surgeries

MDPI

Review

Evolving Body Contouring Strategies for Patients After Massive Weight Loss: Insights from Bariatric and Pharmacologic Interventions

Salvatore Giordano [1,2,*], Andre' Salval [1,2], Pietro di Summa [3] and Carlo Maria Oranges [4]

[1] Department of Surgery, Satasairaala Hospital, 28500 Pori, Finland; a.salval@istitutoesteticoitaliano.it
[2] Department of Plastic and General Surgery, Turku University Hospital, The University of Turku, 20500 Turku, Finland
[3] Department of Plastic and Hand Surgery, University Hospital of Lausanne (CHUV), University of Lausanne, 1011 Lausanne, Switzerland; pietro.di-summa@chuv.ch
[4] Department of Plastic, Reconstructive and Aesthetic Surgery, Geneva University Hospitals, University of Geneva, 1201 Geneva, Switzerland; carlo.oranges@hcuge.ch
* Correspondence: salgio@utu.fi

Abstract: Background/Objectives: Significant weight loss, whether through bariatric surgery or medication-assisted approaches, presents unique challenges for body contouring procedures. A thorough preoperative evaluation is essential to optimize outcomes and minimize risks. Methods: A comprehensive literature search was conducted across various databases to identify studies on assessment, nutritional optimization, thromboembolic risk, and surgical planning for post-weight-loss patients, with a particular focus on those undergoing medication-assisted weight loss using Glucagon-like peptide-1 (GLP-1) agonists. Results: A detailed review of medical history, comorbidities, weight loss trajectory, and nutritional status is essential. Common conditions such as diabetes, hypertension, and sleep apnea often improve after weight loss but require ongoing management. Nutritional deficiencies, particularly in vitamins and minerals, necessitate dietary counseling and supplementation. Patients who have undergone significant weight loss are at increased risk of thromboembolic events, particularly after body contouring procedures. Surgical planning should be patient-centered, setting realistic expectations and employing a strategic, staged approach when necessary to optimize outcomes. GLP-1 agonists users require special consideration due to their distinct metabolic and physiological profiles. Conclusions: Optimizing preoperative assessment, nutrition, and thromboprophylaxis is critical for safe and effective body contouring in post-weight-loss patients. With the increasing prevalence of medication-assisted weight loss, surgical strategies must adapt to address the distinct anatomical and physiological features of these patients.

Keywords: massive weight loss; moderate medication-assisted weight loss; body contouring; post-bariatric; Ozempic face; Mounjaro face; staging; BMI

Academic Editor: Giovanni Tarantino

Received: 27 March 2025
Revised: 16 May 2025
Accepted: 23 May 2025
Published: 26 May 2025

Citation: Giordano, S.; Salval, A.; di Summa, P.; Oranges, C.M. Evolving Body Contouring Strategies for Patients After Massive Weight Loss: Insights from Bariatric and Pharmacologic Interventions. *Surgeries* **2025**, *6*, 42. https://doi.org/10.3390/surgeries6020042

1. Introduction

Globally, the number of bariatric procedures has quintupled in 15 years, with 720,000 surgeries performed in 2018. Growth has been strongest in the Asia/Pacific region [1]. While the global number of metabolic and bariatric surgeries dropped significantly in 2020, there was an encouraging increase in 2021, though figures did not return to pre-COVID-19 levels. Sleeve gastrectomy remained the most performed procedure, whereas adjustable gastric banding continued to see a decline worldwide [2]. Thus, the request

for post-bariatric body contouring procedures has increased as well [3]. Excess skin is a common sequela of significant weight loss, affecting up to 96% of patients, and can lead to functional impairments, such as hygiene difficulties, skin irritation, and restricted mobility, impeding daily activities, as well as negatively impacting quality of life, including body image and psychosocial well-being [4].

Post-bariatric surgery refers to plastic surgery procedures performed after major weight loss. These surgeries aim to improve quality of life by improving the body contour and functionality [3,4]. Achieving successful body contouring outcomes implies careful planning, together with a deep understanding of the patient's goals, considering medical conditions and, thus, suitability for surgery. Physicians need to pursue a balance between accommodating patients' priorities and desires for possible combined procedures (everything together), as well as ensuring medical safety and maximizing the aesthetic results for each patient. Properly staging these procedures is essential to reduce the surgical time, mitigate postoperative complications, and prevent excessive tension in the surgical wounds. Furthermore, with the increasing and often long-term use of weight loss agents such as Ozempic and Mounjaro, the principles discussed are becoming increasingly relevant not only to individuals who have undergone massive weight loss—whether through bariatric surgery, pharmacotherapy, or lifestyle interventions—but also to a broader population seeking body contouring and aesthetic optimization [5–7]. Massive weight loss is typically defined as the reduction of at least 50% of excess body weight, where excess weight loss (%EWL) is calculated as the percentage of weight lost relative to the amount of weight above an individual's ideal body weight [3,4]. The goal of this mini-review was to examine the preoperative assessment of patients after massive weight loss (MWL) and to underline the differences and management of those patients undergoing Moderate Medication-Assisted Weight Loss (MMA) based on the most recent findings.

2. Materials and Methods

This narrative review synthesizes the current literature on preoperative evaluation, risk assessment, and surgical planning for body contouring procedures in post-weight-loss patients, including those undergoing "Moderate Medication-Assisted Weight Loss" with Glucagon-like peptide-1 (GLP-1) agonists.

A comprehensive literature search was performed across the MEDLINE (via PubMed), Cochrane Library, Embase, Scopus, and Google Scholar databases in May 2025. The search strategy utilized Boolean operators to combine keywords and MeSH terms such as "body contouring", "post-weight loss surgery", "panniculectomy", "abdominoplasty", "GLP-1 receptor agonists", and "bariatric surgery". Our search aimed to identify studies reporting on clinical outcomes, perioperative risk factors, and patient management strategies. Inclusion criteria encompassed studies addressing preoperative evaluation, nutritional optimization, thromboembolic risk assessment, and surgical planning. No language or publication date restrictions were applied.

Relevant articles were selected based on their discussion of patient safety, complication rates, and emerging considerations in body contouring for post-weight-loss patients. Particular attention was given to studies addressing the unique characteristics of patients using GLP-1 agonists. The findings were analyzed to provide a comprehensive overview of the best practices and evolving trends in this field.

3. Results

The assessment of patients begins with a comprehensive history-taking, which encompasses their full medical and surgical history. Key factors essential for assessing individuals undergoing weight loss are elaborated upon in the following discussion.

3.1. Patient Assessment

3.1.1. The Process and Consequences After Losing Weight

Understanding the method of how weight loss was achieved is a crucial aspect of assessing MWL patients. When weight loss follows surgery, it is crucial to differentiate between restrictive and malabsorptive techniques to identify potential nutritional deficiencies. Notably, half of the MWL patients present iron deficiency, potentially leading to anemia already before the surgery. Other nutrients commonly impacted in these patients include calcium, vitamin B12, and thiamine. Furthermore, protein deficiency—due to various factors after bariatric surgery—can lead to extended recovery times and impaired wound healing [8]. Hence, it is essential to ensure that weight loss patients are nutritionally well prepared before surgery [9]. Recently, even people without type 2 diabetes have been increasingly using incretin mimetic drugs for weight loss [7]. This new group of patients who achieve weight loss through medication is referred to as the Moderate Medication-Assisted Weight Loss (MMA) population. Typically, MMA patients experience up to a 25% reduction in total body weight. This distinguishes them from traditional MWL patients, who often achieve greater weight loss through bariatric surgery and present with more significant comorbidities and pronounced skin laxity. Despite these differences, MMA patients still exhibit several postoperative characteristics like MWL patients, albeit to a lesser extent. Notably, their soft tissue quality tends to be superior, retaining more elasticity, which may influence surgical planning and outcomes [10,11].

For MMA patients, surgeons need to be informed about the specific medication used, its duration, and the current dosage. Very common weight loss medications typically include semaglutide (Ozempic) and tirzepatide (Mounjaro). Semaglutide promotes insulin release, activating Glucagon-like peptide-1 (GLP-1) receptors in response to glucose and inhibits the release of Glucagon, reducing glucose production by the liver [8,9]. Tirzepatide, on the other hand, has both actions as a GLP-1 agonist (like semaglutide) and a glucose-dependent insulinotropic polypeptide (GIP) agonist [7,12,13]. Both these drugs also resulted in reducing and slowing gastric emptying, especially at the beginning of the therapy, which must be considered for perioperative management [14].

3.1.2. The Impact of Body Mass Index (BMI), Weight Alterations, and the Importance of Its Stability

Patients with a high BMI (over 30 kg/m^2) are well known to have a higher risk of postoperative complications [15]. This risk increases for those who have undergone significant weight loss and experienced substantial changes in their BMI. Generally, a preoperative BMI of 30 kg/m^2 or lower is considered a safe benchmark for patients undergoing body contouring procedures [3,4,15,16]. Maintaining a stable body weight is crucial when assessing candidates for surgery. In the authors' practice, patients are required to demonstrate weight stability for at least three months, preferably six months, before becoming fully eligible for body contouring surgery with a BMI of less than 30 kg/m^2.

We define weight stability as a weight fluctuation of no more than 5 kg between the consultations during the preoperative follow-up. Although a six-month period of stability is preferred by us and our peers, a minimum of three months is mandatory. This duration ensures that medical comorbidities can stabilize and the body can reach a state of physiological balance, which is crucial for achieving better results in body contouring.

Plastic surgeons need to be very careful when treating patients with a BMI ranging from 30 to 35 kg/m^2. It is crucial to analyze how fat is distributed to plan for body contouring procedures. For instance, male patients usually can present more visceral fat that can hinder good abdominal contouring. Likewise, individuals with a higher BMI (typically 35–40 kg/m^2) often have still thick subcutaneous fat, which can limit aesthetic

contouring interventions. As a result, functional procedures such as panniculectomy or reduction mammaplasty might be advantageous for these patients, improving comfort during exercise and supporting further weight loss [17].

Unfortunately, both MMA and MWL patients are very likely to still display medical conditions stemming from their history of being overweight or obese, including diabetes, coronary disease, not balanced hypertension, osteoarthritis, sleep apnea, and other health conditions.

While weight loss can lessen some of these conditions, they may not be completely resolved, necessitating a comprehensive medical evaluation. All health issues should be well managed and stabilized before undergoing body contouring procedures. Moreover, problems such as skin infections, intertrigo, rashes due to excess skin and skin folds, difficulties in physical activity, and psychological issues like depression must be thoroughly addressed before proceeding with body contouring surgery [2,3].

3.1.3. Health-Related Comorbidities

Previous studies have shown that bariatric surgery leads to remission of diabetes in up to 75% of patients, a reduction in antihypertensive medication use in more than half, and a significant improvement in sleep apnea symptoms in most patients [2]. Although weight loss can improve comorbid conditions to some extent, complete remission complete remission may not always be achieved. Therefore, plastic surgeons should carefully evaluate the status of a patient's comorbidities before planning any surgery and try to mitigate them effectively perioperatively [18,19].

Although many patients can achieve even a remission of diabetes after massive weight loss (MWL), they may still exhibit insulin resistance. Consequently, it is advisable for patients to undergo HbA1c tests as part of preoperative laboratory studies. In cases where diabetes persists post-weight loss, adjustments to medications become necessary. Typically, oral hypoglycemics are temporarily halted, and insulin doses are reduced by one-fifth because of fasting before and during the surgical procedure [19].

Following MWL, patients with longstanding obesity may endure prolonged cardiovascular damage. While bariatric surgery results in the normalization of blood pressure in up to 60% of patients, in the rest of these, high blood pressure increases the risk of complications, particularly bleeding, heart attack, or stroke. Consequently, routine blood pressure monitoring is essential, commencing before surgical intervention. The approach to weight loss can significantly influence heart health because losing weight through diet and exercise strengthens the heart differently compared to the effects of bariatric surgery [20].

Abdominal obesity is closely associated with an increased risk of insulin resistance, metabolic syndrome, and type 2 diabetes. These conditions represent important considerations, often relative contraindications, for body contouring procedures, warranting thorough preoperative evaluation [21,22].

Specifically, metabolic syndrome, characterized by the coexistence of obesity, diabetes, hypertension, and dyslipidemia, remains a significant concern even in post-weight-loss patients. Its persistent presence has been linked to higher rates of surgical complications, hospital readmissions, and reoperations [21].

Non-alcoholic fatty liver disease (NAFLD), particularly when associated with obesity, also has implications for surgical outcomes. Obesity-related NAFLD is increasingly recognized as a condition associated with elevated cancer risk, including a growing body of evidence linking it to bladder cancer [23,24]. Additionally, hepatic steatosis and increased visceral adiposity contribute to postoperative hyperglycemia, which can impair healing and compromise surgical results [25].

Bariatric procedures such as sleeve gastrectomy and Roux-en-Y gastric bypass are demonstrated to be effective in reducing weight and improving NAFLD. However, NAFLD itself may negatively influence weight loss outcomes, particularly following sleeve gastrectomy [26].

Given these factors, comprehensive preoperative assessment and metabolic optimization are essential. Patients with NAFLD undergoing abdominoplasty or other abdominal body contouring surgeries require individualized management strategies to minimize perioperative risk and enhance surgical outcomes.

3.1.4. Tobacco, Alcohol Use, and Social Assistance

Other important factors to be considered in MML patients include smoking habits and the presence of social support. The adverse impact of smoking on surgical outcomes is widely recognized. Similarly, risky alcohol use (>2 drinks/day) with or without smoking co-occurrence can further increase the likelihood of postoperative complications [27]. Our recommendation includes postponing surgery for active smokers or nicotine users and mandating those individuals with a history of smoking refrain for a minimum of four weeks both before and after the surgical procedure. In our institution, we currently perform a cotinine test a few days before surgery [28]. Stopping smoking prior to body contouring surgery significantly lowers postoperative complications and saves lives, resulting in an estimated annual societal cost savings of USD 104.9 million in the United States. Reducing the rate of smoking could further save lives and decrease societal costs [29,30].

Social support is vital for individuals contemplating body contouring surgery following bariatric surgery. Many patients face obstacles such as insufficient information about the procedures, high costs, and challenges with insurance reimbursement, which can deter them from pursuing these post-bariatric procedures. Additionally, because body contouring surgery can lead to physical limitations during recovery, having support is particularly helpful, especially for those who have had surgeries involving extremities [31]. The likelihood of bariatric surgery patients receiving different contouring procedures is strongly linked to their insurance status and gender. Those who paid out of pocket were twice as likely to have a panniculectomy, about 14 times more likely to undergo abdominoplasty, and 48 times more likely to receive mastopexy. Consequently, access to body contouring surgery for post-bariatric patients may be more affected by personal choice and the availability of financial resources rather than by a real clinical necessity [31,32].

3.1.5. Nutritional Status and Enhancement

Weight loss surgery can impair the absorption and metabolism of essential nutrients, such as vitamins and minerals, due to anatomical alterations of the gastrointestinal tract. These changes often lead to clinically significant deficiencies. Therefore, comprehensive preoperative nutritional optimization is essential to mitigate physiological stress and promote effective postoperative recovery [32]. Optimal nutrition before surgery permits the patients to enhance their overall health, improve wound healing, and eventually achieve excellent outcomes. Even mild protein-calorie malnutrition can impair wound healing. Patients are aiming for a protein intake of at least 1–2 g/kg/day [33,34]. Optimizing nutrition is vital for maintaining optimal body composition and helping surgeons achieve improved aesthetic outcomes [34].

3.1.6. Prevention and Postoperative Monitoring of Deep Vein Thrombosis

Body contouring surgeries, like any other procedures, carry the risk of venous thromboembolic (VTE) events. Common risk factors for that include obesity (BMI over 30 kg/m^2), multiple surgical sites, extended operative times (typically over 2 h), and reduced ambulation after surgery. The estimated risk of VTE in these patients ranges from 1% to 3%, but it

can increase up to three times when BMI is over 35, reaching 10% of risk [35]. Prophylactic measures, such as the use of intraoperative compression devices and chemoprophylaxis—unfractionated or low-molecular-weight heparin—are employed alone or in combination to reduce the likelihood of postoperative VTE.

On the other hand, the MWL population often presents a heightened risk of bleeding, leading surgeons to administer anticoagulation medications with caution.

Risk stratification using the Caprini score for deep vein thrombosis prophylaxis in plastic surgery patients is recommended. When the score is higher than eight, then chemoprophylaxis is advised [36]. However, controversy still exists on the optimal timing and doses of chemoprophylaxis in MWL patients undergoing body contouring due to the lack of evidence.

Doppler ultrasound or CT scans are used to detect blood clots together with clinical signs of VTE, including leg swelling, pain, warmth, and redness [37].

3.2. Clinical Assessment

3.2.1. Physical Examination

The physical examination in MWL and MMA patients should involve a thorough evaluation, encompassing both general observations of body shape and habitus BMI calculation and routine vital signs measurement. Special attention should be given to areas prone to excess skin, fat, or a combination of both, as well as to the quality of the skin. Any presence of striae, intertriginous rashes, infections, as well as any prior surgical or traumatic scars, lymphedema, lipedema, and varicose veins should also be noticed. Care should be taken into the assessment of possible incisional or any hernias as well as rectus diastasis presence [38]. The quality and elasticity of the patient's skin should be assessed, as well as the location of any skin folds or fat rolls. Specifically focusing on the abdominal area, the examination should determine the presence of a significant visceral fat component (Table 1).

Table 1. Type of weight loss and key characteristics: Moderate Medication-Assisted (MMA) Weight Loss versus massive weight loss (MWL).

	Moderate Medication-Assisted (MMA) Weight Loss	**Massive Weight Loss (MWL)**
Amount of Weight Loss	Less than 25% of total body weight	Typically over 50 kg of weight loss
Nutritional Deficits	Not necessarily appreciable, but possible, especially protein deficiencies	Depending on the type of bariatric surgery procedure: malabsorptive with iron, vitamin B 12, thiamine, calcium, protein deficiencies
Skin and Tissue Quality	Mild tissue elasticity and skin excess	Poor elasticity, important skin excess, and deformation
Preoperative Concerns	Delayed gastric emptying with subsequent higher risk of aspiration pneumonia	In the case of a previous gastric band, consider deflating the band prior to surgery to decrease aspiration risk
Excisional Surgery	Likely to combine multiple procedures to reduce the number of surgeries and limited skin excisions	Conservative combination procedures and larger skin excisions with minimal undermining or dissection
Debulking Liposuction	Often performed in a prior or at the same stage of surgical excision	Safer to perform excisional surgery in separate stages to optimize aesthetic results
Energy-based Tools (like Renuvion® or Ligasure®)	Utilized together with surgical excision	Reserved after excisional surgery to address recurrent skin laxity

The Pittsburgh rating system aids in preoperative planning and serves as a valuable tool for measuring post-surgery improvements through systematic assessment and quantification of deformities in each body region (Table 2) [31,39].

Table 2. Pittsburgh Weight Loss Deformity Scale [33].

Area	Scale	Definition
Arms	0	Normal
	1	Adiposity with good skin tone
	2	Loose, hanging skin without severe adiposity
	3	Loose, hanging skin with severe adiposity
Breasts	0	Normal
	1	Ptosis grade 1 or 2 or severe macromastia
	2	Ptosis grade 3, moderate volume loss, or constricted
	3	Severe lateral roll and/or severe volume loss with laxity
Back	0	Normal
	1	Single fat roll or adiposity
	2	Multiple skin and fat rolls
	3	Ptosis of rolls
Abdomen	0	Normal
	1	Redundant skin with rhytides or moderate adiposity without overhang
	2	Overhanging pannus
	3	Multiple rolls or epigastric fullness
Flank	0	Normal
	1	Adiposity
	2	Rolls without ptosis
	3	Rolls with ptosis
Buttocks	0	Normal
	1	Mild to moderate adiposity and/or mild to moderate cellulite
	2	Severe adiposity and/or severe cellulite
	3	Skin folds
Mons	0	Normal
	1	Excessive adiposity
	2	Ptosis
	3	Significant overhanging below symphysis
Hips/Lateral Thigh	0	Normal
	1	Mild to moderate adiposity and/or mild to moderate cellulite
	2	Severe adiposity and/or severe cellulite
	3	Skin folds
Medial Thigh	0	Normal
	1	Excessive adiposity
	2	Severe adiposity and/or severe cellulite
	3	Skin folds
Knees/Lower Thigh	0	Normal
	1	Adiposity
	2	Severe adiposity
	3	Skin folds

3.2.2. Safety First

It is crucial to restrict the anesthesia duration for body contouring surgery to six hours. This precaution is based on evidence demonstrating that the duration of surgery indepen-

dently contributes to the risk of postoperative complications [40]. This becomes especially crucial when conducting body contouring procedures in day surgery settings. It is also crucial to ensure that patients are classified as American Society of Anesthesiologists (ASA) class 1 or 2, that the duration of anesthesia does not exceed six hours, and that liposuction volume is ideally limited to two liters when performed alongside other procedures. Intuitively, as the number of excisional procedures increases, wound healing issues rise proportionately.

For the MMA weight loss patients, the possibility of delayed gastric emptying caused by these medications increases the risk of intraoperative pulmonary aspiration. To mitigate this risk, it is crucial to discontinue these medications for at least two weeks before the surgery [41].

However, discontinuation of these medications might not be required for patients who have been using them for a long time, as delayed gastric emptying usually improves over time. It is crucial to carefully evaluate the recommended fasting duration before surgery for these patients [11]. Additionally, for all body contouring procedures, having a co-surgeon present is recommended whenever feasible.

This not only helps in minimizing operative time but also addresses the issue of surgeon fatigue. In cases involving combined procedures, even a two-team approach may be suggested. The engagement and experience of the surgical team are paramount, and we regularly review the surgical plan with the entire team to ensure a thorough understanding and efficient execution of patient positioning, draping, monitor placement, safety devices, and surgical sequence [42].

3.3. Staging the Surgeries

Various combinations of body contouring procedures are available for post-bariatric patients, with the most appropriate combination depending on the preferences of both the surgeon and the patient according to the clinical situation [43].

3.3.1. Abdominal Contouring Associated with Breast Surgery

Combining surgeries for breasts and abdomen is a frequent practice. This involves performing standard abdominoplasty, repairing any encountered hernias, and, additionally, conducting an appropriate breast procedure such as mastopexy, augmentation, reduction, or gynecomastia removal, depending on the patient's indications. For patients with typical breast deformities resulting from MML that necessitate a complex dermal suspension mastopexy involving the lateral rolls, we frequently recommend conducting this procedure as a separate operation because of its technical complexity and time requirements. However, if the surgeon has experience in handling such deformities and the patient prefers a single-stage surgery, combining it with an abdominal procedure may be feasible.

A major advantage of this combined approach is that all procedures can be performed with the patient in a supine position, eliminating the time that would otherwise be spent to reposition the patient. However, it is important to remember that in patients with significant weight loss, anatomical structures that are normally considered stable, like the inframammary fold (IMF), may be more flexible and prone to shifting due to poorer tissue and skin quality. This can lead to the IMF moving downward, especially when there is a downward pull on the midsection. Moreover, when planning a fleur-de-lis abdominoplasty, the potential inward movement of the IMF should be considered [43,44].

3.3.2. Abdominal Contouring, with or Without a Lower Body Lift, in Conjunction with Brachioplasty

A combination of the above-mentioned procedures can permit the surgeon to comprehensively contour the central body while including a less time-consuming procedure like

arm surgery. By targeting regions such as the abdomen, mons pubis, lateral thighs, and buttocks, the combined abdominoplasty and lower body lift procedure effectively address issues such as standing cone deformities. This approach allows for more comprehensive removal of excess lateral abdominal tissues and improves overall body contour. The integration of these procedures not only enhances the aesthetic outcome by reshaping and tightening the affected areas but also helps in achieving a more balanced and smoother body silhouette [45].

Patients are initially placed in a prone position for this combination, and any need for repositioning can prolong the overall surgery time. Additional procedures, such as gluteal autoaugmentation, may further extend the operative time and should be carefully evaluated. In such cases, we suggest performing brachioplasty as a separate procedure. However, with this combined approach, a more challenging recovery can follow. Patients may find it difficult to reposition themselves using their arms if also a concomitant rectus plication is performed to enhance the abdominal contour, so it is important to discuss this with patients beforehand and emphasize the need for social support to aid in their postoperative recovery. Furthermore, for patients using weight loss medication naltrexone/bupropion (Mysimba), it is known that it blocks the effects of opioid medications, including pain-relieving drugs such as morphine and codeine, other opioids used during surgery, as well as certain cough, cold, and diarrhea medications. This may result in opioid medications being ineffective during and after surgery, as well as during pain management. If a patient is using naltrexone/bupropion, they may be advised to discontinue its use at least three days prior to the procedure (ideally five days prior) [42].

3.3.3. Breast Contouring with or Without Upper Body Lift Associated with Brachioplasty

Like the previously mentioned procedures, this combination also enables a circumferential approach, effectively removing standing cone deformities and enhancing aesthetic outcomes through the excision of excess skin. The patient is in a prone position, which requires repositioning and consequently prolongs the overall operative time. When pursuing breast autoaugmentation using tissue from the lateral chest roll, careful preoperative planning and marking are essential. If an upper body lift is also scheduled for a later stage, it is important to ensure that this tissue is not compromised during the initial surgery, as it could affect the feasibility of future autoaugmentation.

3.3.4. Thigh Lift

This surgical technique is performed for the correction of the sagging skin in the thighs, particularly in the medial part and it can be combined with other upper body procedures. To reduce wound healing issues and optimize aesthetic outcomes, we do not recommend perfecting thigh lift together with abdominal or truncal contouring procedures in both MWL and MMA patients [43]. The tension created by a medial thigh lift, which is opposite to the upward and lateral pull of abdominal procedures, can complicate healing. The optimal approach is to perform thigh contouring in a separate stage after completing abdominal contouring. The positioning for the thigh lift varies according to the surgeon's preference and typically involves the frog leg position or gynecological position. However, some surgeons prefer to suture the posterior part of the incision with patients in a prone position [46].

3.3.5. Liposuction to Reduce Volume

For patients with both significant skin laxity and considerable lipodystrophy, thus, we recommend performing a preliminary debulking liposuction and, after that, proceeding with the skin excisional surgery for the affected area. This strategy can significantly improve the body contour in the end because it provides sufficient time for contraction of the skin,

which is particularly beneficial for limb areas, the arms, and medial thighs [47]. However, opting for liposuction together with excisional surgery in the same stage, it is always advisable to adopt a more conservative volume in the liposuction procedure. This helps minimize the risk of postoperative swelling and the potential recurrence of laxity. However, the outcome might not be maximized.

3.3.6. Post-Bariatric Facial Surgeries

Weight loss can lead to the stretching of facial skin and soft tissues. After losing substantial amounts of fat, individuals may experience sagging, atrophic facial features, including jowls and noticeable submental laxity. A strong association exists between significant weight loss and accelerating facial aging. The most pronounced loss of fat volume is observed in the mid-cheek region, accompanied by increased skin laxity in the central neck. Studies have indicated that individuals who have undergone substantial weight reduction tend to appear older than their actual age. This accelerated aging process is primarily attributed to fat volume depletion and a decrease in skin elasticity [48]. The MMA population has increasingly recognized this issue, sparking discussions in the media regarding the so-called "Ozempic Face", which is characteristic of significant weight loss. To address these facial features effectively, face and neck lift procedures are recommended. Patients who have undergone significant weight loss typically present with greater skin redundancy than those without such a history, necessitating more extensive skin undermining to adequately address both the excess tissue and achieve optimal Superficial Musculoaponeurotic System (SMAS) contouring [49]. In addition to skin laxity, most of these patients present important laxity in the neck area, particularly platysma bands, which need to be addressed despite their younger age [50]. Adding fat grafting in the areas of major facial volume loss can be beneficial for those patients. Generally, weight loss patients need more volume than those undergoing standard facial rejuvenation procedures [51–53]. Facial aesthetic surgery can be safely combined with body contouring or breast procedures in MMA patients.

3.4. Staging Surgeries for Patients After Moderate Medication-Assisted Weight Loss

The staging approach for MWL and MMA patients differs. In MMA patients, it is safe and, therefore, common to perform several procedures in one stage, opt for less extensive excisions, and potentially use adjuncts like energy devices (for example, ultrasound-assisted liposuction or radiofrequency skin tightening) during the excisional surgery [54,55]. Conversely, for massive weight loss patients, who often have lower tissue quality, we avoid combining energy devices with excisional surgery. This is because their compromised tissue quality makes them more susceptible to recurring laxity even after surgery. To manage this issue, energy devices are employed as supplementary treatments to tackle the recurring laxity, typically 6 to 12 months following the excisional surgery in the affected area.

4. Discussion

The management of patients undergoing body contouring following significant weight loss, whether through bariatric surgery or medication-assisted approaches (MMA), presents distinct challenges that require comprehensive assessment and individualized planning. This narrative review emphasizes the clinical considerations surrounding preoperative evaluation, risk stratification, and surgical staging in this unique patient population, with a special focus on the emerging implications of GLP-1 receptor agonists such as semaglutide and tirzepatide.

4.1. Patient Assessment

Preoperative preparation is essential for successful surgical outcomes. Patients with a history of bariatric surgery often present nutritional deficiencies, including iron, vitamin

B12, calcium, and protein, which may compromise wound healing and increase surgical risk if uncorrected. Iron deficiency anemia and vitamin B12 deficiency are the most reported causes of anemia following bariatric surgery. Among these, iron deficiency is particularly prevalent and clinically significant, with reported rates ranging from 12 to 53% in adults and 30 to 70% in adolescents [56]. Anemia affects approximately 30% of post-bariatric patients and is a notable contributor to perioperative morbidity. Iron deficiency anemia is frequently associated with reduced preoperative hemoglobin levels and delayed postoperative hemoglobin recovery, increasing the likelihood of red blood cell transfusion requirements [57]. Therefore, all bariatric surgery candidates should undergo preoperative screening for anemia, with heightened vigilance in patients at risk for substantial blood loss ($\geq$500 mL) or transfusion. In these cases, preoperative iron repletion can improve hemoglobin concentrations and iron reserves, thereby reducing postoperative anemia and transfusion needs [57]. Additionally, the performance of combined surgical procedures should be avoided in patients with anemia or high bleeding risk to minimize complications. For MMA patients, medications like semaglutide and tirzepatide may affect gastric emptying and insulin regulation, complicating perioperative management [41,42]. GLP-1 agonist therapies are also associated with reductions in serum protein, vitamin B12, and zinc levels, further contributing to impaired wound healing.

BMI and weight stability are critical factors in determining surgical candidacy. Patients with a BMI over 30 kg/m^2, particularly those who have experienced significant weight loss, are at higher risk for postoperative complications. Weight stability, ideally for six months, helps reduce risks and ensures that medical conditions stabilize before surgery [13–15]. Fat distribution is also important for planning procedures. Male patients often have more visceral fat, which complicates abdominal contouring, while those with higher BMI may still have substantial subcutaneous fat, necessitating functional procedures such as panniculectomy or reduction mammaplasty [15].

Despite improvements in obesity-related comorbidities after weight loss, conditions like diabetes, hypertension, cardiovascular disease, and NAFLD require ongoing management. Bariatric surgery may mitigate diabetes in many cases, but insulin resistance may persist, requiring glucose monitoring and medication adjustments [16–18].

Lifestyle factors, such as smoking and alcohol use, significantly affect surgical outcomes. Smoking increases the risk of wound complications, and smoking cessation at least four weeks before surgery is recommended. Similarly, risky alcohol use further exacerbates surgical risks [27,28]. Social support is essential for successful recovery. Barriers such as financial constraints and lack of recovery support can hinder access to surgery, underscoring the need for comprehensive support systems [29]. Nutritional optimization before surgery is vital, especially in bariatric surgery patients, to address protein-calorie malnutrition and ensure adequate intake of vitamins and minerals. Protein intake (1–2 g/kg/day) is crucial for wound healing and improves recovery outcomes [32,33].

Postoperative care to prevent complications such as deep vein thrombosis (DVT) is crucial, especially for patients with higher BMI and multiple surgical sites. Prophylactic measures, including compression devices and chemoprophylaxis, are essential. Careful risk stratification is needed for optimal outcomes [32,33].

4.2. Staging the Surgeries

Surgical staging in body contouring procedures should be individualized based on tissue quality, surgical risk, and patient goals. MMA patients, particularly those treated with GLP-1 agonists such as semaglutide, tirzepatide, or liraglutide, often maintain better skin elasticity and overall tissue quality compared to those who have experienced MWL through bariatric surgery. As a result, MMA patients may safely undergo more extensive

combination procedures in fewer surgical stages. This aligns with their typically smaller excisional requirements and more favorable tissue characteristics [58].

In contrast, MWL patients frequently present with significant skin redundancy and poorer tissue quality, necessitating a staged surgical approach to reduce operative risk and accommodate the extent of excisions required. For these patients, procedures such as abdominoplasty, breast surgery, thigh lift, and liposuction must be tailored to the individual's anatomy, health status, and aesthetic priorities.

The use of energy-based devices in conjunction with excisional surgery in MWL patients remains debated. While they may enhance skin tightening, outcomes can be suboptimal in patients with poor dermal quality. In such cases, a staged surgical approach may offer better aesthetic and functional results [44,54].

Postoperative outcomes in GLP-1 agonist users are generally comparable to non-users; however, emerging evidence suggests that semaglutide use in non-diabetic patients may increase the risk of complications, including wound dehiscence, delayed healing, and gastrointestinal disturbances [58]. These adverse outcomes are hypothesized to result from GLP-1 receptor-induced protein malnutrition and impaired immune function. Interestingly, such complications appear less pronounced in diabetic patients, possibly due to improved glycemic control mitigating surgical risk.

4.3. Limitations

This narrative review has several limitations that should be acknowledged. First, unlike systematic reviews, narrative reviews do not follow a very strict, predefined, and replicable methodology for literature search and selection. As such, there is an inherent risk of selection bias, where certain studies may be unintentionally excluded based on accessibility or publication prominence rather than objective criteria. This lack of standardization may influence the comprehensiveness and balance of the evidence presented.

Second, this narrative format may introduce some degree of subjectivity, as the interpretation and emphasis of included studies are influenced by the authors' clinical experience and perspectives. While this can offer valuable expert insight, it may also contribute to author bias in framing the discussion and synthesizing evidence.

Nevertheless, the literature in this area is characterized by significant heterogeneity. Studies vary widely in terms of patient populations (e.g., post-bariatric versus medication-assisted weight loss), preferred surgical techniques, comorbidity profiles, and outcome measures. This variability limits the ability to draw definitive or generalizable conclusions and prevents meaningful cross-study comparisons.

Another limitation is the relative lack of high-quality comparative studies between post-bariatric and pharmacologic weight loss patients undergoing body contouring. As a result, certain insights presented in this review rely on extrapolated data or isolated clinical observations, highlighting the need for further research to fill these evidence gaps.

The field of medication-assisted weight loss—particularly involving agents such as GLP-1 receptor agonists—is rapidly evolving. The current body of literature is still emerging, and new findings may quickly outdate some of the content discussed herein. This underscores the importance of ongoing review and reassessment as more long-term data become available.

Finally, publication bias may have influenced the body of literature available for review. Studies reporting favorable outcomes or novel surgical approaches are more likely to be published, potentially skewing the overall representation of risks, complications, and long-term efficacy in this patient population.

4.4. Implications for Future Research and Practice

There is a critical need for prospective, controlled studies to isolate the effects of GLP-1 agonists from confounding variables such as prior bariatric procedures, baseline nutritional status, and demographic heterogeneity. Standardizing variables such as protein intake, BMI, and surgical staging across study cohorts will be essential to accurately determine causal relationships.

As the use of GLP-1 agonists becomes more widespread in aesthetic and post-weight-loss surgery populations, surgical teams must adapt by implementing standardized protocols for preoperative nutritional optimization and individualized surgical staging. Future research should aim to control confounding variables such as BMI, race, type of weight loss intervention, and comorbidities to better elucidate the mechanisms driving postoperative complications and inform evidence-based guidelines.

Future research should also explore the impact of GLP-1 agonists on surgical outcomes based on their indication (e.g., diabetes vs. obesity) and duration of use. Stratifying patients by the type of bariatric procedure, such as sleeve gastrectomy versus Roux-en-Y gastric bypass, may help identify differing complication profiles. Additionally, longitudinal studies assessing the durability of weight loss and aesthetic outcomes following the discontinuation of GLP-1 agonists would offer valuable clinical insights.

5. Conclusions

The intersection of pharmacologic and surgical weight loss strategies is transforming the landscape of body contouring surgery. For patients who have achieved massive weight loss (MWL), whether through medical or surgical means, a structured and comprehensive preoperative protocol is essential. This includes the management of comorbidities, strategic staging of procedures, and maintaining efficiency in the operating room to enhance safety and minimize postoperative complications.

While GLP-1 receptor agonists offer a highly effective option for weight reduction and eligibility for body contouring surgery, they also introduce novel perioperative considerations that require thorough evaluation.

Surgeons must assess several factors when planning body contouring procedures, including the method and degree of weight loss, current Body Mass Index (BMI), maximum lifetime weight and its stability, smoking status, and the presence of adequate social support. In terms of surgical planning, it is advisable to limit combined procedures to an anesthesia duration of no more than six hours. The staging of surgeries should be patient-centered, prioritizing the areas of greatest concern in the initial stage whenever feasible.

Notably, patients undergoing moderate medical-assisted (MMA) weight loss may often be managed in fewer operative stages compared to MWL patients. This is largely due to the typically smaller excisions required and better tissue quality in MMA patients, which allows for the safe treatment of multiple anatomical areas in a single session.

Author Contributions: Conceptualization, S.G., A.S., P.d.S., and C.M.O.; methodology, S.G., A.S., P.d.S., and C.M.O.; validation, S.G., A.S., and C.M.O.; formal analysis, S.G., A.S., and C.M.O.; investigation, S.G., A.S., and C.M.O.; resources, S.G., A.S., P.d.S., and C.M.O.; data curation, S.G.; writing—original draft preparation, S.G.; writing—review and editing, S.G., A.S., and C.M.O.; visualization, S.G.; supervision, S.G., A.S., P.d.S., and C.M.O.; project administration, S.G.; funding acquisition, S.G. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: No new data were created or analyzed in this study. Data sharing is not applicable to this article.

Conflicts of Interest: The authors declare no conflicts of interest.

Abbreviations

The following abbreviations are used in this manuscript:

GLP-1	Glucagon-like peptide-1
HbA1c	Glycated Hemoglobin
MWL	Massive weight loss
MMA	Moderate Medication-Assisted Weight Loss
NAFLD	Non-alcoholic fatty liver disease
SMAS	Superficial Musculoaponeurotic System

References

1. Lazzati, A. Epidemiology of the surgical management of obesity. *J. Visc. Surg.* **2023**, *160*, S3–S6. [CrossRef] [PubMed]
2. Angrisani, L.; Santonicola, A.; Iovino, P.; Palma, R.; Kow, L.; Prager, G.; Ramos, A.; Shikora, S.; Collaborative Study Group for the IFSO Worldwide Survey. IFSO Worldwide Survey 2020–2021: Current Trends for Bariatric and Metabolic Procedures. *Obes. Surg.* **2024**, *34*, 1075–1085. [CrossRef] [PubMed]
3. Giordano, S.; Victorzon, M.; Stormi, T.; Suominen, E. Desire for body contouring surgery after bariatric surgery: Do body mass index and weight loss matter? *Aesthet. Surg. J.* **2014**, *34*, 96–105. [CrossRef] [PubMed]
4. Giordano, S.; Victorzon, M.; Koskivuo, I.; Suominen, E. Physical discomfort due to redundant skin in post-bariatric surgery patients. *J. Plast. Reconstr. Aesthet. Surg.* **2013**, *66*, 950–955. [CrossRef] [PubMed]
5. Humphrey, C.D.; Lawrence, A.C. Implications of Ozempic and Other Semaglutide Medications for Facial Plastic Surgeons. *Facial Plast. Surg.* **2023**, *39*, 719–721. [CrossRef] [PubMed]
6. Malhotra, A.; Grunstein, R.R.; Fietze, I.; Weaver, T.E.; Redline, S.; Azarbarzin, A.; Sands, S.A.; Schwab, R.J.; Dunn, J.P.; Chakladar, S.; et al. Tirzepatide for the Treatment of Obstructive Sleep Apnea and Obesity. *N. Engl. J. Med.* **2024**, *391*, 1193–1205. [CrossRef] [PubMed]
7. Ryan, D.H.; Lingvay, I.; Deanfield, J.; Kahn, S.E.; Barros, E.; Burguera, B.; Colhoun, H.M.; Cercato, C.; Dicker, D.; Horn, D.B.; et al. Long-term weight loss effects of semaglutide in obesity without diabetes in the SELECT trial. *Nat. Med.* **2024**, *30*, 2049–2057. [CrossRef] [PubMed]
8. Daniel, M.; Al Dhib, R.; Mendoza, M.; Tisekar, S.N.; Cingireddy, A.R.; Essani, B.; Mahashabde, R.; Maddineni, S.A.; Kamel, M. Understanding and Managing Metabolic Deficiencies Post Bariatric and Esophagectomy Surgeries: A Narrative Review of the Literature. *Cureus* **2024**, *16*, e60192. [CrossRef] [PubMed]
9. Bossert, R.P.; Rubin, J.P. Evaluation of the weight loss patient presenting for plastic surgery consultation. *Plast. Reconstr. Surg.* **2012**, *130*, 1361–1369. [CrossRef] [PubMed]
10. Rocha, R.I.; Junior, W.C.; Modolin, M.L.A.; Takahashi, G.G.; Caldini, E.T.E.G.; Gemperli, R. Skin Changes Due to Massive Weight Loss: Histological Changes and the Causes of the Limited Results of Contouring Surgeries. *Obes. Surg.* **2021**, *31*, 1505–1513. [CrossRef] [PubMed]
11. Reiss, A.B.; Gulkarov, S.; Lau, R.; Klek, S.P.; Srivastava, A.; Renna, H.A.; De Leon, J. Weight Reduction with GLP-1 Agonists and Paths for Discontinuation While Maintaining Weight Loss. *Biomolecules* **2025**, *15*, 408. [CrossRef] [PubMed]
12. Wilding, J.P.H.; Batterham, R.L.; Calanna, S.; Davies, M.; Van Gaal, L.F.; Lingvay, I.; McGowan, B.M.; Rosenstock, J.; Tran, M.T.; Wadden, T.A.; et al. Once-Weekly Semaglutide in Adults with Overweight or Obesity. *N. Engl. J. Med.* **2021**, *384*, 989–1002. [CrossRef] [PubMed]
13. Hulst, A.H.; Polderman, J.A.W.; Siegelaar, S.E.; van Raalte, D.H.; DeVries, J.H.; Preckel, B.; Hermanides, J. Preoperative considerations of new long-acting glucagon-like peptide-1 receptor agonists in diabetes mellitus. *Br. J. Anaesth.* **2021**, *126*, 567–571. [CrossRef] [PubMed]
14. Nauck, M.A.; Kemmeries, G.; Holst, J.J.; Meier, J.J. Rapid tachyphylaxis of the glucagon-like peptide 1-induced deceleration of gastric emptying in humans. *Diabetes* **2011**, *60*, 1561–1565. [CrossRef] [PubMed Central]
15. Almutairi, K.; Gusenoff, J.A.; Rubin, J.P. Body Contouring. *Plast. Reconstr. Surg.* **2016**, *137*, 586e–602e. [CrossRef] [PubMed]
16. Simman, R.; Abbas, F.T.; Gordon, D. The role of the plastic surgeon in wound care. *Wounds* **2023**, *35*, E102–E106. [CrossRef] [PubMed]

17. Wang, Z.; Crowe, F.L.; Tahrani, A.A.; Singh, P.; Wang, J.; Tan, L.; Nirantharakumar, K.; Hazlehurst, J. The effect of bariatric surgery on diabetes-related foot complications among patients with type 2 diabetes: A systematic review. *J. Diabetes Complicat.* **2024**, *38*, 108813. [CrossRef] [PubMed]
18. Sandoval, D.A.; Patti, M.E. Glucose metabolism after bariatric surgery: Implications for T2DM remission and hypoglycaemia. *Nat. Rev. Endocrinol.* **2023**, *19*, 164–176. [CrossRef] [PubMed]
19. Obeso-Fernández, J.; Millan-Alanis, J.M.; Sáenz-Flores, M.; Rodríguez-Bautista, M.; Medrano-Juarez, S.; Oyervides-Fuentes, S.; Gonzalez-Cruz, D.; Manzanares-Gallegos, D.M.; González-González, J.G.; Rodríguez-Gutiérrez, R. Benefits of metabolic surgery on macrovascular outcomes in adult patients with type 2 diabetes: A systematic review and meta-analysis. *Surg. Obes. Relat. Dis.* **2023**, *20*, 202–212. [CrossRef] [PubMed]
20. Fernandez, A.C.; Bohnert, K.M.; Bicket, M.C.; Weng, W.; Singh, K.; Englesbe, M. Adverse Surgical Outcomes Linked to Co-occurring Smoking and Risky Alcohol Use Among General Surgery Patients. *Ann. Surg.* **2023**, *278*, 201–207. [CrossRef] [PubMed]
21. Zavlin, D.; Jubbal, K.T.; Balinger, C.L.; Dinh, T.A.; Friedman, J.D.; Echo, A. Impact of Metabolic Syndrome on the Morbidity and Mortality of Patients Undergoing Panniculectomy. *Aesthet. Plast. Surg.* **2017**, *41*, 1400–1407. [CrossRef] [PubMed]
22. Escobar-Domingo, M.J.; Taritsa, I.C.; Mahmoud, A.-A.; Fanning, J.E.; Alvarez, A.H.; Escobar-Domingo, D.P.; Foppiani, J.; Lee, D.; Schuster, K.; Lin, S.J.; et al. The Impact of Metabolic Syndrome on Postoperative Outcomes in Abdominal Body Contouring: A Propensity Score-Matched Nationwide Analysis. *Aesthet. Plast. Surg.* **2024**, *48*, 4168–4177. [CrossRef] [PubMed]
23. Chiang, C.L.; Huang, H.H.; Huang, T.Y.; Shih, Y.L.; Hsieh, T.Y.; Lin, H.H. Nonalcoholic Fatty Liver Disease Associated With Bladder Cancer. *Am. J. Med. Sci.* **2020**, *360*, 161–165. [CrossRef] [PubMed]
24. Kim, S.; Jung, J.-H.; Han, K.; Koh, S.-J.; Im, J.P.; Kim, B.G.; Kim, J.S.; Lee, H.J. Association between nonalcoholic fatty liver disease and risk of early onset colorectal cancer. *Clin. Gastroenterol. Hepatol.* **2025**, *9*, S1542-3565(25)00344-1. [CrossRef] [PubMed]
25. Ssentongo, P.; Ssentongo, A.E.; Dykes, T.; Pauli, E.M.; Soybel, D.I. Nonalcoholic Fatty Liver Disease as a High-Value Predictor of Postoperative Hyperglycemia and Its Associated Complications in Major Abdominal Surgery. *J. Am. Coll. Surg.* **2018**, *227*, 419–429.e6. [CrossRef] [PubMed]
26. Sabench, F.; Bertran, L.; Vives, M.; París, M.; Aguilar, C.; Martínez, S.; Binetti, J.; Real, M.; Alibalic, A.; Richart, C.; et al. NASH Presence is Associated with a Lower Weight Loss One and 2 Years After Bariatric Surgery in Women with Severe Obesity. *Obes. Surg.* **2022**, *32*, 3313–3323. [CrossRef] [PubMed]
27. Gormsen, J.; Hjørne, F.; Helgstrand, F. Cotinine Test in Evaluating Smoking Cessation at the Day of Bariatric Surgery. *Scand. J. Surg.* **2020**, *109*, 265–268. [CrossRef] [PubMed]
28. Bloom, J.A.; Rashad, R.; Chatterjee, A. The Impact on Mortality and Societal Costs From Smoking Cessation in Aesthetic Plastic Surgery in the United States. *Aesthet. Surg. J.* **2019**, *39*, 439–444. [CrossRef] [PubMed]
29. Marchica, P.; Costa, A.L.; Brambullo, T.; Marini, M.; Masciopinto, G.; Gardener, C.; Grigatti, M.; Bassetto, F.; Vindigni, V. Retrospective Analysis of Predictive Factors for Complications in Abdominoplasty in Massive Weight Loss Patients. *Aesthet. Plast. Surg.* **2023**, *47*, 1447–1458. [CrossRef] [PubMed]
30. Al-Sumaih, I.; Donnelly, M.; O'Neill, C. Sociodemographic characteristics of patients and their use of post-bariatric contouring surgery in the US. *BMC Health Serv. Res.* **2022**, *22*, 308. [CrossRef] [PubMed]
31. Ellison, J.M.; Steffen, K.J.; Sarwer, D.B. Body Contouring After Bariatric Surgery. *Eur. Eat. Disord. Rev.* **2015**, *23*, 479–487. [CrossRef] [PubMed]
32. Austin, R.E.; Lista, F.; Khan, A.; Ahmad, J. The Impact of Protein Nutritional Supplementation for Massive Weight Loss Patients Undergoing Abdominoplasty. *Aesthet. Surg. J.* **2016**, *36*, 204–210. [CrossRef] [PubMed]
33. Seth, I.; Lim, B.; Cevik, J.; Gracias, D.; Chua, M.; Kenney, P.S.; Rozen, W.M.; Cuomo, R. Impact of nutrition on skin wound healing and aesthetic outcomes: A comprehensive narrative review. *JPRAS Open* **2024**, *39*, 291–302. [CrossRef] [PubMed]
34. Humar, P.; Robinson, B. Preparing Patients for Body Contouring Surgery and Postoperative Surveillance for Deep Venous Thrombosis. *Clin. Plast. Surg.* **2024**, *51*, 1–6. [CrossRef] [PubMed]
35. Pannucci, C.J.; MacDonald, J.K.; Ariyan, S.; Gutowski, K.A.; Kerrigan, C.L.; Kim, J.Y.; Chung, K.C. Benefits and Risks of Prophylaxis for Deep Venous Thrombosis and Pulmonary Embolus in Plastic Surgery: A Systematic Review and Meta-Analysis of Controlled Trials and Consensus Conference. *Plast. Reconstr. Surg.* **2016**, *137*, 709–730. [CrossRef] [PubMed]
36. Neeman, E.; Liu, V.; Mishra, P.; Thai, K.K.; Xu, J.; Clancy, H.A.; Schlessinger, D.; Liu, R. Trends and Risk Factors for Venous Thromboembolism Among Hospitalized Medical Patients. *JAMA Netw. Open* **2022**, *5*, e2240373. [CrossRef] [PubMed]
37. Basta, M.N.; Mirzabeigi, M.N.; Shubinets, V.; Kelz, R.R.; Williams, N.N.; Fischer, J.P. Predicting incisional hernia after bariatric surgery: A risk stratification model based upon 2161 operations. *Surg. Obes. Relat. Dis.* **2016**, *12*, 1466–1473. [CrossRef] [PubMed]
38. Song, A.Y.; Jean, R.D.; Hurwitz, D.J.; Fernstrom, M.H.; Scott, J.A.; Rubin, J.P. A classification of contour deformities after bariatric weight loss: The Pittsburgh rating scale. *Plast. Reconstr. Surg.* **2005**, *116*, 1535–1544. [CrossRef] [PubMed]
39. Haykal, D.; Cartier, H.; Rossi, A.; Margara, A.; du Crest, D. The art of a successful cosmetic consultation in 2023. *J. Eur. Acad. Dermatol. Venereol.* **2023**, *37*, e1166–e1167. [CrossRef] [PubMed]

40. Hardy, K.L.; Davis, K.E.; Constantine, R.S.; Chen, M.; Hein, R.; Jewell, J.L.; Dirisala, K.; Lysikowski, J.; Reed, G.; Kenkel, J.M. The impact of operative time on complications after plastic surgery: A multi-variate regression analysis of 1753 cases. *Aesthet. Surg. J.* **2014**, *34*, 614–622. [CrossRef] [PubMed]
41. Gulak, M.A.; Murphy, P. Regurgitation under anesthesia in a fasted patient prescribed semaglutide for weight loss: A case report. *Can. J. Anaesth.* **2023**, *70*, 1397–1400. [CrossRef] [PubMed]
42. Bello, N.T. Update on drug safety evaluation of naltrexone/bupropion for the treatment of obesity. *Expert Opin. Drug Saf.* **2019**, *18*, 549–552. [CrossRef] [PubMed]
43. Giordano, S. Removal of excess skin after massive weight loss: Challenges and solutions. *Open Access Surg.* **2015**, *8*, 51–60. [CrossRef]
44. Giordano, S.; Kangas, R.; Veräjänkorva, E.; Koskivuo, I. Ligasure Impact™ might reduce blood loss, complications, and re-operation occurrence after abdominoplasty in massive-weight-loss patients: A Comparative Study. *Scand. J. Surg.* **2020**, *109*, 151–158. [CrossRef] [PubMed]
45. Anlatıcı, R.; Özerdem, G.; Demiralay, S.; Özerdem, Ö.R. One-Stage Combined Postbariatric Surgery: A Series of 248 Procedures in 55 Cases. *Aesthet. Plast. Surg.* **2018**, *42*, 1591–1599. [CrossRef] [PubMed]
46. Han, H.H.; Lee, M.C.; Kim, S.H.; Lee, J.H.; Ahn, S.T.; Rhie, J.W. Upper arm contouring with brachioplasty after massive weight loss. *Arch. Plast. Surg.* **2014**, *41*, 271–276. [CrossRef] [PubMed]
47. Vindigni, V.; Marchica, P.; Pagani, A.; Bassetto, F. Inguinocrural dermolipectomy: A retrospective study. *Ann. Ital. Chir.* **2019**, *90*, 350–356. [PubMed]
48. Jafar, A.B.; Jacob, J.; Kao, W.K.; Ho, T. Soft Tissue Facial Changes Following Massive Weight Loss Secondary to Medical and Surgical Bariatric Interventions: A Systematic Review. *Aesthet. Surg. J. Open Forum.* **2024**, *6*, ojae069. [CrossRef] [PubMed]
49. Narasimhan, K.; Ramanadham, S.; Rohrich, R.J. Face lifting in the massive weight loss patient: Modifications of our technique for this population. *Plast. Reconstr. Surg.* **2015**, *135*, 397–405. [CrossRef] [PubMed]
50. Cambiaso-Daniel, J.; Giordano, S.; Agnelli, B.; Bella, L.; Gualdi, A. Neck Lift to Treat Platysma Bands and Defining Cervical Angle: A Systematic Review and Pooled Analysis. *Facial Plast. Surg.* 2024; *in press*. [CrossRef] [PubMed]
51. Schmidt, M.; Pollhammer, M.S.; Januszyk, M.; Duscher, D.; Huemer, G.M. Concomitant Liposuction Reduces Complications of Vertical Medial Thigh Lift in Massive Weight Loss Patients. *Plast. Reconstr. Surg.* **2016**, *137*, 1748–1757. [CrossRef] [PubMed]
52. Couto, R.A.; Charafeddine, A.H.; Zins, J.E. Facelift in patients with massive weight loss. *Clin. Plast. Surg.* **2019**, *46*, 559–571. [CrossRef] [PubMed]
53. De La Cruz, E. Lipoplasty in the Overweight Patient. *Clin. Plast. Surg.* **2024**, *51*, 29–43. [CrossRef] [PubMed]
54. Gentile, R.D. Renuvion/J-Plasma for Subdermal Skin Tightening Facial Contouring and Skin Rejuvenation of the Face and Neck. *Facial Plast. Surg. Clin. N. Am.* **2019**, *27*, 273–290. [CrossRef] [PubMed]
55. Kaberi-Otarod, J.; Still, C.D.; Wood, G.C.; Benotti, P.N. Iron Treatment in Patients with Iron Deficiency Before and After Metabolic and Bariatric Surgery: A Narrative Review. *Nutrients* **2024**, *16*, 3350. [CrossRef] [PubMed]
56. Neel, O.F.; Mortada, H.; Qasim, S.S.; AlNojaidi, T.F.; Alotaibi, G. Current Practices and Guidelines for Perioperative Blood Management in Post-Bariatric Body Contouring Surgery: A Comprehensive Review of Literature. *Aesthet. Plast. Surg.* **2023**, *47*, 1462–1471. [CrossRef] [PubMed]
57. Toms, J.A., 3rd; O'Neill, E.; Wiegmann, A.L.; Adepoju, J.; Raj, M.S. Prevalence Patterns of Body Contouring Procedures Among Injectable Glucagon-like Peptide-1 Receptor Agonist Users. *Aesthet. Surg. J.* **2024**, *44*, 1072–1079. [CrossRef] [PubMed]
58. Lewis, J.E.; Ghogomu, M.; Hickman, S.J.; Ashade, A.; Hollis, R.J.; E Lewis, J.; Lee, W.-C. Semaglutide and Postoperative Outcomes in Nondiabetic Patients Following Body Contouring Surgery. *Aesthet. Surg. J.* **2025**, *45*, 381–386. [CrossRef] [PubMed]