

Upper Body Contouring after Massive Weight Loss

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ABSTRACT

After massive weight loss (MWL), skin redundancy remains an aesthetic and functional problem that remains amenable only by surgical excision. Upper body deformities include the arms, breast/chest and back. **Aim of work:** To classify the various upper body deformities with view to surgical approach. **Patients and methods:** MWL patients were classified according to position of the lateral inframammary folds and offered corrective surgery – either as isolated procedures or in the form of an upper body lift. **Results:** 26 patients were included in the study, 17 of which had a descended lateral IMF. A total of six patients underwent an upper body lift procedure. Complication rate was 23% and was correlated with the presenting body mass index. **Conclusion:** the lateral inframammary fold position is a good tool for classifying patients into a group that requires isolated procedures to treat the upper body deformity (mastopexy/brachioplasty), and a group that needs a unit approach known as the upper body lift.

Keywords: Upper body contouring - massive weight loss – upper body lift – brachioplasty – mastopexy.

INTRODUCTION

Obesity has become a global epidemic, associated with many conditions that may lead to increased morbidity and early death. More than one billion people living today are considered to overweight or obese⁽¹⁾. Over the last years, several bariatric procedures have been on the rise to treat obesity. However, weight loss by these methods usually results in redundant skin in the abdomen, breast, arm and thighs⁽²⁾.

Massive weight loss (MWL) is defined as loss of more than 50 pounds body weight in a deliberate fashion⁽³⁻⁵⁾. These patients are left with unique deformities in the upper and lower body, that often present a challenge to the plastic surgeon⁽⁶⁾. While correction of the lower body in the form of circumferential type body lifts combined with thigh lifting procedures will improve the truncal deformity, the deformity in the upper body and breasts leaves the patient with an incomplete result⁽⁵⁾.

A variety of surgical options are available, ranging from upper body lift for extensive deformities to brachioplasty and/or breast surgery as individual procedures for more limited problems⁽⁷⁻¹³⁾. It was suggested that the position of the lateral inframammary fold (IMF) can be used to determine whether the upper body needed to be lifted as one unit – a descended lateral IMF denotes upper back laxity, and will need a form of body lift to correct it⁽¹⁴⁾. A body lift procedure

aims to correct any epigastric looseness while elevating the IMF, excise excess chest/back rolls, shape the breasts in females (and chest deformity in males), in addition to a brachioplasty procedure that is usually needed^(6,13, 14-16).

Upper body lifts have further been described as being one of three patterns – male pattern, female pattern type I: for patients with extensive upper back deformity where scars will cross along the back similar to male pattern), and female pattern type II: for patients with a minimal upper back deformity where scars can be avoided. Female pattern type 2 lift will eliminate the lateral thoracic excess through extending the brachioplasty incision into the IMF⁽¹⁴⁾.

Aim of the Work

The aim of this study was to classify upper body deformities after massive weight loss using the position on the inframammary fold, in an attempt to guide the surgical approach for this unique group of patients. This was in addition to evaluating the different options available for correction of the upper body deformity in terms of patient selection, surgical techniques, postoperative outcome and patient satisfaction.

PATIENTS AND METHODS

The study was conducted on 26 patients requesting upper body contouring after massive weight loss (MWL). All patients presented at

Kasr El Ainy University Hospitals from June 2012 to July 2014.

Inclusion Criteria:

MWL was defined as losing 23 kilograms (50 pounds) or more, by means of bariatric procedures or self-weight loss through diet and exercise. This weight loss had to be stable for at least three months. Upper body contouring criteria included patients requesting correction of at least two deformities of the upper body viz. arms, breasts/anterior chest, lateral thorax and upper back.

Exclusion Criteria:

Exclusion criteria included patients with uncontrolled medical illness, patients with uncorrected nutritional deficiencies and patients who have undergone any type of plastic surgery procedure to the upper body prior to weight loss.

General Preoperative Evaluation:

All patients underwent extensive preoperative evaluation in the form of history taking, meticulous physical examination, complete laboratory investigations, psychiatric evaluation, and relevant tests for assessment of general condition and comorbidities. A detailed history of weight loss was obtained regarding the method used (bariatric surgery or diet and exercise), date of commencement, surgery details with post-operative course, and the bariatric surgery team contact details. Body Mass Index (BMI) prior to weight loss and at presentation was recorded and BMI drop calculated. Last visit to the bariatric surgeon and nutrition specialist was also documented.

Patients were classed according to their BMI range as follows:

Class A: BMI <25 kg/m²

Class B: BMI 25 – 30 kg/m²

Class C: BMI >30 kg/m²

Evaluation of the Upper Body:

The different areas of the upper body were assessed individually for the type and grade of deformity. The upper body unit was also evaluated as a whole for the possibility of a total upper body lift. The first thing that was determined was the position of the lateral inframammary fold (IMF). This was done by examining the patient in the upright position with the arms slightly abducted from the chest wall. The arms were examined while abducted and elbows flexed both at 90 degrees. Simple pinching techniques were used to assess the skin

fat envelope, the extent of laxity distally and proximally. Breasts were then examined in the upright position to determine the position of the anterior and lateral inframammary fold, size and position of the nipple areola complex (NAC), the degree of ptosis, overall breast volume in relation to the overall body habitus, projection and fullness of the different poles of the breast and symmetry with regards to all the previous aspects. The male chest was similarly examined in the upright position to determine the level of the NAC and inframammary fold/roll, the extension of the lateral inframammary fold onto the back, in addition to chest hair distribution. The lateral thoracic excess was assessed in continuation of the arm laxity across the axilla, and the back excess similarly in continuation of the lateral IMF.

Assessment for Surgical Approach:

Guided by the position of the lateral IMF that is indicative of significant lateral thoracic and upper back excess, patients were classified into two groups.

Group 1: This group did not have a descended lateral IMF or back rolls. The members of this group were assessed to be candidates for isolated upper body contouring procedures eg. brachioplasty and mastopexy or pseudogynecomastia correction.

Group 2: This group had a descended lateral IMF that was indicative of significant lateral thoracic and upper back excess (Figure 1). The members of this group were assessed for and offered an upper body lift procedure.



Fig. (1): Descent of the lateral inframammary fold in a male (left) and female (right) patient, both belonging to Group 2

Formulation of Plan, Counseling and Consent:

In light of this analysis, patients were offered either isolated procedures or an upper body lift depending on the position of the IMF. A surgical plan was devised and discussed with the patients. The positions and extents of incision lines were drawn on the patients for better understanding of the procedure, together with manually lifting tissues into the intended scar positions. Complications were thoroughly explained, including the early complications such as wound dehiscence and seromas in addition to late procedure specific complications such as ugly scarring in the arms and overall scar migration on the back and possibly of the IMF. An informed consent was obtained at the end of this detailed counseling session.

Surgical Techniques:

According to the previous grouping, and guided by the patients' preferences and convictions, patients underwent either isolated procedure for correction of upper body deformities, or an upper body lift for a global correction of the upper body. Liposuction was combined with some of these excisional procedures.

- Brachioplasty markings were drawn using the double ellipse^(10,11,14) technique (Figure 2). The incision started at the distal end of the inner ellipse down to the fascia, and excision was performed by a segmental resection and closure technique to ensure adequate tension. A Z-plasty was performed to break the incision at the level of the axilla.
- For patients who underwent isolated mastopexy or reduction mammoplasty, a central pedicle technique was combined with a Wise pattern or circumvertical (Figure 2) skin excision pattern depending on the degree of skin excess. The option of autologous breast augmentation using breast flaps or excess dermofat flaps was explored where indicated.
- The upper body lift techniques used were those described by Aly and Soliman^(6,14). Male patients had a free NAC graft, and female patients had a class II upper body lift. All incisions were closed in 2 layers over suction drains - the first layer compromised of interrupted subdermal 2/0 Vicryl® sutures, followed by a running subcuticular 4/0 Monocryl® stitch.

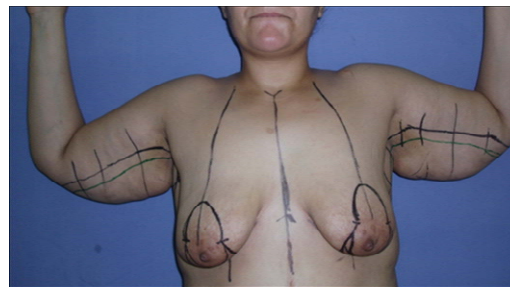


Fig. (2): Preoperative markings for a double ellipse brachioplasty and circumvertical pattern mastopexy

Male pattern upper body lift - Markings (figure 3) were done using a combination of skin pinching and tissue displacement/lifting. The expected incision line at the inferior border of the pectoralis major muscle was marked with the tissues displaced inferiorly. The procedure was started in the lateral position with the brachioplasty. The superior border of the back ellipse was then incised to the deep fascia and a flap is dissected inferiorly down to the proposed inferior level of resection. The inferiorly based flap was then elevated superiorly with the shoulders pushed inferiorly and the flap was tailored to the superior incision. After wound closure, the patient is turned to the opposite side and the same procedure performed. The patient is then placed in the supine position for the breast/chest surgery. The IMF marking is incised down to the fascia and a flap dissected superiorly up to the level of the second rib. The inferior edge of the incision was then secured to the periosteum at the level of the inferior border of the pectoralis major muscle along the length of the IMF using Vicryl® 0 sutures. After that, full thickness NAC graft was harvested with a diameter of 3 cm. The upper flap was then pulled down over the secured inferior flap, and incised. Closure was accomplished in 2 layers over suction drainage. After the procedure was repeated on the other side, the positions of the beds for the grafts were marked and deepithelialized. This was marked slightly lateral to the breast meridian, 2-3 cm above the IMF closure. The NAC grafts were applied and bolstered with tie-over sutures.



Fig. (3): Markings for Male pattern upper body lift – anterior and posterior views

Female Pattern Upper Body Lift - A type II upper body lift was used in female patients (figure 4). The brachioplasty markings were done using the double-ellipse technique. Next, the Wise pattern markings were done for the mastopexy/mammoplasty procedure. At the lateral end of the Wise pattern, the lateral thoracic excess was defined by a pinch technique, and an ellipse of excision planned to meet the brachioplasty markings. The procedure was started in the supine position, with the mastopexy part of the lift. This was done by same technique described for the patients who underwent isolated procedures. Reverse abdominoplasty through the IMF incision was considered in patients with significant upper abdominal laxity. The edge of the abdominal resection was secured to the periosteum of the 6th rib using a series of PDS® 0 suture across the new IM. Alternatively, his redundant upper abdominal tissue was deepithelialized and fashioned as a laterally based flap for autologous breast augmentation where appropriate. Having completed the mastopexy on both sides and securing the IMF in an elevated position, the brachioplasty part of the lift was then done using the same techniques described for patients who underwent isolated procedures. After brachioplasty was complete on one side, the elliptical incision for removal of the lateral

thoracic excess was made. This was fashioned to come out of the brachioplasty incision to meet the lateral part of the IMF. Minimal undermining was done, and the edges were sutured to the underlying periosteum and fascia using PDS® 0 sutures. All the wounds were closed in 2 layers as described previously, and suction drains were used for the arm and lateral thoracic excisions.



Fig. (4): Lateral view of markings for female upper body lift type II, also showing lateral thoracic excess

Postoperative Care:

The arms were kept above heart level supported on pillows. No external compression was used. Drains were left until 24 hour output was less than 30 ml, and oral antibiotics were administered until the drains were out. The breasts were supported with light dressings and a soft bra, and the adhesive elastic bandaging was applied over the back/lateral thoracic incisions and was removed at 10 days.

Follow up:

After recording any general postoperative complications if any, all patients were followed up for 2 weeks for the detection of wound dehiscence, wound infection and stitch sinuses, seroma, hematoma, skin necrosis/graft loss, and numbness of the hand. Complication rates were correlated with current BMI range. Evaluation was done at 3 months for all patients and at 6 months for 20 patients. Analysis of the aesthetic result was done in terms of the degree of correction of the deformity, quality of scars, scar migration, and the need for revisional surgery. Further, patient satisfaction was assessed by direct questionnaires to be satisfied, fairly satisfied or unsatisfied.

RESULTS

Demographics:

This study included 26 patients, 3 male and 23 female patients. Their ages varied between 26 and 40 years, with an average of 30.8 years. All patients had experienced massive weight loss: 6 patients by diet and exercise (23%), and 20 patients by bariatric surgery (77%). The current Body Mass Index (BMI) of the patients ranged from 24.2 to 36.0, with an average of 30.8 kg/m². BMI of all patients has been stable for more than 3 months.

According to the current BMI range, 4% had a BMI of less than 25, 27% had a BMI between 25 and 30, and 69% had a BMI of over 30 (table 1). The BMI drop after massive weight loss was found to vary between 9.3 and 26.2, with an average of 17.4 kg/m².

Table (1): Distribution of patients in BMI range classes.

Current BMI* Class	Number	% of total
A (<25)	1	4%
B (25 – 30)	7	27%
C (>30)	18	69%

*BMI in kg/m².

All patients were free of medical comorbidities, nutritional deficiencies and major psychological disorders; and all but 2 were non-smokers

Analysis of Deformities:

Group 1: consisted of 9 patients (8 females and 1 male) with a normal position of the lateral IMF and minimal/no back excess. The patients of this group were seen as candidates of isolated procedure for different upper body deformities. The average BMI drop after weight loss in this group was 15.3 kg/m²

Group 2: consisted of 17 patients (15 females and 2 males) that showed a descended lateral IMF or significant upper back rolls. The patients of this group were seen as candidates for an upper body lift procedure. The average BMI drop after weight loss in this group was 19.5 kg/m².

Surgical Procedures Performed:

21 patients (20 females and one male) underwent isolated procedures for correction of upper body deformities; 9 were from Group 1, and 12 (out of 17 patients) were from Group 2

who refused a total upper body lift procedure. The details of these isolated procedures are shown in table (2).

Table (2): Distribution of isolated procedures performed on 21 patients.

Sex	Number	Procedure
Males	1	Simple excision of pseudogynecomastia with free NAC grafting
Females	6	Mastopexy + brachioplasty
	14	Reduction mammoplasty + brachioplasty

Two female patients from this group were seen to require an augmentation procedure for the breast deformity, but requested small breasts, and so only mastopexy was done. 5 patients (3 females and 2 males) underwent a total upper body lift. The 3 female patients had a female pattern type II upper body lift. No females underwent female type I upper body lift. Additionally, 2 female patients had an extended abdominoplasty done in the same session.

Postoperative complications:

None of the 26 patients in the study experienced any general complications in the form of the need for blood transfusion or the occurrence of deep vein thrombosis. There were also no recorded mortalities in this study. Six patients (23%) were found to have specific complications during the first 2 weeks postoperatively. Two patients had 2 complications each in the form of wound dehiscence (<2cm in width, in 3 patients, at the axillary Z-plasty in brachioplasty incision lines) and wound infection (occurred in a single smoker patient who underwent an abdominoplasty together with a mastopexy and brachioplasty). Culture and sensitivity swabs were taken from the wounds, and a course of oral antibiotics was given accordingly. Wounds healed conservatively by secondary intention. Three patients developed seroma, one in the breast after mastopexy, and two in the arm following brachioplasty. In all 3 cases, the seroma was aspirated repeatedly together with the application of compressive bandaging; and resolved at an average of 10 days. One case who had a reduction mammoplasty experienced a minimal subcutaneous hematoma at the lateral IMF. No surgical intervention was needed in any of these patients.

The occurrence of complications was correlated with the class of current BMI where most complications occurred in patients with a BMI of more than 30kg/m² (table 3).

Table (3): Occurrence of complications in the different BMI classes.

<i>BMI* Class</i>	<i>Total no. of patients in class</i>	<i>No. of patients with complications</i>	<i>% of total with complications</i>
A <25	1	0	0 %
B 25 – 30	7	1	14 %
C >30	18	7	39 %

*BMI in kg/m².

Evaluation of outcome:

At 3 months, all patients were followed up for outcome. Regarding the quality of scars, 15 out of the 25 brachioplasty patients were seen to have unsatisfactory healing in the form of raised and/or widened immature scars, for which topical ointments and silicone sheets were used. As for the correction of the deformity, all patients who underwent brachioplasty had their arm deformity corrected. All male patients had their anterior chest deformity corrected, while 5 out of 25 female patients were noted to have recurrent breast deformities in the form of ptosis and/or decreased projection. Moreover, out of the 12 patients who refuse to have a total upper body lift, 8 patients were left with a disfiguring lateral thoracic excess, while 4 patients had this preoperative excess smoothed-out by the adjacent brachioplasty and mastopexy procedure.

At 6 months, 20 patients were assessed for quality of brachioplasty scars. Out of the 15 patients who had unsightly scars at 3 months, 13 patients still had immature raised scars. As for the correction of the deformity 2 patients presented with minimal excess above the elbow, and 5 patients presented with recurrent breast ptosis after mastopexy/reduction. Scar migration was mainly assessed in patients who had a total upper body lift. The positions of the scars of the IMF anteriorly and laterally were compared to their position in the early postoperative period. Male patients had minimal scar descent, while all 3 female patients had inferiorly displaced scars mainly at the lateral thoracic region. Two of these 3 female patients underwent revisional surgery for correction of this displacement.

Patient Satisfaction:

A direct questionnaire for overall level of satisfaction at 6 months showed that 12 patients (60%) were satisfied, 4 patients (20%) were fairly satisfied, and 4 patients (20%) were unsatisfied with their outcome. All patients who underwent a total upper body lift procedure were satisfied. For patients who had isolated procedures: 7 patients were satisfied, 5 patients were fairly satisfied, and 3 patients were unsatisfied.

Case Presentations:

Case 1 (Fig.5):

28 year old male patient presented with a BMI drop of 23.3 to reach a BMI of 28.8 kg/m² at presentation. He was classified as a Group 2 patient and underwent a male type upper body lift using a free NAC graft.



Fig. (5): Case 1: Group 2 patient - Male pattern upper body lift. Preoperative (left) and 3 months postoperative (right) views

Case 2 (fig. 6):

A 34 year old female patient who presented with a BMI of 30.3 kg/m². Her BMI had only dropped 9.3 kg/m² after a sleeve gastrectomy, that explains why her deformities were not so severe. She was classified as Group 1, and underwent brachioplasty and reduction mammoplasty using a central mound pedicle.



Fig. (6): Case 2: Group 1 patient - Isolated brachioplasty and reduction mammoplasty. Preoperative (left) and 3 months postoperative (right) views

Case 3 (fig. 7):

28 years old female patient presented a BMI of 24.2 kg/m², the lowest BMI in our sample. She also had the largest drop in BMI (26.2) after laparoscopic vertical banded gastroplasty, and was also the patient who presented with the most severe deformity. She was classified as Group 2, however, she did not have any upper back rolls, making her the perfect candidate for a female pattern type II upper body lift. Additionally, she had a significant upper abdominal roll, for which a reverse abdominoplasty was done. The excess upper abdominal tissue was used as a flap in an attempt to modestly autoaugment the breasts.



Fig. (7): Case 3: Group 2 patient - Type II Female upper body lift. Preoperative (left) and postoperative (right) views

DISCUSSION

In our study, we used the position of the lateral inframammary fold (IMF) as an indication of significant lateral thoracic and back excess, that would require a unit approach for correction of the upper body deformity, taking after the work done by Soliman et al⁽¹⁴⁾.

Our results showed that the average BMI drop of Group 1 was lower than that of Group 2, supporting the statement that the greater the BMI drop, the greater the deformity, that usually requires a unit approach for the upper body known as the upper body lift^(13,14).

Patient involvement and good rapport was emphasized in the literature⁽⁶⁾ and so, the planned procedures were discussed with the patients. However, for Group 2 patients, this explanation left most patients of that group (12 patients out of 17) unconvinced with the benefits of the upper body lift approach, and so they underwent isolated procedures at their request.

Isolated procedures were performed on 21 patients. The 20 female patients had a brachioplasty, and all of them opted for the double ellipse techniques described by Aly and Cram^(10,11,14). For isolated correction of the breast deformity, 6 patients had a simple mastopexy, while 14 patients had a reduction mammoplasty. In several studies on breast surgery after MWL, a need for breast augmentation was encountered in most patients^(7, 12, 13). A difference in the pre weight loss breast size is probably the cause of this variation, being of a greater volume in our patients. Vertical type mastopexy or reduction was tried in two of our patients that were assessed as suitable for such procedures. However, our intraoperative assessment confirmed the fact that the skin laxity is always in excess for such techniques, and accordingly the skin closure was modified into an L shaped closure in the mastopexy patient, and a T shaped closure for the reduction mammoplasty. One mastopexy patient had a breast flap pushed up into the upper pole.

Five patients underwent an upper body lift that included a brachioplasty, breast/pseudogynecomastia correction, and some form of an upper back and/or lateral thoracic lift. For the 2 male patients, we used the free NAC technique similar to that of previous studies^(6,14). In one of our male patient, we tried to redirect the anterior chest scar towards the axilla rather than

across the lateral chest, in an attempt to effectively simulate the normal male chest contour. Because this single patient had only been followed up for 3 months, we were not at a position to comment on the benefit of this alteration on the long term.

We performed an upper body lift on 3 females, and used the type II female pattern described by Soliman et al⁽¹⁴⁾. Type I female pattern was described to involve an upper back excision, and was not used in any of our patients because none had a definite upper back roll. Type II upper body lift is actually a modification of the technique reported in the past by Pitanguy for correction of lipodystrophy of the lateral thoracic aspect and inner side of the arm and elbow⁽¹⁷⁾. It is basically a lateral thoracic excision that joins the brachioplasty incision with that of the mastopexy, to create an upper body lift.

In one of our female patients who had a noticeable upper abdominal fold, a reverse abdominoplasty was done to correct this excess. This was similar to the technique used by Hurwitz⁽¹³⁾, but instead of using the epigastric excess in a spiral flap, we used it as a laterally based flap for breast augmentation. This maneuver has not been described, nor did we explore its vascular base beyond simple intraoperative assessment of the vascularity at the tip of the flap. In this same patient, we emphasized securing the IMF to the periosteum. This was not done with the same precision in the other 2 cases, who in turn experienced inferior migration of the anterior IMF. Hurwitz has stressed on securing the IMF to avoid this migration although it cause temporary dimpling of the skin⁽⁷⁾.

Twenty three percent of all our patients experienced complications following upper body contouring after MWL. Partial wound dehiscence and seromas were the most common complications. The percentage of complications in our patient population is significantly lower than that reported in the literature where complication rates were as high as 76%⁽¹⁸⁾. However, most of these reports were based on total body lift procedures⁽¹⁸⁻²⁰⁾. Complication rate was found to be proportional to the BMI of the patients at presentation, however the sample size was too small to apply statistical tools to measure this significance. Nevertheless, this correlates with the literature, where sample size was apt^(19, 21). Again, these reports did not address

complication rates for upper body contouring alone.

On evaluation of our outcome in term of long term correction of the deformities, we used the preoperative photographs as a reference. Recurrence of breast ptosis was mainly of the breast tissue rather than the NAC, and was seen in 10 out of 25 female patients. This supports the occasional need of dermal suspension advocated by Rubin^(8,9,15). We have not had any experience with this technique, but recommend considering it in MWL patients in light of our results. Brachioplasty procedures seemed more resistant to the test of time, as only 2 patients had recurrent sagging just above the elbow. However, the persistent bad scar quality was our major concern in the arms.

Twelve patients from Group 2 refused our advice for an upper body lift. While isolated procedures on the arms and breast in these patients resulted in defining the lateral thoracic deformity in 8 patients, the brachioplasty seemed to obliterate this excess in the other 4. This observation might modify the selection of procedure for future patients.

Patient satisfaction was what we ultimately aim for in plastic surgery, and in our study 60% were generally satisfied. Males and females were found to be equally satisfied, especially with the change in their clothed appearance. All patients who had upper body lifts were satisfied, possibly because these patients had the greatest deformities. Out of the unsatisfied group, 3 patients happened to be of those who were advised to undergo an upper body lift but refused. Such patients must therefore understand the shortcomings of their choice beforehand.

CONCLUSION

The upper body is one of the areas that patients request correcting after massive weight loss, either as part of a total body lift, or as a separate procedure. Several reports in the literature have described identified the patients into one of two groups: a group that required separate procedures for correction of the upper body deformity, and another group that required a unit approach known as the upper body lift. In this study we used the lateral inframammary fold (IMF) position as the key to this grouping. Accordingly, we performed isolated procedures

on the arms and breast for some patients, and a total upper body lift for the others.

In the light of our aims in this study, we found using the lateral IMF position was a good tool for the grouping of MWL patients requiring upper body contouring. This grouping into patients that either needed isolated procedures or an upper body lift was seen appropriate by analysis of postoperative outcome. The rate of complications mainly correlated with the body mass index (BMI) of the patients at presentation. Scar migration and recurrence of some deformities were the most difficult to anticipate, and emphasized the need to discuss a policy of revisional surgery with the MWL patient.

The main recommendations gathered from our results are centered around meticulous selection and technique. Patients that have had their weight loss stabilize at a near-ideal BMI would be expected to have less complications and a more pleasing and persistent outcome. Further, it is strongly suggested to use the lateral IMF position for selection of the most suitable surgical approach for these patients. This conscious selection of both patient and approach directly affects patient satisfaction, which is the ultimate goal of the plastic surgeon.

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