INTRODUCTION

Obesity is an excess body fat, which can be distributed equally all over the body or concentrated in a particular region. There are gender differences in body fat distribution. Males usually have less body fat, which is usually distributed around the waist and is called android. Females deposit fat around their thighs and buttocks, which are called gynoid ***(Aly, 2006).***

Over the last decades, a number of bariatric surgical techniques have been developed to treat morbid obesity (Body Mass Index equal to or greater than 40) such as an intestinal bypass, then Roux-en-Y Gastric bypass, Biliopancreatic diversion and gastroplasty which is also known as "stomach stapling" then Laparoscopic gastric bypass and Laparoscopic adjustable gastric band . These operations promote weight loss by malabsorption, gastric restriction or both. All procedures result into massive weight loss (approximately 50% to 80% of excess weight loss). That is maintained long term, along with high significant improvement in mental and physical health status ***(Buchwald et al., 2009).***

Patients of massive weight loss post bariatric procedure are those who lost ≥ 200 pounds of weight over short period (12-24 months). So, they should be aware of the generalized and localized anatomic and figure changes following massive weight loss.These changes include redundancy of the skin,

accumulation of subcutaneous adipose tissue around the gluteal region, loss of adipose volume of the buttocks leading to decrease buttock projection (flat buttocks). There are also collapse of the surface tissues which cause skin sagging and wobbly or floppy skin with cellulite, dimpled buttock with skin wrinkles and skin laxity and increase buttock ptosis, increased hip width, and lengthening of the infragluteal fold and V- zone deformity.These deformities contribute to **Platypygia** in many ways. Platypygia is a loss of aesethtic buttocks contour and increase the buttocks flattening and ptosis. Any one of these deformities can cause physiological and psychological problems that promote patient to seek aesthetic consultation for gluteoplasty and other procedures ***(Da Rocha, 2001).***

The recent increase in the demand for gluteoplasty is a result of changing demographics, improvement in body contouring techniques after massive weight loss, and an evolution of aesthetic preferences and fashion norms ***(Babuccu et al., 2009)***.

As in any aesthetic surgery, the surgeon must understand the patient's requests and also a universal ideal of proportions and anthropometric measures that create the impression of beauty and youth. The ideal buttocks involve more than projection and volume, a balanced and harmonious proportion with the rest of the body is a hallmark of gluteal beauty. Surgeons must be familiar with those features that characterize

beautiful buttocks before they can attempt to recreate them ***(Roberts, 2006).***

There are major differences in the perception of ideal shape of the buttocks among Asians, Caucasians, Hispanics, and African Americans. The parameters on which they differ are size of the buttocks, whether the lateral buttocks should be full, and whether there is fullness of the lateral thighs (trochanteric area). All ethnic groups find a Waist to Hip Ratio of (0.7) to be a universally most attractive. These cultural differences and different of buttocks shape (square, round, A-shape andV-shape) must be considered before beginning in any gluteoplastic procedures ***(Roberts and Mendieta, 2006).***

To achieve the best aesthetic buttock shape we need a classification system that can be individualized for each patient to guide the surgical planning for different gluteoplastic procedures. This classification system will help to evaluate the particular anatomy of each patient and analyze the important contouring zones of the buttock. In addition, this system will classify the buttock deformities according to the buttock frame categories, skin laxity, ptosis and projection ***(Mendieta, 2006).***

To obtain an optimal outcome in the most severe cases after massive weight loss with skin laxity an excisional techniques as Circumferential Body Lift used in combination with Autologous Graft Augmentation, in cases of infragluteal skin excess are corrected fully with lifting. Furthermore, in

cases with loss of tissue volume and buttock ptosis a circumferntial body lift with augmentation by implants are the best options. Liposuction is necessary if there is volume excess in areas surrounding the buttocks to enhance the buttock shape. ***(Centeno, 2008)***

Augmentation of the deflated buttocks "flat buttocks" caused by massive weight loss or after circumferential body lift is achieved by one of three ways: fat transfers, local dermal fat flaps, both are called (Autologos Gluteal Augmentation), and/or silicone implants (prothesis filler) ***(Pascal, 2006)***.

The patients may seek to correct buttock deformities with buttock implants, autologous fat harvest or transfer, liposuction and buttocks lifting or combinations of these procedures ***(Roberts and Mendieta, 2006).***

The gluteoplastic techniques in massive weight loss patients suggest that no single technique is applicable to all gluteal deformities. The wide spectrum of deformities demands an individualized approach to each patient ***(Pitanguy, 2005).***

AIM OF THE WORK

Aesthetic study and collection of the most recent techniques of gluteuoplasty after massive weight loss to reach to the ideal surgical choices in each case with simple gluteoplasic algorithm.

Chapter (1)

ANATOMY OF GLUTEAL REGION

Gluteoplasty is based on an understanding the anatomy of the buttocks and gluteal region, the superficial fascial system anatomy, and the anatomic changes that occur with massive weight loss ***(Aly, 2006).***

Anatomy of the skin and subcutaneous tissue of the buttock:

The buttocks are firm and normally convex part of the lower back. The skin over buttocks is very thick and firmly attached to the underlying subcutaneous fat. The thickness of subcutaneous fat varies in different patients. In older patients or after massive weight loss, the gluteal muscles lose tone and the retinacular attachments from the skin to the deep fascia, this causes the skin to sag and droop. There are no vital structures in the subcutaneous layer of the buttocks, just smaller cutaneous nerves and vessels ***(Lockwood, 1991).***

The gluteai muscles and the muscle mass of the hamstrings largely determined the contour of the buttock and upper posterior thigh. The gluteal crease represents a zone of adherence, while anteriorly the quadriceps underlies the bulk of the upper anterior thigh. Concerning the fat distribution of this area, normally there is a double curve in women which can be seen from behind due to the presence of two areas of fullness; a smaller area at the level of iliac crest and a large fullness at the trochanteric area. The superficial and deep fat layers above the

zone of adherence are narrower than below the zone adherence ***(González-Ulloa, 2006)*.**

The skin over the buttock is thick and covers a thick layer of subcutaneous fat. Multiple diffuse fibrous septa traverse from the gluteal fascia to the skin. They are especially density in the area of the gluteal fold. Cutting these during a buttock lift leads to an "effacement" of the gluteal fold. The skin overlaying the greater trochanter (lateral hips) also is thick but with less subcutaneous fat. It is densely adherent to the deep tissues and is recognized as an area that must be released during thigh lift (fig.1) ***(González-Ulloa, 2006)***.

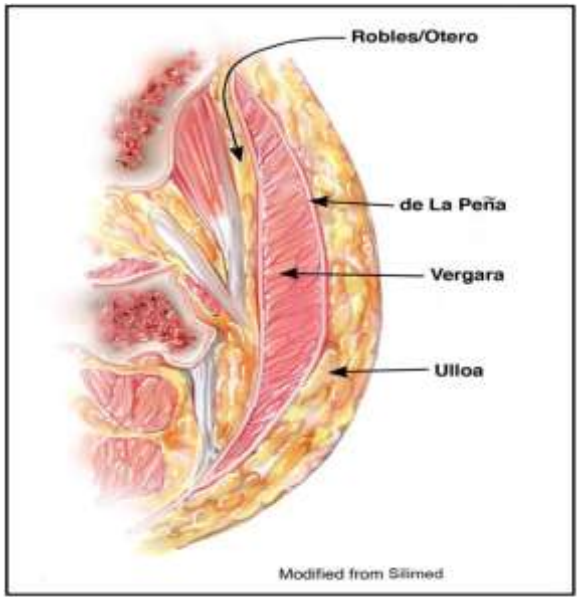

Fig. (1): Subcutaneous fat (Ulloa), gluteal fascia (De la Peña), gluteaus maximus muscular (Vergara), and submuscular fat (Robles) ***(González-Ulloa, 2006).***

Vascular anatomy of the skin and subcutaneous tissue of the buttock and lateral thigh: The blood supply of the skin of the lower extremity is random. The buttock skin is supplied from vertical perforators that originate in the gluteal muscles from superior gluteal artery in the upper buttock and inferior gluteal artery in the lower buttock and inferior gluteal fold, fasciocutaneous perforatrators from the quadriceps muscles and the tensor fascia lata muscles supply the skin of the lateral thigh (fig.2) ***(Vergara and Marcos, 2009).***

The superficial iliac circumflex artery the smallest of the indirect cutaneous branches, lateral circumflex iliac artery, skin perforators from the transverse and/or descending branches of the ascending branch of the lateral circumflex femoral artery.

Septocutaneous perforators (direct supply) posterior to the tensor fascia lata muscle were also obtained from these branches. These perforators spread to the posterior aspect of the thigh ***(Williams, 2003)***.

Fig. (2): Blood supply of the skin of buttock.
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After the skin of the gluteal region has been removed, should be able to identify the superficial cutaneous nerves in the gluteal area branches of the subcostal nerve (T12), dorsal rami of lumbar nerves,dorsal rami of sacral nerves, inferior cluneal nerves and posterior cutanous nerve of the thigh (fig.3) ***(Williams, 2003)***.

Fig. (3): Cutaneous nerve supply of gluteal region ***(Williams, 2003)***.

Gross anatomy of fatty tissues of buttocks (Mitchell and Rose, 2006):

There are three layers of subcutaneous fat: apical, mantle, and deep layers (Fig. 4)

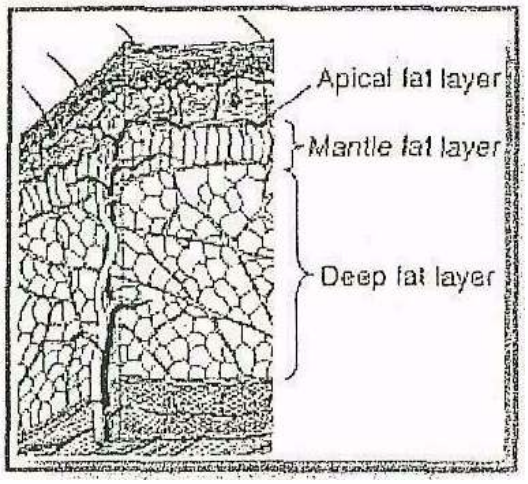

Fig. (4): Gross anatomy of fatty tissue in buttocks ***(Mitchell and Rose, 2006)***.

1- Apical Layer:

Beneath the reticular dermis, so called the thecal or periadnexal layer. It surrounds sweat glands and hair follicles, slightly deeper, the apical layer also surrounds vascular and lymphatic channels. This layer is rich in carotenoids and tends to be yellow in appearance.

Anatomical consideration:

Because of the neural, vascular, and lymphatic potential for damage, this layer should be avoided during liposuction, Extensive disruption of these anatomical elements can lead to seroma, erythema, hyper pigmentation, and even full thickness dermal necrosis. This was more of a problem in the past when larger-diameter 8 and 10-mm cannulas were directed at the deep fat layer, but these complications have become rare in this area of 2- and 3-mm cannulas.

2- Mantle Layer:

Beneath the adipocytes investing dermal structures. Anatomically organized layer of fat cells which is part of the superficial fat layer. It is called the mantle layer and is composed of more columnar-shaped lipocytes. It is separated from the deep layer of fat by fascia-like layer of fibrous tissue.

Anatomical consideration:

This layer significantly contributes to the skin's ability to resist trauma. It causes external pressure to be distributed across a larger field; much like a box-spring mattress absorbs sitting pressure.

3- The Deep Layer:

It extends from the undersurface of the mantle layer to the muscle fascia below. Its shape and thickness depend on the sex, genes, and diet of the individual. This is the layer best suited for liposculpture. Fat cells are arranged in pearls, and the pearls are gathered into globules. These globules are then packaged like eggs in an egg crate between fibrous septa, and arranged between tangential and oblique fibrous planes.

Anatomical consideration:

Tangential planes are thicker and run parallel to the underlying muscle fascia, but they are of little consequence when performing liposuction. Oblique planes are thinner and interconnect the tangential fibrous layers. They hold fat globules in their relative positions. Though thinner, they are of cosmetic consequence because the vertical arrangement of subcutaneous fat from skin to muscle fascia is the cause of cellulite ***(Mitchell and Rose, 2006).***

Gluteal region:

The gluteal region is a more anatomical and clinical concept than the term buttocks which is (the rounded, fat-filled elevation) which forms only a part of the gluteal region. The region itself extends upwards to the iliac crest of the hip bone and forwards to the level of the anterior iliac spines. It is limited posteriorly by the gluteal crease, conjoining with the undersurface of the buttock (fig. 5A, B) ***(Williams, 2003).***

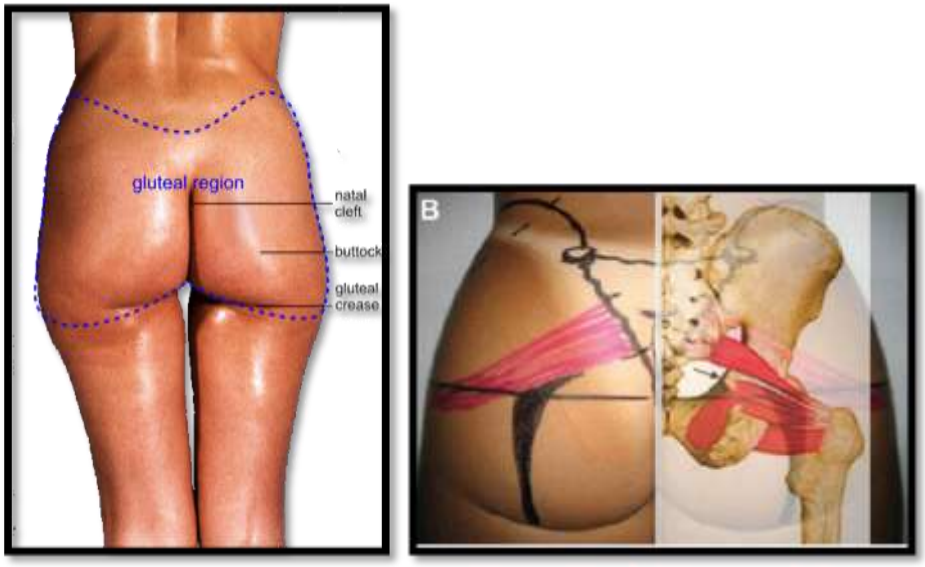

Fig. (5): A),B) Boundaries of gluteal region ***(Williams, 2003).***

The gluteal region contains the muscles of the glutei maximus, medius, and minimus (which form the main bulk of the buttocks) and piriformis, superior gemellus, obturator internus, inferior gemellus and obturator externus from superficial to deep (fig. 6). They are supplied by the gluteal

nerves and vessels, which reach them through the greater sciatic foramen ***(Williams, 2003).***

The gluteus maximus muscle is the thickest muscle in the human body, ranging from 4 to 7 cm. It originates in the iliac crest, ileum, sacrum, coccyx, and sacrotuberal ligament, with insertions in the rough line and gluteal tuberosity of the femur and the ileotibial tract of fascia lata ***(Centeno, 2006).***

The muscle acts as a powerful extensor of the thigh and stabilizes the pelvis during movements where strength is required, such as sitting up and running ***(Mendieta, 2003).***

The gluteus medius and minimus muscles originate from outer surface of ilium and inserted in greater trochanter of femur, the piriforms muscle originates from the sacrum and sacrotuberal ligament and inserts on the top edge of the greater trochanter of the femur ***(Testut and Latarjet, 2003).***

The piriforms is highly important because it splits the higher sciatic foramen, with the sciatic nerve passing inferiorly (Fig. 6) ***(Williams, 2003).***

Gluteus maximus muscle is vascularized by two major pedicles the superior and inferior gluteal arteries which are branches from internal iliac artery in the pelvis (Fig.7). These arteries and internal pudendal artery coming into the gluteal region through the greater sciatic foramen. (Fig. 7, 8) ***(Masthes and Nahai, 2004).***

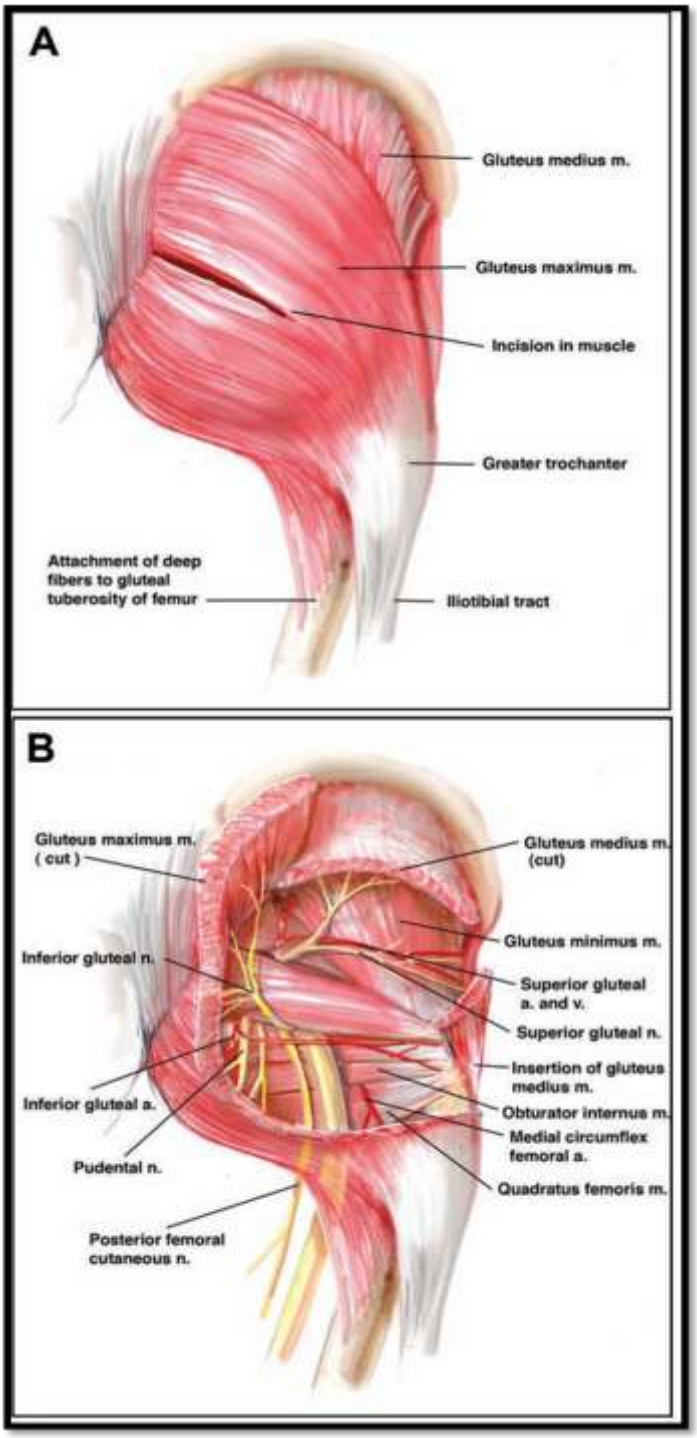

Fig. (6): Gluteus maximus, medius, minimus muscle and Piriform muscle ***(Mathes, 2006).***

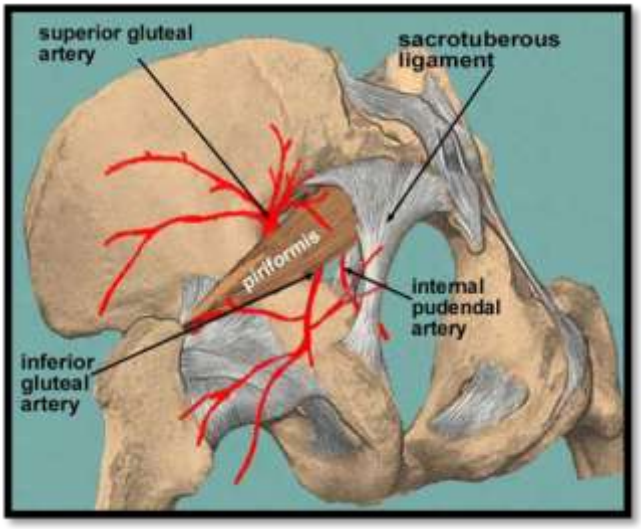

Fig. (7): Blood supply of gluteal region
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The nerve supply of the gluteal region: are branches of the lumbosacral plexus (L5, S1, and S2). As with the arteries, the nerves arise in the pelvis and pass through the greater sciatic foramen to reach the gluteal region. The piriformis muscle separates the greater sciatic foramen into superior and inferior parts. The Inferior and superior gluteal nerves are the nerve supply of the gluteal muscles.Siatic nerve ,posterior femoral cutaneous narve,pudendal nerve and nerve to quadrates femoris which is also supply the inferior gemellus and nerve to obturator internus and superior gemellus muscles these nerves pass below the piriformis muscle ***(Mathes, 2006).***

Sciatic Nerve The sciatic nerve (L4, 5 and S1, 2, 3) is the largest nerve of the human body, comprising the tibial and fibular nerve, exiting the pelvis below the piriform muscle (Fig. 8). Anatomic variations are found in about 30% of cases, as