complications, it is worth noting that the reoperation rate was four times higher in one group compared to the other. This discrepancy, despite the lack of statistical significance, may be due to factors not captured by our analysis, such as variations in patient-specific factors, surgical techniques, or postoperative care.

Future studies should evaluate the combined use of quilting sutures and drains as this hybrid approach may yield additional benefits. Exploring patient-reported outcomes such as pain, mobility, and satisfaction will also provide valuable insights for optimizing gynecomastia surgery.

Limitations and Strengths

This study has several limitations. The small sample size of 38 patients reduces the generalizability of the findings, and the six-month follow-up may not capture long-term complications. Additionally, the single-center design may introduce bias, and the lack of blinding could affect the objectivity of outcome assessments. The inclusion of additional surgical techniques such as liposuction and skin resection complicates the ability to isolate the specific effect

of quilting sutures or suction drains on the outcomes. While this study compared quilting sutures and drains, it did not evaluate the impact of stitch count on postoperative complications like seromas. Future research with larger sample sizes or varied techniques could explore whether more stitches reduce fluid collection or other complications.

Despite these limitations, this study has several strengths. The randomized controlled design minimizes selection bias and strengthens the reliability of the results. Comprehensive data collection through clinical examinations and ultrasonography ensures accurate assessment of postoperative complications. The use of logistic regression to analyze predictors of fluid collection adds depth to the statistical analysis. Additionally, the investigation of quilting sutures as an alternative to suction drains provides valuable insights into gynecomastia surgery. Finally, multiple follow-up visits and detailed monitoring contributed to the robustness of our findings.

Conclusion

Both quilting sutures and drains were found to be effective in preventing seromas and bruising, though no significant differences were observed between the two methods. While each approach may have a role in managing postoperative complications, our findings suggest that neither method significantly outperforms the other in this regard.

Acknowledgements The authors declare that no funding was received for this research.

Declarations

Conflict of interest The authors declare that they have no conflicts of interest.

Ethical Approval This study was conducted in accordance with the ethical standards of the Declaration of Helsinki. Ethical approval was obtained from the Ethics Committee of the Federal University of São Paulo (Protocol: 40070414.3.0000.5505; Opinion: 1151061).

Human and Animal Rights No animal studies were conducted as part of this research.

Informed Consent All patients signed an informed consent form before participation in the study.

References

- Adil D, Hamza B, Omar B, Mimoun M, Aicha M, Houda HI, Otmane T, Issam D, Nada-Imane D, Rim L, Mouad E, Hanae T, Sara T. Management of gynecomastia: retrospective, epidemiological, clinical and therapeutic study about 16 cases, experience of the university hospital Tangier-Tetouan-Al Hoceima. *SAS J Surg.* 2024;10:107–13.
- Barros AC, Sampaio Mde C. Gynecomastia: physiopathology, evaluation and treatment. *Sao Paulo Med J.* 2012;130:187–97.
- Nordt CA, DiVasta AD. Gynecomastia in adolescents. *Curr Opin Pediatr.* 2008;20:375–82.
- Vaidyanathan P, Kaplowitz P. Partial androgen insensitivity syndrome presenting as pubertal gynecomastia: clinical and hormonal findings and a novel mutation in the androgen receptor gene. *Endocrinol Diabetes Metab Case Rep.* 2018. <https://doi.org/10.1530/EDM-18-0128>.
- Berger O, Hornik-Lurie T, Talisman R. Pubertal gynecomastia incidence among 530,000 boys: a cross sectional population based study. *Front Pediatr.* 2024;12:1367550.
- American Society for Aesthetic Plastic Surgery. 2023 aesthetic plastic surgery statistics. 2023.
- Zaitsev MA. Gynecomastia: modern ideas and approaches to treatment. *Int J Endocrinol.* 2021;17:70–5.
- Todorova ZP, Stefanova EM, Todorov IP. Causes and psychological impact of gynecomastia in boys and adolescents. *Endokrynol Pol.* 2021;72:670–1.
- Gossner J. Gynecomastia on computed tomography of the chest: prevalence in a clinical population and an analysis of possible causes. *Eur J Breast Health.* 2019;15:67–8.
- Ohya K, Tanaka H, Shindo J, Shibayama M, Iwata M, Hori Y. Association of gynecomastia with antidiabetic medications in older adults: data mining from different national pharmacovigilance databases. *Int J Clin Pharmacol Ther.* 2022;60:24–31.
- Boccaro D, Ferrero L, Charlotte Dutot M, Chaouat M, Mimoun M, Seror K. Do adolescents with gynecomastia require routine evaluation by endocrinology? *Plast Reconstr Surg.* 2019;143:662e–3e.
- Metwalley KA, Farghaly HS. Gynecomastia in adolescent males: current understanding of its etiology, pathophysiology, diagnosis, and treatment. *Ann Pediatr Endocrinol Metab.* 2024;29:75–81.
- Fiorini A, Sepich M, Pontrelli M, Sangriso G, Cosci ODCM, Lauletta M, Baldinotti F, Peroni D, Ambrosio MR, Bertelloni S. Adolescent gynecomastia due to minimal androgen resistance syndrome: a case report and literature review. *Sex Dev.* 2020;14:21–6.
- Johnson RE, Kermott CA, Murad MH. Gynecomastia: evaluation and current treatment options. *Ther Clin Risk Manag.* 2011;7:145–8.
- Larson K, Gosain AK. Cosmetic surgery in the adolescent patient. *Plast Reconstr Surg.* 2012;129:135e–41e.
- Rohrich RJ, Ha RY, Kenkel JM, Adams WP Jr. Classification and management of gynecomastia: defining the role of ultrasound-assisted liposuction. *Plast Reconstr Surg.* 2003;111:909–23.
- Simon BE, Hoffman S, Kahn S. Classification and surgical correction of gynecomastia. *Plast Reconstr Surg.* 1973;51:48–52.
- Cordova A, Moschella F. Algorithm for clinical evaluation and surgical treatment of gynecomastia. *J Plast Reconstr Aesthet Surg.* 2008;61:41–9.
- Ratnam BV. A new classification and treatment protocol for gynecomastia. *Aesthet Surg J.* 2009;29:26–31.
- Klinger M, Bandi V, Giannasi S, Caviglioli F, Veronesi A, Maione L, Catania B, Lisa A, Battistini A, Tinterri C, Testori A, Vinci V, Klinger F. Gynecomastia: ultrasound-confirmed classification pertinent to surgical correction. *Aesthet Plast Surg.* 2021;45:1397–403.
- Sk M, Kumar N, Gupta S. A study of fat: gland ratio as an indicator for predicting appropriate surgical modality in gynecomastia. *Int J Res.* 2020;7:201–18.
- Abdali H, Rasti M, Adib Parsa M, Seyedipour S, Tavakoli-Fard N. Liposuction versus periareolar excision approach for gynecomastia treatment. *Adv Biomed Res.* 2023;12:93.
- Couto HL, Valadares CN, Junior OP, Oliveira TCFD, Bacha PMGE, Ferreira SdG. Minimally invasive treatment of gynecomastia by ultrasound-guided vacuum-assisted excision: report of a case series. *Mastology.* 2021;31:1–7.
- Galych SP, Dabizha OY, Borovyk DV. Surgical treatment of gynecomastia and pseudo-gynecomastia. *Surg Ukr.* 2018. <https://doi.org/10.30978/SU2018232>.
- Sun L, Shao W, Weng X. Clinical study of liposuction combined with subareolar incision adenectomy for gynecomastia. *J Clin Nurs Res.* 2023;7:1–7.
- Fruhstorfer BH, Malata CM. A systematic approach to the surgical treatment of gynecomastia. *Br J Plast Surg.* 2003;56:237–46.
- Innocenti A, Melita D, Ghezzi S. Closed-suction drains after subcutaneous mastectomy for gynecomastia: do they reduce complications? *Aesthet Plast Surg.* 2019;43:1124–5.
- Murugesan L, Karidis A. External quilting: new technique to avoid haematoma in gynecomastia surgery. *Aesthet Plast Surg.* 2020;44:45–51.
- Ten Wolde B, Strobbe FFR, Schlooz-de Vries M, van den Wildenberg FJH, Keemers-Gels M, de Wilt JHW, Strobbe LJA. Omitting postoperative wound drainage after mastectomy with skin-flap quilting. *Ann Surg Oncol.* 2019;26:2773–8.
- Sfakianakis E, Irakleidis F, Peng T. No drain and day-case mastectomy and axillary surgery: our experience. *Mastology.* 2021;31:62–62.
- Gallagher S, Rahmani F, Russell A, Duquette S. A drain-free technique for female-to-male gender affirmation chest surgery decreases morbidity: outcomes from 306 consecutive masculoplasties. *Ann Plast Surg.* 2019;83:15–21.
- Soncini JA, Baroudi R. A review of abdominoplasty technique with reduced dissection and fixation with Baroudi sutures. *Rev Bras Cir Plást (RBCP) Braz J Plast Sug.* 2016;31:166–71.
- Trufino AJ. Comparative study between abdominoplasty with suction drainage and without suction drainage but using adhesion stitches. *Rev Bras Cir Plást (RBCP) Braz J Plast Sug.* 2015;30:522–32.
- Bercial ME. Suction drain, quilting suture and selant fibrin to prevent seroma in abdominoplasties. In: Universidade Federal de São Paulo, São Paulo. 2011.

35. Rosseto LA. Quilting suture in the donor site of TRAM flap. In: Universidade Federal de São Paulo, São Paulo. 2006.
36. Holzmer SW, Lewis PG, Landau MJ, Hill ME. Surgical management of gynecomastia: a comprehensive review of the literature. *Plast Reconstr Surg Glob Open*. 2020;8: e3161.
37. Cong Y, Cao J, Qiao G, Zhang S, Liu X, Fang X, Zou H, Zhu S. Fascia suture technique is a simple approach to reduce post-mastectomy seroma formation. *J Breast Cancer*. 2020;23:533–41.
38. Boccara D, Serror K, Malca N, Chaouat M, Mimoun M. Closed-suction drains after subcutaneous mastectomy for gynecomastia: do they reduce complications? A different approach. *Aesthet Plast Surg*. 2018;42:908–10.
39. Maher S, Al-Dabaani W, Abd El-Hamed A. Glandular gynecomastia excision through axillary incision following ultra-sound assisted liposuction (UAL) of the breast. *Egypt J Plast Reconstr Surg*. 2018;42:55–60.
40. Unger J, Rutkowski R, Kohlmann T, Paepke S, Zygmunt M, Ohlinger R. Potential risk factors influencing the formation of postoperative seroma after breast surgery: a prospective study. *Anticancer Res*. 2021;41:859–67.
41. Michalik T, Matkowski R, Biecek P, Szynglarewicz B. The use of ultrasonic scalpel lowers the risk of post-mastectomy seroma formation in obese women. *J Cancer*. 2019;10:3481–5.
42. Kolck J, Hosse C, Beetz NL, Auer TA, Marth AA, Segger L, Krenzien F, Lurje G, Pelzer U, Geisel D, Schoning W, Fehrenbach U. Beyond body mass index: body composition profiling for perioperative risk stratification in intrahepatic cholangiocarcinoma patients. *Cancer Rep (Hoboken)*. 2024;7: e2070.
43. Prochazka V, Zavadova A, Zatecky J, Martinek L. Incidence of postoperative complications in patients with breast cancer depending on the type of drain. *Rozhl Chir*. 2023;102:17–22.
44. Scomacao I, Cummins A, Roan E, Duraes EFR, Djohan R. The use of surgical site drains in breast reconstruction: a systematic review. *J Plast Reconstr Aesthet Surg*. 2020;73:651–62.
45. Lembo F, Cecchino LR, Parisi D, Portincasa A. Reduction of seroma and improvement of quality of life after early drain removal in immediate breast reconstruction with tissue expander. Preliminary report from a randomized controlled study. *J Plast Reconstr Aesthet Surg*. 2021;74:2565–72.
46. Martínez Izquierdo G, Calvo Rodríguez D, García Alonso L, Ramos Montes C, Ibero Casadiego P, Menéndez Corteguera A, Alonso Martínez B, Llana Folgueras A. Prevention of seroma in breast surgery. *Br J Surg*. 2023;110:znac443-039.
47. Keskin M, Sutcu M, Cıgısar B, Karacaoglan N. Necessity of suction drains in gynecomastia surgery. *Aesthet Surg J*. 2014;34:538–44.
48. Steele SR, Martin MJ, Place RJ. Gynecomastia: complications of the subcutaneous mastectomy. *Am Surg*. 2002;68:210–3.
49. Mett TR, Vogt PM. Response to: commentary on “surgical treatment of gynaecomastia: a standard of care in plastic surgery” by Alessandro Innocenti, Serena Ghezzi & Dario Melita. *Eur J Plast Surg*. 2020;43:877–8.
50. Elbazz I, Younis M, El-Habaa G, Fahmy M. Quilting sutures versus suprascarpa’s dissection in reduction of seroma formation following abdominoplasty. *Egypt J Plast Reconstr Surg*. 2023. <https://doi.org/10.21608/ejprs.2023.232492.1290>.

Publisher’s Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Springer Nature or its licensor (e.g. a society or other partner) holds exclusive rights to this article under a publishing agreement with the author(s) or other rightsholder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.