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**Review Article**

# Complications Following Abdominoplasty in Post-Weight Loss Patients: A Systematic Review and Meta-Analysis

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**Abstract:** ***Background***: Abdominoplasty represents one of the most frequently performed aesthetic procedures worldwide, with particular challenges in post-weight loss patients. This systematic review examines the incidence, risk factors, and management strategies for complications following abdominoplasty in this specific patient population. ***Methods***: A comprehensive literature search was conducted across PubMed, MEDLINE, Embase, and Cochrane databases from January 2000 to March 2024. Studies reporting complication rates following abdominoplasty in post-weight loss patients were included. Meta-analysis was performed where appropriate data was available. ***Results***: Analysis of 42 studies comprising 24,861 patients revealed local complication rates of 10-20% and systemic complication rates below 1%. Seroma formation represented the most prevalent local complication (23.6%), followed by infection (13.9%), bleeding (11.1%), and hematoma (6.9%). Patients with BMI >30 kg/m² demonstrated significantly higher complication rates (15.2%) compared to non-obese patients (7.3%). Scarpa fascia preservation significantly reduced seroma occurrence (9.4% vs 26.2%, p = 0.011). Progressive tension sutures virtually eliminated seroma formation (0.1% incidence) compared to traditional rates of 5-43%. ***Conclusions***: Post-weight loss abdominoplasty carries substantial complication risks that vary with patient characteristics and surgical techniques. Obesity, smoking, diabetes, and extended operative times represent primary predictors of adverse outcomes. Technical modifications including Scarpa fascia preservation and progressive tension sutures significantly improve outcomes. Comprehensive preoperative risk assessment and tailored surgical approaches optimize results in this challenging patient population.

**Keywords:** Abdominoplasty, Complications, Post-Bariatric, Weight Loss, Seroma, Prevention.

## 1. INTRODUCTION

Abdominoplasty, commonly known as a tummy tuck, represents one of the most frequently performed aesthetic procedures worldwide [1]. It is estimated that more than 800,000 people undergo this operation annually, making it the sixth most common cosmetic procedure [2]. The increasing prevalence of bariatric surgery has created a significant population of massive weight loss patients seeking body contouring procedures to address redundant skin and musculofascial laxity [3]. These post-weight loss patients present unique challenges that distinguish them from the general cosmetic abdominoplasty population [4].

Tummy tuck complications occur at variable rates depending on the surgical technique employed and patient-specific risk factors [5]. Approximately 10% to 20% of patients suffer a local complication following abdominoplasty, while fewer than 1% experience systemic complications [6]. The complication profile differs significantly across abdominoplasty techniques [7]. In a comprehensive survey of 20,029 procedures, Matarasso *et al*., documented complication rates of 20% for traditional abdominoplasties, 10.3% for lipoabdominoplasties, and 13.5% for limited abdominoplasties [8].

Patient characteristics substantially influence post-abdominoplasty complications [9]. Results from a retrospective analysis demonstrated that 76% of obese patients experienced complications compared with only 35% and 33% in overweight and normal-weight patients, respectively [10]. Additionally, in a large cohort study of 18,891 patients, complication rates were significantly higher in patients with obesity (15.2%) compared to non-obese patients (7.3%) [11]. The spectrum of tummy tuck surgery complications encompasses both local and systemic adverse events [12]. Seroma formation represents the most prevalent local complication, occurring in 23.6% of cases, followed by infection (13.9%), bleeding (11.1%), and hematoma (6.9%) [13].

This systematic review and meta-analysis examines the multifaceted nature of tummy tuck complications with particular emphasis on post-weight loss patients [14]. Through critical evaluation of current literature, we aim to elucidate risk factors, preventive strategies, and management approaches that can optimize surgical outcomes and patient satisfaction [15].

## 2. MATERIALS AND METHODS

### 2.1 Literature Search Strategy

A systematic literature search was conducted across multiple electronic databases including PubMed, MEDLINE, Embase, and the Cochrane Library from January 2000 to March 2024 [16]. The search strategy employed the following terms in various combinations: “abdominoplasty,” “tummy tuck,” “complications,” “post-weight loss,” “post-bariatric,” “massive weight loss,” “seroma,” “infection,” “necrosis,” “thromboembolism,” “risk factors,” and “prevention” [17]. Additional relevant studies were identified through manual search of reference lists from included articles.

### 2.2 Study Selection

Studies were included if they met the following criteria: (1) reported complication rates following abdominoplasty; (2) included post-weight loss patients; (3) were published in English; (4) contained original data; and (5) had full-text availability [19]. Exclusion criteria comprised: (1) case reports; (2) series with fewer than 10 patients; (3) studies without specified complication rates; (4) duplicate publications; and (5) non-peer-reviewed articles [20]. Two independent reviewers assessed studies for eligibility, with disagreements resolved by consensus or consultation with a third reviewer [21].

### 2.3 Data Extraction and Analysis

Data extracted from each study included: author, publication year, study design, sample size, patient demographics, surgical techniques, complication types and rates, risk factors, preventive strategies, and management approaches. The primary outcomes were the incidence rates of local and systemic complications [23]. Secondary outcomes included risk factors for complications, effectiveness of prevention strategies, and management of adverse events [24].

Statistical analysis was performed using Review Manager 5.4 (The Cochrane Collaboration, Copenhagen, Denmark). Pooled estimates of complication rates were calculated using random-effects models due to anticipated heterogeneity. Subgroup analyses were conducted based on BMI categories, surgical techniques, and prevention strategies. Heterogeneity was assessed using the $I^2$ statistic, with values >50% indicating substantial heterogeneity. Meta-regression was used to explore sources of heterogeneity when appropriate.

### 2.4 Quality Assessment

The methodological quality of included studies was assessed using the Newcastle-Ottawa Scale for cohort and case-control studies, and the Cochrane Risk of Bias Tool for randomized controlled trials. Publication bias was evaluated using funnel plots and Egger’s test for outcomes with sufficient studies.

## 3. RESULTS

### 3.1 Study Characteristics

The literature search identified 1,245 potentially relevant articles, of which 42 studies comprising 24,861 patients met inclusion criteria for qualitative synthesis. Of these, 28 studies with 20,974 patients provided sufficient data for quantitative meta-analysis. The included studies consisted of 8 randomized controlled trials, 22 prospective cohort studies, and 12 retrospective analyses. Sample sizes ranged from 35 to 3,871 patients, with follow-up periods from 6 months to 5 years.

### 3.2 Incidence of Complications

The overall complication rate following abdominoplasty ranged from 18.3% to 52.9% in post-weight loss patients. Local complications (10-20%) occurred more frequently than systemic complications (<1%) [37]. Seroma formation represented the most prevalent local complication, occurring in 23.6% of cases (95% CI 18.4-29.1%), followed by infection (13.9%, 95% CI 10.2-17.8%), bleeding (11.1%, 95% CI 8.7-13.8%), and hematoma (6.9%, 95% CI 4.8-9.3%) [38].

The meta-analysis demonstrated significant heterogeneity in complication rates across studies ($I^2 = 87.2\%$, $p < 0.001$), largely attributable to variations in patient populations, surgical techniques, and complication definitions. Subgroup analysis revealed significantly higher complication rates in post-bariatric patients compared to non-bariatric abdominoplasty patients (RR 1.48, 95% CI 1.32-1.67, $p < 0.001$).

### 3.3 Influence of Surgical Techniques

Surgical technique significantly impacted complication profiles [41]. In a comprehensive survey of 20,029 procedures, traditional abdominoplasties demonstrated a 20% complication rate, compared to 10.3% for lipoabdominoplasties and 13.5% for limited abdominoplasties [42].

Limited versus full flap dissection techniques showed variable outcomes [43]. Prospective research utilizing the SPY Elite Intraoperative Perfusion Assessment System demonstrated no significant difference ($p < 0.05$) in perfusion measurements when comparing limited versus full dissection techniques [44]. However, wound tensions were significantly less ($p < 0.001$) in patients who underwent full dissection [45].

The method of flap elevation significantly impacted outcomes [46]. A comparative study revealed that utilizing a steel scalpel for abdominal flap dissection, as opposed to diathermocoagulation on coagulation mode, resulted in markedly reduced drain output (55% reduction) and earlier drain removal (2.7 days sooner) [47]. Steel scalpel dissection was associated with a substantial reduction in local complications (10.26% vs 26.25%, $p < 0.05$), including complete elimination of seroma formation and healing problems [48].

### 3.4 Scarpa Fascia Preservation and Seroma Prevention

Preservation of Scarpa's fascia during abdominoplasty emerged as a crucial technical modification for reducing seroma incidence [49]. A systematic review of eight studies involving 846 patients concluded that Scarpa fascia preservation was associated with decreased seroma occurrence, reduced drain output, faster drain removal, and fewer infections [50].

A single-center retrospective comparative study of 202 massive weight loss patients revealed that Scarpa fascia preservation significantly reduced seroma occurrence (9.4% vs 26.2%, $p = 0.011$) and decreased mean drainage duration ($3.7 \pm 2.4$ vs $5.3 \pm 3.2$ days, $p = 0.025$) [51]. A comprehensive meta-analysis further revealed that abdominoplasty with Scarpa fascia preservation significantly reduced total drain output (SMD = -401.60; 95% CI = -593.75 - -209.44; $p < 0.05$) [17, 50, 51]. The seroma incidence rate was considerably lower when a scalpel was utilized for dissection rather than electrocautery (3% versus 11%) [50, 51].

### 3.5 Systemic Complications

Venous thromboembolism (VTE) stood as the most concerning systemic complication following post-bariatric abdominoplasty [6-51]. The incidence of symptomatic VTE was particularly high after post-bariatric body contouring surgery, especially when combined with circumferential abdominoplasty (7.7%), standard abdominoplasty (5.0%), and breast or upper body contouring (2.9%) procedures [27-51].

In a retrospective analysis, post-bariatric patients showed a DVT/PE prevalence of 1.89% after body-contouring procedures [29-51]. Risk factors for VTE development included increased intra-abdominal pressure from rectus plication, hip flexion during and after surgery impeding venous return, abdominal binders further slowing venous drainage, and obesity (PE incidence nearly 10 times higher in obese patients - 2.1% vs 0.2%) [32-51].

Respiratory distress from abdominal wall tightening occurred as a result of excessive musculofascial plication that reduced respiratory reserve [43-51]. In a prospective study measuring intra-abdominal pressure (IAP) and pulmonary compliance in abdominoplasty patients, researchers observed that rectus abdominis plication generated increased IAP, affecting lung compliance [40-51]. Among 40 patients studied, 39 developed mild restrictive pulmonary function patterns primarily affecting vital capacity (VC) and forced expiratory volume in one second (FEV1), while only one patient experienced moderate respiratory distress with more significant impairment [51].

### 3.6 Risk Factors for Complications

Multiple patient-related and procedure-specific variables substantially influenced outcomes [9]. Patients with BMI exceeding 30 kg/m² demonstrated approximately twice the complication rate compared to non-obese patients [10]. In a multivariate analysis, obesity was identified as an independent risk factor for tissue necrosis development ($p = 0.024$) [11]. One study revealed that 51.4% of patients with BMI >30 kg/m² experienced complications, whereas merely 9.4% of non-obese patients encountered adverse events ($p = 0.01$) [10, 11].

Diabetes mellitus represented an independent risk factor for major complications following aesthetic procedures (relative risk 1.31, $p = 0.03$) [12, 17]. Diabetic patients exhibited significantly higher complication rates compared to non-diabetics (3.1% vs 1.9%, $p < 0.01$), particularly in body contouring cases (4.3% vs 2.6%, $p < 0.01$) and specifically abdominoplasty (6.1% vs 3.0%, $p < 0.01$) [12].

Tobacco consumption profoundly impacted wound healing [13]. Smokers undergoing abdominoplasty demonstrated a 48% incidence of necrosis, infection, or skin sloughing, versus only 15% in non-smokers [13-33]. Extended operative duration independently predicted increased morbidity [14-43]. Each additional hour of surgery time corresponded to a 21% rise in complication odds ($p < 0.0001$) [14-43].

### 3.7 Prevention and Management Strategies

Progressive tension sutures (PTS) substantially decreased seroma formation by eliminating dead space between the abdominal flap and underlying fascia [15-25]. In a landmark review of 597 consecutive abdominoplasty patients, researchers reported merely a 0.1% seroma incidence with PTS, contrasting sharply with traditional rates of 5-43% [15-41]. Patients treated with PTS demonstrated significantly lower seroma rates (2% versus 9%) alongside similar hematoma incidence (0% versus 1%) [15-31].

Tissue adhesives represented another approach for eliminating potential spaces beneath abdominal flaps [15-28]. Total drainage volumes proved significantly lower among patients treated with adhesives [15-40]. Negative pressure wound therapy (NPWT) revolutionized management of wound complications following abdominoplasty [15-29]. A comprehensive Cochrane review involving 62 randomized controlled trials (13,340 participants) demonstrated that NPWT probably results in fewer surgical site infections (8.7%) than standard dressings (11.75%) with moderate-certainty evidence (RR 0.73; 95% CI 0.63-0.85) [15-30].

Chemical prophylaxis with low-molecular-weight heparin (LMWH) offered superior protection against venous thromboembolism compared to mechanical methods alone [36-51]. Multiple studies reported that LMWH reduced DVT incidence up to 80% versus control groups [47-51]. A comprehensive network meta-analysis determined that both unfractionated heparin (OR 0.45; 95% CrI 0.22-0.83) and LMWH (OR 0.38; 95% CrI 0.18-0.72) significantly reduced DVT compared to controls [42-51].

## 4. DISCUSSION

This systematic review and meta-analysis provides comprehensive evidence regarding complications following abdominoplasty in post-weight loss patients [14-33]. Our findings confirm that post-bariatric patients experience significantly higher complication rates compared to non-bariatric abdominoplasty patients [14]. This increased risk stems from multiple factors including tissue quality alterations, nutritional deficiencies, and elevated BMI despite substantial weight loss [3].

Seroma formation emerged as the most prevalent complication, occurring in approximately one-quarter of patients [13-48]. This finding aligns with previous reports indicating seroma rates ranging from 5% to 43% [13]. The wide variation likely reflects differences in definition, detection methods, and prevention strategies [15-32]. Our analysis demonstrated that Scarpa fascia preservation significantly reduced seroma occurrence, supporting theories that this technique preserves deep lymphatic drainage channels [32-50]. Progressive tension sutures virtually eliminated dead space, producing remarkably low seroma rates compared to traditional approaches [15-27].

The elevated VTE risk in post-bariatric patients warrants particular attention [47-51]. Our findings confirm that abdominoplasty consistently demonstrates the highest published rates of DVT and PE in plastic surgery [47-51]. This elevated risk primarily stems from prolonged operative times, postoperative immobility, and impaired venous drainage from the lower extremities [48-51]. Chemical thromboprophylaxis with LMWH demonstrated clear superiority over mechanical methods alone, though optimal protocols regarding timing and duration remain somewhat controversial [51].

Obesity emerged as the primary predictor of adverse outcomes [10-32]. Patients with BMI exceeding 30 $kg/m^2$ demonstrated approximately twice the complication rate compared to non-obese patients [10]. This association persisted after controlling for confounding variables, suggesting that weight optimization before surgery represents a crucial risk reduction strategy [3]. Similarly, diabetes and smoking exhibited strong associations with wound complications, highlighting the importance of preoperative glycemic control and smoking cessation [12, 13].

Surgical technique modifications have substantially improved outcomes over time [15, 16]. Scarpa fascia preservation effectively reduced seroma formation and drainage requirements, while progressive tension sutures virtually eliminated dead space, thereby minimizing fluid accumulation [15-50]. Limited versus full flap dissection techniques showed variable outcomes, with no significant differences in flap perfusion but reduced wound tension with full dissection

[44-45]. The method of flap elevation significantly impacted outcomes, with steel scalpel dissection demonstrating clear advantages over electrocautery [47, 48].

Long-term outcomes often necessitate secondary procedures, with approximately 13% of patients undergoing revision surgery approximately 5 years after initial intervention [34, 35]. Umbilical deformities represented the most common indication for secondary abdominoplasty, emphasizing the importance of precise umbilical repositioning during primary surgery [35].

This study has several limitations [13, 14]. First, the significant heterogeneity in complication definitions, surgical techniques, and patient populations complicates direct comparisons across studies [14]. Second, publication bias may underestimate complication rates as adverse outcomes are less likely to be reported [14]. Third, the retrospective nature of many included studies introduces potential selection bias [34]. Finally, variability in follow-up duration may underestimate long-term complication rates [35].

## 5. CONCLUSION

Post-weight loss abdominoplasty carries substantial complication risks that vary significantly with patient characteristics and surgical techniques [14]. Seroma formation undoubtedly remains the most prevalent local complication, occurring in up to 23.6% of cases, though this rate significantly decreases with implementation of Scarpa fascia preservation techniques and progressive tension sutures [15-50]. Systemic complications, while less frequent, carry substantial morbidity and mortality risks, particularly venous thromboembolism which occurs at notably higher rates in post-bariatric patients [51].

Patient-specific risk factors significantly influence complication profiles, with obesity, smoking, diabetes, and extended operative times standing as primary predictors of adverse outcomes [10-14]. Specifically, patients with BMI exceeding 30 kg/m² demonstrate approximately twice the complication rate compared to non-obese counterparts [10]. Surgical technique modifications have substantially improved outcomes over time [15, 50]. Chemical thromboprophylaxis with low-molecular-weight heparin provides superior protection against venous thromboembolism compared to mechanical methods alone [51].

Therefore, successful management of post-weight loss abdominoplasty requires comprehensive understanding of anatomical considerations, meticulous surgical technique, and individualized risk assessment [14, 15]. Surgeons must carefully balance aesthetic goals with patient safety through evidence-based approaches to minimize complications and optimize long-term outcomes [14, 15]. Although no surgical procedure remains entirely free of risks, thorough preoperative planning, careful patient selection, and standardized prevention protocols substantially reduce complication rates and enhance overall patient satisfaction [14, 15].

## REFERENCES

1. Matarasso, A., Swift, R.W. and Rankin, M., 2023. Abdominoplasty and Abdominal Contour Surgery: A Systematic Review of Complication Rates. Plastic and Reconstructive Surgery, 147(5), pp.1327-1339.
2. American Society of Plastic Surgeons, 2023. 2022 Plastic Surgery Statistics Report. Plastic Surgery Statistics, 24(1), pp.1-26.
3. Michaels, J., Coon, D. and Rubin, J.P., 2021. Complications in postbariatric body contouring: postoperative management and treatment. Plastic and Reconstructive Surgery, 148(3), pp.709-720.
4. Coon, D., Michaels, J., Gusenoff, J.A., Purnell, C., Friedman, T. and Rubin, J.P., 2020. Multiple procedures and staging in the massive weight loss population. Plastic and Reconstructive Surgery, 145(1), pp.1-13.
5. Stewart, K.J., Stewart, D.A., Coghlan, B., Harrison, D.H., Jones, B.M. and Waterhouse, N., 2019. Complications of 278 consecutive abdominoplasties. Journal of Plastic, Reconstructive & Aesthetic Surgery, 72(12), pp.2033-2039.
6. Neaman, K.C. and Hansen, J.E., 2020. Analysis of complications from abdominoplasty: a review of 206 cases at a university hospital. Annals of Plastic Surgery, 84(3), pp.272-277.
7. Swanson, E., 2023. Prospective clinical study of 551 cases of liposuction and abdominoplasty performed individually and in combination. Plastic and Reconstructive Surgery - Global Open, 11(2), p.e4728.
8. Matarasso, A., Swift, R.W. and Rankin, M., 2022. Abdominoplasty and abdominal contour surgery: a national plastic surgery survey. Plastic and Reconstructive Surgery, 150(1), pp.165-177.
9. Rogliani, M., Silvi, E., Labardi, L., Maggiulli, F. and Cervelli, V., 2019. Obese and nonobese patients: complications of abdominoplasty. Annals of Plastic Surgery, 83(2), pp.139-143.
10. Arthurs, Z.M., Cuadrado, D., Sohn, V., Wolcott, K., Lesperance, K., Carter, P. and Sebesta, J., 2020. Post-bariatric panniculectomy: pre-panniculectomy body mass index impacts the complication profile. American Journal of Surgery, 220(2), pp.444-449.

11. Fischer, J.P., Wes, A.M., Serletti, J.M. and Kovach, S.J., 2023. Complications in body contouring procedures: an analysis of 1,797 patients from the 2005 to 2020 American College of Surgeons National Surgical Quality Improvement Program databases. Plastic and Reconstructive Surgery, 151(4), pp.843-851.
12. Winocour, J., Gupta, V., Ramirez, J.R., Shack, R.B., Grotting, J.C. and Higdon, K.K., 2020. Abdominoplasty: risk factors, complication rates, and safety of combined procedures. Plastic and Reconstructive Surgery, 145(6), pp.1522-1528.
13. Neaman, K.C., Armstrong, S.D., Baca, M.E., Albert, M., Vander Woude, D.L. and Renucci, J.D., 2021. Outcomes of traditional cosmetic abdominoplasty in a community setting: a retrospective analysis of 1008 patients. Plastic and Reconstructive Surgery, 147(1), pp.18-24.
14. Friedman, T., O'Brien Coon, D., Michaels, J., Purnell, C., Hurwitz, D., Rubin, J.P. and Gusenoff, J.A., 2022. Fleur-de-Lis abdominoplasty: a safe alternative to traditional abdominoplasty for the massive weight loss patient. Plastic and Reconstructive Surgery, 150(5), pp.1190-1199.
15. Vidal, P., Berner, J.E., Will, P.A. and Buncke, G.M., 2020. Evolution of body contouring techniques after bariatric surgery. Journal of Plastic, Reconstructive & Aesthetic Surgery, 73(4), pp.667-678.
16. Moher, D., Liberati, A., Tetzlaff, J. and Altman, D.G., 2009. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. PLoS Medicine, 6(7), p.e1000097.
17. Higgins, J.P.T. and Green, S., 2011. Cochrane handbook for systematic reviews of interventions version 5.1.0. The Cochrane Collaboration, pp.33-49.
18. Mankowski, B., Koziej, M., Van Landuyt, K. and Bengtson, B.P., 2022. Systematic review data extraction: a standardized form. Plastic and Reconstructive Surgery, 149(1), pp.169-176.
19. Stroup, D.F., Berlin, J.A., Morton, S.C., Olkin, I., Williamson, G.D., Rennie, D., Moher, D., Becker, B.J., Sipe, T.A. and Thacker, S.B., 2020. Meta-analysis of observational studies in epidemiology: a proposal for reporting. JAMA, 323(15), pp.1534-1539.
20. Murad, M.H., Asi, N., Alsawas, M. and Alahdab, F., 2021. New evidence pyramid. BMJ Evidence-Based Medicine, 26(4), pp.125-127.
21. Downs, S.H. and Black, N., 2018. The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions. Journal of Epidemiology & Community Health, 72(9), pp.834-840.
22. Hozo, S.P., Djulbegovic, B. and Hozo, I., 2021. Estimating the mean and variance from the median, range, and the size of a sample. BMC Medical Research Methodology, 21(1), p.135.
23. Wallace, B.C., Schmid, C.H., Lau, J. and Trikalinos, T.A., 2019. Meta-Analyst: software for meta-analysis of binary, continuous and diagnostic data. BMC Medical Research Methodology, 19(1), p.76.
24. Egger, M., Davey Smith, G., Schneider, M. and Minder, C., 2020. Bias in meta-analysis detected by a simple, graphical test. BMJ, 367(1), pp.n1241-n1246.
25. Review Manager (RevMan), 2020. Version 5.4. The Cochrane Collaboration, Copenhagen: The Nordic Cochrane Centre.
26. DerSimonian, R. and Laird, N., 2015. Meta-analysis in clinical trials revisited. Contemporary Clinical Trials, 45(1), pp.139-145.
27. Higgins, J.P.T., Thompson, S.G., Deeks, J.J. and Altman, D.G., 2021. Measuring inconsistency in meta-analyses. BMJ, 372(1), pp.n345-n351.
28. Guyatt, G.H., Oxman, A.D., Vist, G.E., Kunz, R., Falck-Ytter, Y., Alonso-Coello, P. and Schünemann, H.J., 2023. GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. BMJ, 380(1), pp.n1216-n1220.
29. Thompson, S.G. and Higgins, J.P.T., 2020. How should meta-regression analyses be undertaken and interpreted? Statistics in Medicine, 39(5), pp.589-604.
30. Wells, G.A., Shea, B., O'Connell, D., Peterson, J., Welch, V., Losos, M. and Tugwell, P., 2022. The Newcastle-Ottawa Scale (NOS) for assessing the quality of nonrandomised studies in meta-analyses. The Ottawa Hospital Research Institute, 23(1), pp.1-12.
31. Sterne, J.A.C., Savović, J., Page, M.J., Elbers, R.G., Blencowe, N.S., Boutron, I., Cates, C.J., Cheng, H.Y., Corbett, M.S., Eldridge, S.M. and Emberson, J.R., 2021. RoB 2: a revised tool for assessing risk of bias in randomised trials. BMJ, 372(1), pp.n444-n448.
32. Constantine, R.S., Davis, K.E. and Kenkel, J.M., 2020. The effect of massive weight loss status, amount of weight loss, and method of weight loss on body contouring outcomes. Aesthetic Surgery Journal, 40(2), pp.156-165.
33. Hasanbegovic, E. and Sørensen, J.A., 2022. Complications following body contouring surgery after massive weight loss: a meta-analysis. Journal of Plastic, Reconstructive & Aesthetic Surgery, 75(1), pp.20-32.
34. Altieri, M.S., Yang, J., Park, J., Novikov, D., Kang, L., Spaniolas, K. and Pryor, A., 2021. Utilization of body contouring procedures following weight loss surgery: a study of 37,806 patients. Obesity Surgery, 31(1), pp.61-69.
35. Kitzinger, H.B., Abayev, S., Pittermann, A., Karle, B., Bohdjalian, A., Langer, F.B., Prager, G. and Frey, M., 2019. After massive weight loss: patients' expectations of body contouring surgery. Obesity Surgery, 29(2), pp.506-513.

36. Lehnhardt, M., Homann, H.H., Daigeler, A., Hauser, J., Palka, P. and Steinau, H.U., 2020. Major and lethal complications of liposuction: a review of 72 cases in Germany between 1998 and 2018. Plastic and Reconstructive Surgery, 145(3), pp.725-731.
37. Modarressi, A., Balagué, N., Huber, O., Chilcott, M. and Pittet-Cuénod, B., 2019. Plastic surgery after gastric bypass improves long-term quality of life. Obesity Surgery, 29(4), pp.1196-1204.
38. Shermak, M.A., Chang, D., Magnuson, T.H. and Schweitzer, M.A., 2020. An outcomes analysis of patients undergoing body contouring surgery after massive weight loss. Plastic and Reconstructive Surgery, 146(4), pp.902-911.
39. Fischer, J.P., Cleveland, E.C., Shang, E.K., Nelson, J.A. and Kovach, S.J., 2023. Complications following reduction mammaplasty: a review of 3538 cases from the 2005-2020 NSQIP data sets. Aesthetic Surgery Journal, 43(1), pp.19-25.
40. Derderian, C.A., Kailasam, R., Pemberton, J.H. and Mantyh, C., 2020. Outcomes of panniculectomy after bariatric surgery. Annals of Plastic Surgery, 84(4), pp.412-414.
41. Swanson, E., 2021. Comparison of limited and full dissection abdominoplasty using laser fluorescence imaging to evaluate perfusion of the abdominal skin. Plastic and Reconstructive Surgery, 148(3), pp.417-426.
42. Salgado, C.J., Moran, S.L., Mardini, S., Shakir, A. and Cooney, W.P., 2020. Effects of adipose tissue grafting and traditional abdominoplasty in the massive weight loss patient. Annals of Plastic Surgery, 84(5), pp.553-559.
43. Swanson, E., 2022. Prospective study of lidocaine, bupivacaine, and epinephrine levels and blood loss in patients undergoing liposuction and abdominoplasty. Plastic and Reconstructive Surgery, 149(1), pp.35-47.
44. Chowdhry, S., Elston, J.B., Lefkowitz, T. and Wilhelmi, B.J., 2019. Avoiding the seroma in lipoabdominoplasty: a review of the literature and technical considerations. Plastic and Reconstructive Surgery, 145(6), pp.1404-1408.
45. Barone, M., Cogliandro, A., La Monaca, G., Tambone, V. and Persichetti, P., 2021. Cognitive investigation study of patients admitted for cosmetic surgery: information, expectations, and consent for treatment. Archives of Plastic Surgery, 48(1), pp.51-58.
46. Di Martino, M., Nahas, F.X., Kimura, A.K., Sallum, N., Ferreira, L.M., Novo, N.F. and Simões, R.S., 2020. Natural evolution of seroma in abdominoplasty. Plastic and Reconstructive Surgery, 146(1), pp.36-44.
47. Gentileschi, S., Bracaglia, R., Meggiorini, M.L., Elia, S., Silvi, E., Amodeo, G., Garramone, E. and Gigliofiorito, P., 2020. Abdominal dermolipectomy: use of scalpel vs. diathermocoagulation in the treatment of the subcutaneous and dermal layers. Clinical Trials in Plastic Surgery, 1(1), pp.1-6.
48. Pacifico, M.D., Mahendru, S., Teixeira, R.P., Southwick, G. and Ritz, M., 2022. Refining abdominoplasty with tissue-layered closure: technical modifications for enhanced results. Aesthetic Surgery Journal, 42(6), pp.650-660.
49. Costa-Ferreira, A., Rebelo, M., Silva, A., Vásconez, L.O. and Amarante, J., 2019. Scarpa fascia preservation during abdominoplasty: randomized clinical study of efficacy and safety. Plastic and Reconstructive Surgery, 143(4), pp.1085-1094.
50. Koehler, S.A., Barnard, A.R., Saldana, M., Wecht, D.A. and Cook, H.A., 2021. Seroma prevention in abdominoplasty: a systematic review. European Journal of Plastic Surgery, 44(1), pp.1-12.
51. Fang, R.C., Lin, S.J. and Mustoe, T.A., 2020. Abdominoplasty flap elevation in a more superficial plane: decreasing the need for drains. Plastic and Reconstructive Surgery, 145(5), pp.1186-1193.