A Classification of Contour Deformities after Massive Weight Loss: Application of the Pittsburgh Rating Scale

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ABSTRACT

Contour deformities after post–bariatric surgery weight loss are varied and often complex. Existing classification systems do not adequately address the various post–weight loss deformities that can occur in every part of the body. At the University of Pittsburgh, we have devised the Pittsburgh Rating Scale, a classification system that allows grading of 10 areas of the body on a four-point scale. The scale has been validated in a previous study. Currently, the scale is being applied during our initial assessment of the post–bariatric surgery weight loss patient. We have found that accurate classification can assist the surgeon in operative planning. The scale is useful in both classifying the individual deformities in a specific region and performing a comprehensive assessment.

KEYWORDS: Bariatric surgery, body contouring classification, weight loss, abdominoplasty, brachioplasty, buttocks, thighplasty

In response to the immense rise in patients with massive weight loss, body contouring surgery is rapidly undergoing evolution and refinement.[1] Contour deformities after bariatric weight loss are extremely diverse and potentially involve every area of the body. With an increase in number of successful bariatric surgeries, there is a need to classify and develop clinical approaches to patients after massive weight loss.

Today, bariatric surgeries produce successful and sustained weight loss.[2] Post–bariatric weight loss contour deformities well exceed contour deformities plastic surgeons have encountered previously. After massive weight loss, patients are often left with loose, ptotic skin envelopes and irregular adipocytic bulges.[3] It is often difficult to predict where on the body these deformities will materialize in a given patient.

The wide breadth and variety of deformities allow numerous surgical options. Traditional lipectomy, excisional, and excisional-lifting techniques all play an important role in contouring different anatomic regions.[3–23] Permutations and combinations of these procedures can be performed on a single patient. The field is ripe for innovative techniques to address these often unique deformities.

In approaching the patient after massive weight loss with multiple problem areas, thorough preoperative planning and appropriate treatment selection are crucial. A systematic approach is ideal in addressing each area of the patient's body and quantifying the level of deformity in each particular region. A classification system is a valuable tool in systematically describing the deformities in a manner that is translatable from

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Table 1 The Pittsburgh Rating Scale*

Area	Scale	Preferred Procedure
Arms	0 Normal	None
	1 Adiposity with good skin tone	UAL and/or SAL
	2 Loose, hanging skin without severe adiposity	Brachioplasty
	3 Loose, hanging skin with severe adiposity	Brachioplasty ± UAL and/or SAL
Breasts	0 Normal	None
	1 Ptosis grade I/II or severe macromastia	Traditional mastopexy, reduction, or augmentation techniques
	2 Ptosis grade III or moderate volume loss or constricted breast	Traditional mastopexy ± augmentation
	3 Severe lateral roll and/or severe volume loss with loose skin	Parenchymal reshaping techniques with dermal suspension; consider autoaugmentation
Back	0 Normal	None
	1 Single fat roll or adiposity	UAL and/or SAL
	2 Multiple skin and fat rolls	Excisional lifting procedures
	3 Ptosis of rolls	Excisional lifting procedures
Abdomen	0 Normal	None
	1 Redundant skin with rhytids or moderate adiposity without overhang	Mini-abdominoplasty, UAL and/or SAL
	2 Overhanging pannus	Full abdominoplasty
	3 Multiple rolls or epigastric fullness	Modified abdominoplasty techniques, including fleur de lis and/or upper body lift
Flank	0 Normal	None
	1 Adiposity	UAL and/or SAL
	2 Rolls	UAL and/or SAL
	3 Ptosis of rolls	Excisional lifting procedures
Buttocks	0 Normal	None
	1 Mild to moderate adiposity and/or mild to moderate cellulite	UAL and/or SAL
	2 Severe adiposity and/or severe cellulite	UAL and/or SAL ± excisional lifting procedure
	3 Skin folds	Excisional lifting procedure
Mons	0 Normal	None
	1 Excessive adiposity	UAL and/or SAL
	2 Ptosis	Monsplasty
	3 Significant overhang below symphysis	Monsplasty
Hips/Lateral thighs	0 Normal	None
	1 Mild to moderate adiposity and/or mild to moderate cellulite	UAL and/or SAL
	2 Severe adiposity and/or severe cellulite	UAL and/or SAL ± excisional lifting procedure
	3 Skin folds	Excisional lifting procedure
Medial Thighs	0 Normal	None
	1 Excessive adiposity	UAL and/or SAL ± excisional lifting procedure
	2 Severe adiposity and/or severe cellulite	UAL and/or SAL ± excisional lifting procedure
	3 Skin folds	Excisional lifting procedure
Lower Thighs/Knees	0 Normal	None
	1 Adiposity	UAL and SAL ± excisional lifting procedure
	2 Severe adiposity	UAL and SAL ± excisional lifting procedure
	3 Skin folds	Excisional lifting procedure

Ten regions are assessed, on a scale ranging from 0 to 3. The presence of specific deformities determines the score. For each rating, the indicated surgical procedures are outlined. The procedures may be performed alone, or in combination
SAL,; UAL;.

surgeon to surgeon. A variety of previously described classification systems address contour deformities.[24–31] These existing classification systems have two drawbacks: (1) they do not encompass the often unique deformities suffered by bariatric weight loss patients and (2) they focus on a single region of the body and are therefore insufficient in addressing multiple areas in a single patient.

We designed a classification system to address the full range of post–weight loss deformities found in this unique population.[32] Our rating system can be used to perform a comprehensive assessment of a post-bariatric patient. We validated our system for clinical use and produced a correlated list of appropriate surgical interventions for the levels of deformities. We use the scale in our clinical practice for assessment, surgical planning, and outcome analysis.

DEVELOPMENT AND VALIDATION OF THE PITTSBURGH RATING SCALE

From full body photographs of more than 300 female patients, 25 patients who encompassed the full span of post–weight loss appearances, ranging from normal to most severe deformities, were selected for further study. We limited the study to female patients because this was representative of the gender predilection to seek plastic surgery after massive weight loss.

Ten anatomic areas that were delineated for analysis were arms, breasts, abdomen, flank, mons, back, buttocks, medial thighs, hips/lateral thighs, and lower thighs/knees. A four-point grading scale was designed to describe the common deformities found in each region of the body. Each scale ranged from 0 to 3, with 0 indicating an appearance within a normal range, 1 indicating a mild deformity, 2 indicating moderate deformity, and a grade of 3 indicating the most severe level of deformity (Table 1). The rating scale was customized for each region of the body.

Generally, a deformity considered "mild" would require nonexcisional or a minimally invasive procedure for correction. A moderate deformity would require an excisional procedure. A severe deformity would require combinations of excisional, lifting, and noninvasive procedures and frequently involve large areas of undermining.

Interobserver validity and test-retest reliability was determined using weighted kappa analysis. In all 10 categories, the kappa value was 0.6 or higher (0.6 = threshold for good validity), with a mean kappa of 0.68 (range 0.61–0.78) and an overall agreement of 69% over two sessions. All 12 observers scored an individual mean kappa value greater than 0.6, indicating good interobserver validity. A given observer had a mean 67% agreement, indicating reasonable test-retest reliability.

APPLICATION OF THE PITTSBURGH RATING SCALE

We are currently utilizing the Pittsburgh Rating Scale in clinical practice. In our clinics, we use the scale to assess the level of deformity, plan appropriate procedures, and grade pre- and postoperative results.

Using the Pittsburgh Rating Scale, we made a series of recommendations for correlating appearance and the list of suitable surgical interventions. Mild deformities call for less invasive measures, and increasing levels of deformity call for more invasive procedures of complex design to achieve adequate correction. For most anatomic regions, significant ptosis of adipose-filled rolls or obvious skin folds represent the most severe level of deformity that are best rectified by excisional lifting procedures combined with tissue reshaping and augmentation procedures.

In applying the scale in our clinics, we were able to grade a deformity preoperatively, choose an appropriate corrective surgery, and assess the postoperative contour using the same scale. In cases in which the corrective procedure was successful, the postoperative rating on the scale would decrease and often be restored to a 0, indicating normal contour (Figs. 1–10).

The Pittsburgh Rating Scale is a useful organizational tool for performing clinical studies. For

Figure 1 Arms

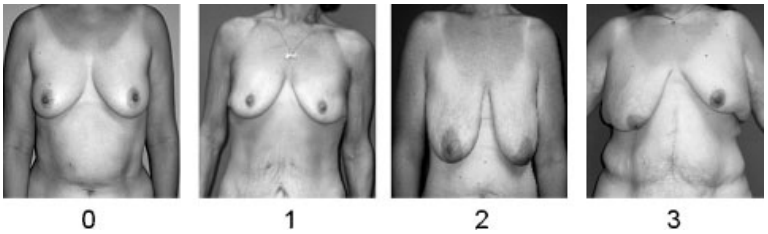

Figure 2 Breasts

Figure 3 Abdomen

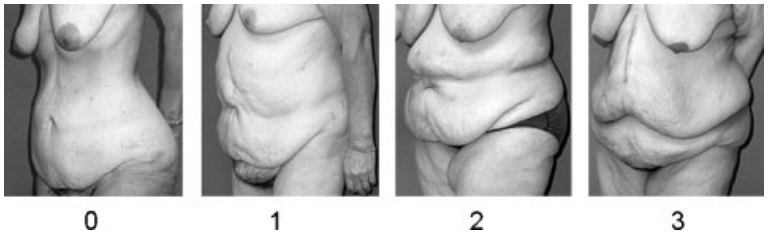

Figure 4 Flank

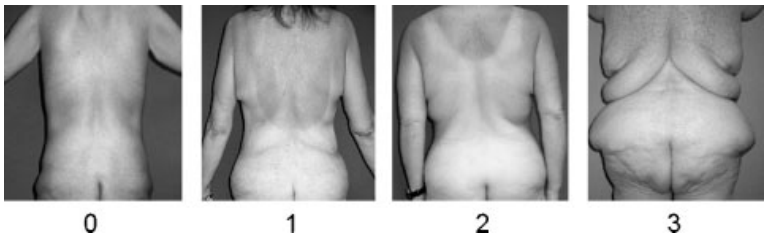

Figure 5 Back

Figure 6 Buttocks

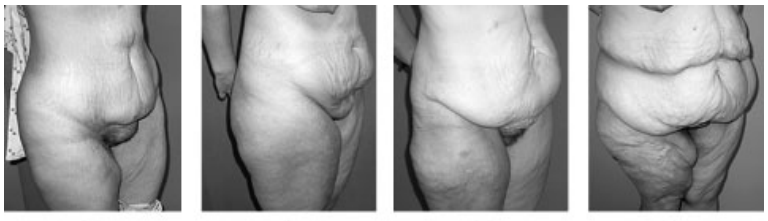

Figure 7 Hips

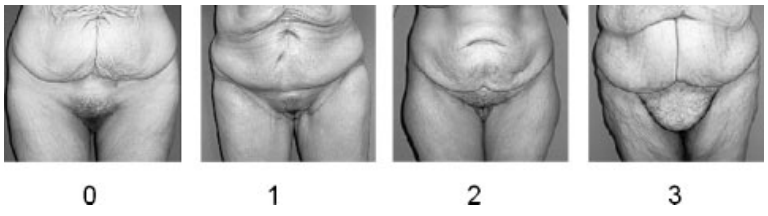

Figure 8 Mons

Figure 9 Medial thighs

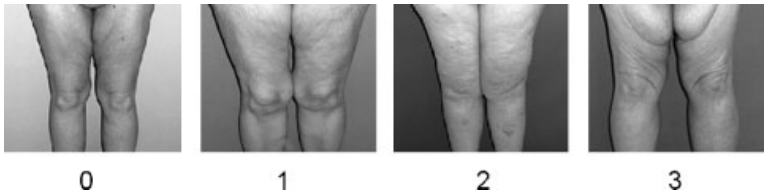

Figure 10 Knees

simplification, the regional scores can be combined into Upper Body, Lower Body, and Total Body scores (Table 2). We should emphasize, however, that these composite scores should be used for outcome analysis only and not for dictation of therapy. We are applying the Pittsburgh Rating Scale in our prospective studies of populations of bariatric patients after weight loss. We are systematically entering contour deformities of the patients into an institutional review board–approved clinical registry.

DISCUSSION

Post–bariatric weight loss deformities are diverse, disordered, and often unpredictable. The Pittsburgh Rating Scale is succinct and structured and easily applied. The scale both categorizes preoperative appearance and helps formulate appropriate treatment. The scale was made practical by limiting each subscale to four ordered classifications.

Table 2 Pittsburgh Rating Scale: Composite Scores. The Individual Ratings can be Combined into Upper Body, Lower Body, and Total Body Deformity scores.

Upper Body: Arms, Breasts, Abdomen, Flank, Back
0 Normal
1–5 Mild
6–10 Moderate
11–15 Severe
Lower Body: Mons, Buttocks, Hips/Lateral Thighs, Medial Thighs, Lower Thighs/Knees
0 Normal
1–5 Mild
6–10 Moderate
11–15 Severe
Total Body Deformity Score
0 Normal
1–10 Mild
11–20 Moderate
21–30 Severe

Classification schemas in plastic surgery serve multiple purposes. First, they should be used to describe preoperative deformities in a standardized, graded approach. During the validation of the Pittsburgh Rating Scale, a majority of observers agreed on the rating for a given deformity on a given patient. A score should be compelling enough that a surgeon who has not yet viewed the patient can participate in surgical planning.

The second purpose that a classification system should serve is to correlate deformity to surgical strategy. In body contouring after massive weight loss, the successive grades of deformities should correlate to degree of complexity of procedures. The highest grade of deformity is often an indication for a multifaceted procedure that adequately addresses the clinical severity. Multiple severe deformities in adjacent regions (i.e., a patient with a severe flank and buttock deformity) can help the surgeon to decide on inclusive procedures to address multiple regions.

The third function that a classification system should fulfill is to allow numerical comparison of preoperative state with the surgical outcome. This allows objective quantification of improvement related to surgical manipulation. When we applied the scale to our body contouring patients, the postoperative score for the region that underwent surgery was often restored to normal. The Pittsburgh Rating Scale assesses contour but does not examine postsurgical scar quality or location. Extensive scarring is an undesirable component of skin excision, and successful outcome is contingent on minimizing scar deformity.

The authors recognize that in functional panniculectomies, the resulting contour should not be held up to stringent aesthetic standards. In patients seeking optimal aesthetic outcome after weight loss deformity, surgeons should strive for a normal rating on the Pittsburgh Rating Scale. If the postoperative appearance

is outside the normal range, the chosen surgical intervention may have been inadequate for the level of deformity or additional procedures may have been necessary.

The Pittsburgh Rating Scale reflects deformities found in our female patients. The contour deformities in male patients with massive weight loss are different from those in our female subjects and need to be addressed in a separate study. In our clinics, we are seeing an increasing number of male patients with massive weight loss, and we will soon finalize and validate a classification system for massive weight loss deformities in males.

The Pittsburgh Rating Scale is easy to administer, demonstrates appropriate validity, displays acceptable reliability, and detects changes resulting from surgery, making it an appropriate outcome measure.[33] We are confident that our scale appropriately detects changes resulting from surgical intervention. Measurable success from surgical intervention will further guide us in polishing our body contouring repertoire. As post–bariatric body contouring surgery enters a new era of sophistication, we expect that the scale will have broader applications in both initial assessment and treatment.

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