

I NTRODUCTION

Overweight and obesity are fifth leading risk for global deaths. At least 2.8 million adults die each year as a result of being overweight or obese. In addition 44% of diabetes burden, 23% of ischemic heart diseases burden and between 7% and 41% of certain cancer burdens are attributable to overweight and obesity which are defined as abnormal or excessive fat accumulation that may impair health. The World Health Organization (WHO) definition is: a body mass index (BMI) greater than or equal to 25 is overweight while a BMI greater than or equal to 30 is obesity (*WHO, 2012*).

Bariatric surgery is currently the most efficacious and enduring treatment for clinically severe obesity, and as a result, the number of bariatric surgery procedures performed has risen dramatically in recent years including gastric bypass (open and laparoscopic), laparoscopic adjustable gastric banding, and biliopancreatic diversion (with or without duodenal switch) (*Elder & Wolfe, 2007*).

After massive weight loss, patients are often left with loose ptotic skin envelopes and irregular bulges especially the buttocks. The Pittsburgh Rating Scale was the first all-inclusive and validated measure of contour deformities after massive weight loss. Regarding the buttocks, they are assessed on A scale ranging from 0 to 3 where (0) is normal, (1) is mild to moderate adiposity and/or mild to moderate cellulite, (2) is

severe adiposity and/or severe cellulite and (3) is skin folds (*Landfair et al., 2010*).

The common complaints concerning the buttock after massive weight loss are skin excess, skin ptosis, and poor projection. Gluteal dermolipectomy improves the skin excess and ptosis but worsens the projection due to flattening of the gluteal region. Dermal fat flaps, obtained from excess tissues, improve projection, but consistent long-term results are rarely achieved due to gravity and intrinsic alterations of the local skin.

The inclusion of a silicone prosthesis during dorsal dermolipectomy with or without dermal fat flaps shows promising results. Addition of silicone implants improves the contour, corrects the laxity, and increases the projection in a more definitive way (*Tavares et al., 2011*).

AIM OF THE STUDY

It is to review literature regarding the different ways of management of post massive weight loss buttocks deformities in females delineating the advantages and disadvantages of each technique.

Chapter One

○ **BESITY****Definition:**

○besity is a medical condition in which excess body fat has accumulated to the extent that it may have an adverse effect on health, leading to reduced life expectancy and/or increased health problems (*Haslam & James, 2005; WHO, 2012*). This increase in fat can be evenly distributed over the body, or it can be concentrated in specific regions. Differences in body fat distribution are gender specific. Women tend to deposit fat more on their buttocks (gynoid distribution), and men tend to deposit fat on their waist (android distribution) (*Pietrobelli, 2005*).

Fat Distribution

In 1956, the French physician, Jean Vague, noted that an upper body, or masculine, fat distribution was associated with adverse health consequences. It has now been clearly demonstrated that obesity related chronic diseases are associated with the location, as well as the amount, of adipose tissue on the body. Although the relative importance of total adiposity versus type of adiposity continues to be debated, the notion that an ‘apple-shaped’ (or android) body is associated with greater obesity-related health risks than a ‘pear-shaped’ (or gynoid) body is well accepted (Figure 1) (*Stevens & Truesdale, 2005*).

Imaging techniques such as computed tomography (CT) allow measurement of visceral adipose tissue and layers of subcutaneous fat. Anthropometric studies do not provide precise measures of fat depots but nevertheless have provided clues to the causes and consequences of differences in fat distribution (*Stevens & Truesdale, 2005*).

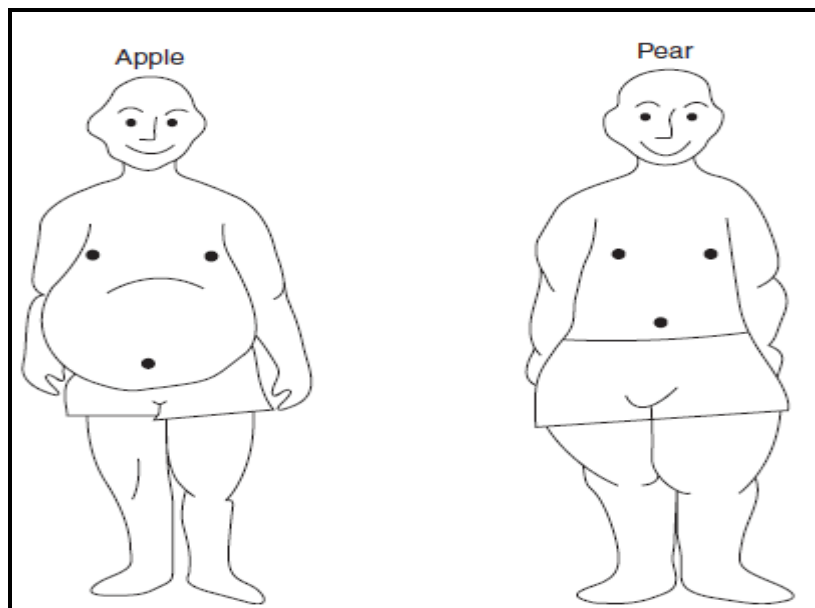


Figure (1): The apple (android) and pear (gynoid) body shapes.

Measures of Body Composition

Some have advocated the use of bioelectrical impedance in an effort to provide patients with more specific information on lean body mass as well as body fat content (*Kyle et al., 2004*). Unfortunately, at this time there are technical limitations with this measure in those with a high BMI that limit its accuracy. As a result, there is not wide support for the use of

bioelectrical impedance in the assessment of obese patients in clinical practice (**Kyle et al., 2004**). Measurements of skin fold thickness, air displacement plethysmography, underwater weighing, and dual-energy X-ray absorptiometry all can provide information on body fat and regional fat distribution. However, in routine practice, BMI and waist circumference provide adequate information for clinical assessment and initial risk stratification.

Assessment of obesity:

There are no precisely defined normal values of body fat. Thus for practical reasons, obesity is measured by means of the body mass index (BMI). Similarly, the distribution of fat can also be assessed practically by the measurement of the waist circumference. In addition, waist to hip ratio and skin fold thickness could be used (**Kumar, 2001**).

1) Body mass index:

Body mass index (BMI) of an individual is calculated as:

$$BMI = weight (kg) / height^2 (m^2)$$

American Society for Bariatric Surgery has classified obesity as per BMI values (Table 1). BMI up to 24.9 is considered as normal. Overweight is defined as a BMI between 25.0 and 26.9 kg/m², and extreme (morbid or class III) obesity is defined as BMI exceeding 40 kg/m². Individuals with BMI

>35 kg/m² with major co-morbid condition(s) like obesity related hypertension, diabetes etc. are also classified as morbidly obese (Table 1) (**Lakka & Bouchard, 2007**).

Table (1): Obesity classification by American society for Bariatric Surgery

BMI value (kg/m²)	Category
18.5-24.9	Normal
25.0-26.9	Overweight
27.0-29.9	Mild obesity
30.0-34.9	Moderate obesity- Class I
35.0-39.9	Severe obesity- Class II
40.0-49.9	Extreme (morbid) obesity- Class III
50.0-59.9	Super obesity
60.0 +	Super-super obesity

(**Lakka & Bouchard, 2007**)

2) The waist circumference

The proper way for accurate measurement of waist circumference is to measure the abdominal circumference midway between the illiac crest and the lower costal margin. waist circumference is a better predictor of health risks associated with obesity as compared with BMI (**Wang et al., 2005**).

Waist circumference is a practical indicator of visceral abdominal fat. Evidence suggests that abdominal fat carries a higher health risk than peripheral fat, and that the visceral fat component correlates the most strongly with increased risk (Table 2) (**National Institutes of Health (NIH), National Heart, Lung, and Blood Institute (NHLBI), 1998**).

Table (2): Classification of overweight and obesity by BMI, waist circumference, and associated disease risks.

			Disease risk* relative to normal weight and waist circumference	
	BMI (kg/m ²)	Obesity Class	Males <40 inches (<102cm) Females <35 inches (<88cm)	Males >40 inches (>102cm) Females >35 inches (>88cm)
Underweight	<18.5		—	—
Normal	18.5 – 24.9		—	—
Overweight	25.0 – 29.9		Increased	High
Obesity				
Mild	30.0 – 34.9	I	High	Very high
Moderate	35.0 – 39.9	II	Very high	Very high
Severe/extreme	>40	III	Extremely high	Extremely high

(From the National Heart, Lung, and Blood Institute Evidence Report, National Institutes of health, Washington, DC. 2000).

* Disease risk for type II diabetes, hypertension, and cardiovascular disease.

3) The waist to hip ratio (WHR):

Waist-to-hip girth ratio is computed as abdominal girth (in centimetres) divided by hip girth (in centimetres), where waist girth represents the smallest girth around the abdomen (natural waist) and hip girth reflects the largest girth measured around the buttocks (*McArdle et al., 2000*). Peripheral distribution of body fat (waist/hip ratio less than 0.85 in men and less than 0.75 in women) is associated with lower risk of cardiovascular disease and type II Diabetes Mellitus (*Kumar, 2001*).

4) Skin fold thickness:

It is measured over the middle of the triceps muscle; normal values are 20 mm in males and 30 mm in females (**Kumar, 2001**). The amount of subcutaneous fat can be estimated by measuring thickness directly using a skin fold caliper at different sites on the body. The sites most often used are the upper arm (biceps and triceps), under the scapula (subscapular), and above the iliac crest (suprailiac). Increasing the number of measurement sites reduces errors and corrects for possible differences in fat distribution among individuals within the same age and gender group (**Pietrobelli, 2005**).

Effect on Health:

Morbid obesity is defined as a body mass index (BMI) equal to or greater than 40. Studies have found that mortality rates among the morbidly obese are 2.5 to 12 fold higher than those of individuals who are normal weight (**Dresnic, 1980**).

Seidell (2010) concluded that:

- Waist circumference and waist–hip ratio are both related to increased risk of all cause mortality, throughout the range of adult BMIs;
- Waist circumference and waist–hip ratio are strongly predictive in young and middle-aged adults compared to older people and those with low BMI;
- Waist circumference alone could replace waist–hip ratio and BMI as a single risk factor for all cause mortality (**Seidell, 2010**).

Health consequences can be categorized by the effects of increased fat mass (osteoarthritis, obstructive sleep apnea, social stigmatization) or by the increased number of fat cells (diabetes, cancer, cardiovascular disease, non-alcoholic fatty liver disease). Increases in body fat alter the body's response to insulin, potentially leading to insulin resistance. Increased fat also creates a pre-inflammatory state, increasing the risk of thrombosis (figure 2) (**Bray, 2004**).

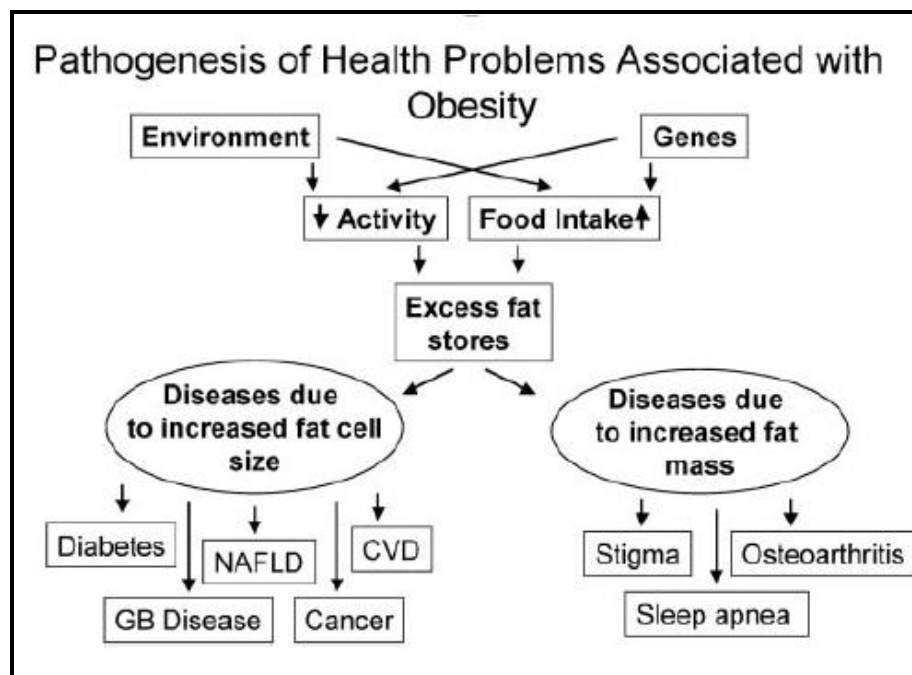


Figure (2): The pathology of obesity produces the myriad of health related problem. These health-related problems can be attributed to either the increased mass of fat or the increased release of peptides from from enlarged fat cells. CVD, cardiovascular disease; GB, gallbladder; NAFLD, Nonalcoholic fatty liver disease (**Bray, 2004**).

In one study, those with a BMI > 30 had a 70% greater risk of dying than lean individuals (**Ajani, et al., 2004**).

Another study estimated that a man 20 to 30 yr old with a BMI > 45 would lose 13 yr of life expectancy owing to his excess weight (*Fontaine et al., 2003*).

Table (3): Proportion of disease prevalence attributable to obesity

Disease	Prevalence (%)
Type 2 diabetes	61
Uterine cancer	34
Gallbladder disease	30
Osteoarthritis	24
Hypertension	17
Coronary heart disease	17
Breast cancer	11
Colon cancer	11

(*Wolf & Colditz, 1998*)

Table (4): Complications of obesity

Cardiology	- Ischemic Heart Disease: angina and myocardial infarction (<i>Yusuf et al., 2004</i>). - Congestive Heart Failure. - High Blood Pressure. - Abnormal Cholesterol Levels. - Deep Vein Thrombosis and pulmonary embolism (<i>Darvall et al., 2007</i>).
Endocrinology and Reproductive system	- Diabetes Mellitus polycystic ovarian syndrome. - Menstrual disorders. - Infertility. - Complications during pregnancy. - Birth Defects (<i>Haslam & James, 2005</i>). - Intrauterine Fetal Death (<i>Arendas et al., 2008</i>).
Neurology	- Stroke. - Meralgiaparesthetica (<i>Harney & Patijn, 2007</i>). - Migraines (<i>Bigal & Lipton, 2008</i>). - Carpal Tunnel Syndrome (<i>Mollayousefi et al., 2008</i>). - Dementia (<i>Beydoun et al., 2008</i>). - Idiopathic Intracranial Hypertension (<i>Wall, 2008</i>).
Psychiatry	- Depression in women. - Social stigmatization.
Rheumatology and Orthopedics	- Gout (<i>Choi et al., 2005</i>). - Poor mobility (<i>Tukker et al., 2008</i>). - Osteoarthritis. - Low Back Pain (<i>Molenaar et al., 2008</i>).
Dermatology	- Stretch Marks. - Acanthosisnigricans. - Lymphedema (<i>Yosipovitch et al., 2007</i>). - Cellulitis. - Hirsutism. - Intertrigo (<i>Hahler, 2006</i>).

Gastrointestinal	- Gastroesophageal Reflux Disease. - Fatty Liver Disease. - Cholelithiasis (gallstones) (<i>Haslam & James, 2005</i>).
Oncology	- Breast, ovarian - Esophageal, colorectal - Hepatic, pancreatic - Gallbladder, gastric - Endometrial, cervical - Prostatic, renal - Non-Hodgkin's Lymphoma, multiple myeloma (<i>Calle et al., 2003</i>).
Respirology	- Obstructive Sleep Apnea - Obesity Hypoventilation Syndrome - Asthma - Increased complications during general anaesthesia (<i>Poulain et al., 2006</i>).
Urology and Nephrology	- Erectile Dysfunction (<i>Esposito et al., 2004</i>). - Urinary Incontinence (<i>Hunnskaar, 2008</i>). - Chronic Renal Failure (<i>Eierblad et al., 2006</i>). - Hypogonadism (<i>Makhsida et al., 2005</i>).

Chapter Two

BARIATRIC SURGERY PROCEDURES

Indications for Bariatric Surgery

Surgical therapy should be considered for individuals who:

1. Have a body mass index (BMI) of greater than 35 to 40 kg/m² and also have obesity related co-morbidities.
2. Have a BMI of greater than 40 kg/m² even without co-morbidities if the weight adversely affects their life.
3. Can show that dietary attempts at weight control have been ineffective.

(Obesity Surgery, 2000)

Patient Evaluation and Workup

Preoperative assessment of candidates for bariatric procedures is based on the principle of identifying modifiable health concerns and implementing risk-reducing treatments to have an impact on perioperative morbidity and mortality. The initial evaluation of the patient who is to undergo bariatric surgery should begin with a candid discussion. Bariatric surgery carries significant risks and can fail in its attempt to improve the health and reduce the weight of the patient. Patients should take part in a preoperative seminar outlining expectations in regard to postoperative recovery, diet alteration, activity, and clinical outcomes *(Buchwald, 2005)*. Beneficial

outcomes are only achieved consistently with careful patient selection and preoperative planning. To evaluate the potential patient properly, surgeons should ideally employ the assistance of a multidisciplinary team, including nutritionists, psychologists or psychiatrists, and appropriate medical specialty consultants as needed (*Yurcisin et al., 2009*).

Appropriate laboratory testing is driven by findings within the history and physical examination (Table 5).

Table (5): Recommended preoperative testing

- | |
|---|
| <ul style="list-style-type: none">- Complete blood cell count- Comprehensive metabolic panel- Hemoglobin A1c- Ferritin- Thyroid-stimulating hormone- Lipid profile- Barium swallow or endoscopy- Electrocardiogram |
|---|

(*Yurcisin et al., 2009*)

Historical Procedures

Figure (3) demonstrates 3 of the most common historical procedures performed for obesity in the 1950s, 1960s, 1970s, and early 1980s. These procedures included (1) jejunoileal bypass (Fig. 3A), (2) loop gastric bypass (Fig. 3B) and (3) horizontal gastropasty or gastric stapling (Fig. 3C) (*Tessier, 2008*).