Recent Advances in Buttock Contouring

Tarek Abulezz, Sohag University

Introduction

A well-developed buttocks are a peculiar trait of the human, and not seen in the other primates [1]. The buttock is an extremely important area in woman's sexuality and is considered a cornerstone of female beauty. Although the concept of female beauty has changed over time, there are two constant items of femininity: the breasts and the buttocks [2, 3]. However, the parameters of beautiful buttocks have varied according to time, culture, and ethnicity [4, 5].

Increasing number of patients are asking for esthetic improvement of their buttock profile or for correction of a deformity or irregularity. Buttock contouring is gaining more space in the media and in doctors' offices as well. Surgical techniques to improve buttocks contour have evolved dramatically over the last two decades [6].

Criteria of Beautiful Buttocks

The gluteal region has been recognized as an important secondary sexual characteristic since the beginning of history and it has its place in the concept of beauty in all communities. The morphology of the gluteal region has been studied extensively in an objective way by many researchers, defining the changes in the gluteal region particularly with ageing and weight gain and loss [7-9]. Beautiful buttocks should be symmetric and rounded, with the greatest projection coming from the upper and middle thirds. In 2006, Cuenca-Guerra and Quezada published their results after carrying out an extensive anthropometric study [10]. They specified 4 main criteria for gluteal aesthetics (Figure 1 and 2):

1. **Lateral depression**: a hollow on the lateral aspect of each buttock formed in its deepest point by the greater trochanter,
2. **Infragluteal fold**: a horizontal crease arising from the median gluteal crease and runs laterally under the ischial tuberosity with a slight upward concavity.

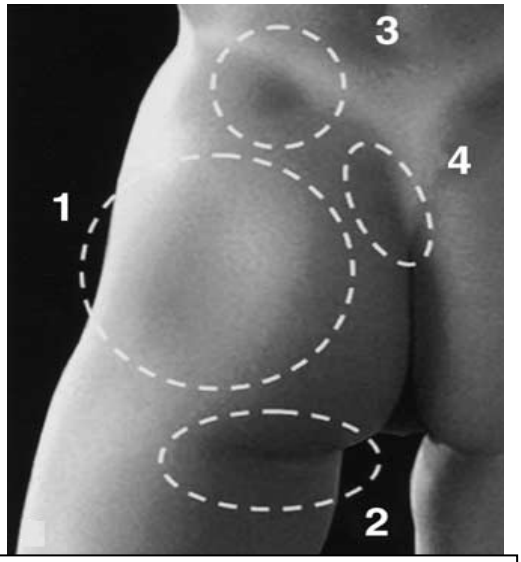

Fig 1: components of beautiful buttock

3. **Supragluteal fossettes**: two hollows located on either side of the medial sacral crest. They are formed by the posterior superior iliac spine and medially by the multifidus muscle.

4. **V-shaped crease**: two lines arising in the upper portion of the gluteal crease toward the supragluteal fossettes.

Lumbar hyperlordosis is an additional feature that may contribute to beautiful buttocks. A beautiful gluteal contour should also include the perigluteal areas namely the lower lumbar regions, the trochanteric/hip area and the inner thighs.

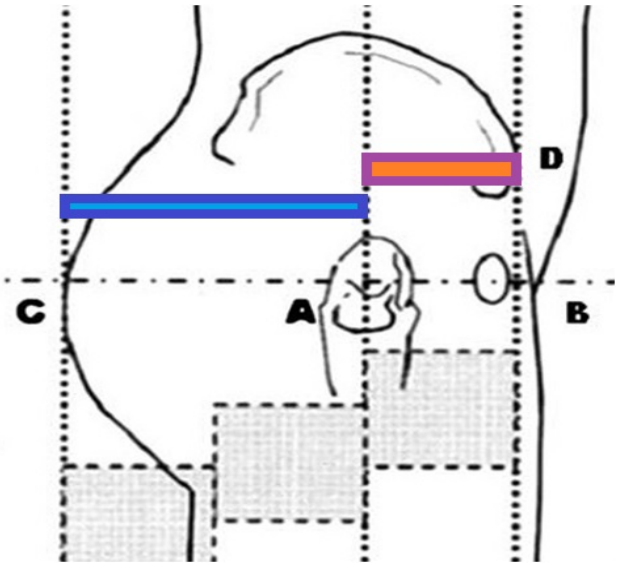

Fig 2: (A) Greater trochanter, (B) Point of maximal projection of the mons veneris, (C) Point of maximal gluteal projection, (D) Anterior superior iliac spine.

AC = 2AB.

The waist-to-hip ratio is a crucial item of aesthetic ideals of the buttock, regardless of ethnicity (Figure 3). It is the ratio between the waist circumference at its narrowest to the hip circumference at the level of maximum prominence of the buttocks [11]. The ration is measured in posterior view and in lateral view (figure 3) with the most pleasing ratio 0.65 and 0.7 respectively (table 1) [4].

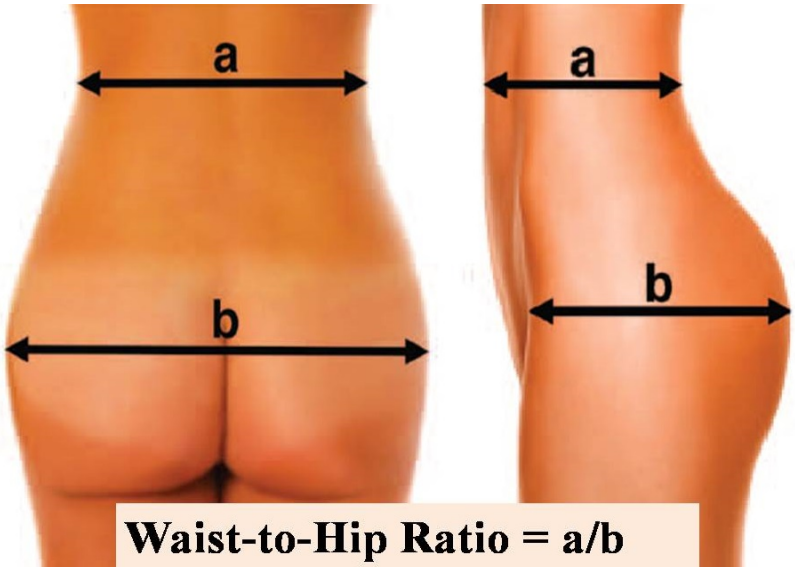

Fig 3: the waist-to-hip ratio in posterior and lateral views.

Table 1. Buttock Aesthetics Preferences [4]

	Most Attractive (Percentage of Respondents)	Second Most Attractive (Percentage of Respondents)
Posterior view		
Waist-to-hip ratio	0.65 (44.2)	0.60 (25.0)
Vertical ratio for lateral prominence	Inferior gluteal convexity (26.3)	70:30 (23.6)
Lateral view		
Waist-to-hip ratio	0.70 (29.8)	0.725 (22.4)
Vertical ratio for posterior prominence	50:50 (45.1)	40:60 (37.5)

Ethnic Gluteoplasty

Waist-to-hip ratio is almost constant for all ethnic gluteal types [11]. However, buttock size, lateral buttock fullness, and lateral thigh fullness are different among various ethnic types. Roberts et al have summarized these ethnic differences as follows: (1) Caucasians, full but not extremely large buttock size, with two types of lateral buttock fullness, either rounded or hollow, and with no lateral thigh fullness; (2) Hispanics, very full buttock size, with very full lateral buttock and slightly full lateral thigh; (3) African Americans, buttock size as full as possible, with high fullness of lateral buttock and lateral thigh; and (4) Asians, small to moderate sized but shapely buttock, with no fullness of lateral buttock and lateral thigh [12].

These ethnic variations have to be kept in mind while evaluating the patient and planning how to manage his problem [5]. The surgical approach should restore the universal esthetic ideals and at the same time, it should respect and preserve the specific ethnic considerations for every patient.

Gluteal Ptosis

Gluteal ptosis was defined and classified in an elegant article published by Gonzalez [13]. The classification includes five degrees of severity and two factors: the length of the lower gluteal crease and the measuremen of posterior gluteal tissue exceeding the crease at posterior mid-thigh line (figure 4).

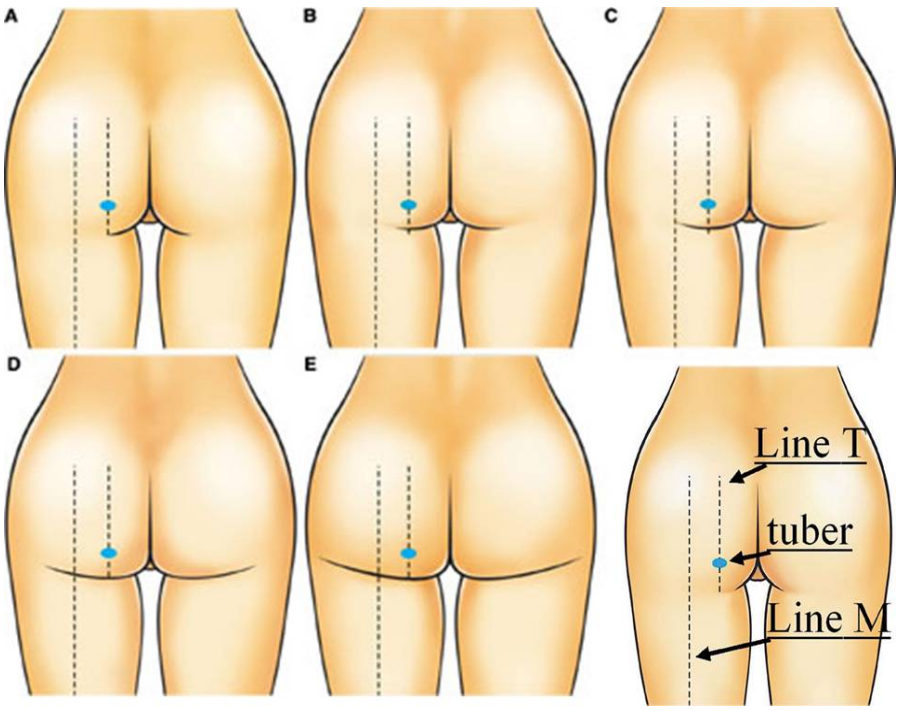

Fig 4: degrees of ptosis (A) Degree zero: the crease can reach T-line but not overpass it. (B) Degree 1: minimal pre-ptosis. The crease passes over T-line, but does not reach M- line. (C) Degree 2: moderate pre-ptosis. The crease reaches M-line. (D) Degree 3: borderline pre-ptosis. The crease goes beyond M-line, with no ptotic tissue at M-line. (E) True ptosis. There is ptotic tissue at M-line *(The **M** line passes through the posterior mid-thigh line, **T**-line passes through the ischial tuber) [13]*.

Indications for Buttock Contouring (Gluteoplasty)

According to the American Society for Aesthetic Plastic Surgery, buttock enhancement was one of the fastest growing areas of aesthetic surgery in 2010. The main reasons why people request buttock augmentation are: to regain shape distorted by weight loss or aging and to increase attractiveness [14]. Still, there are many other indications that can be categorized as:

1- **Genetic abnormality that may be one of the following**:
   a. Genetically absent or hypoplastic buttock
   b. Disproportionately large buttock
   c. Genetic lipodystrophies involving the gluteal region

2- **Acquired abnormalities caused trauma**
   a. Motor vehicle accidents
   b. Post-tumor resection
   c. Animal bites
   d. Post-injection deformities caused by post-injection abscess or hematoma
   e. Depression induced by steroid injection

3- **Acquired degenerative gluteal deformities caused by**
    a. Aging, sun damage and massive weight loss like post-bariatric (skin laxity)
    b. Obesity, menopause and skeletal deformities (diminished gluteal aesthetic)
    c. Loss of substance in longstanding bed-ridden state for medical diseases with atrophy of the muscle and fat and thinning of skin.
    d. Previous radiotherapy
4- **Acquired iatrogenic abnormalities which include**
    a. Iatrogenic deformities after surgeries in the trochanteric or gluteal region (for tumor, bedsores or for cosmetic purposes)
    b. Contour irregularities after liposuction

Aesthetic Vs Reconstructive Gluteoplasty

1. **Pure aesthetic** gluteoplasty when surgery is used for contour enhancement in ptotic buttocks and volume augmentation.
2. **Reconstructive gluteoplasty** cover all other above-mentioned indications.

Procedures Used for Buttock Contouring

Many surgical techniques have been tried to improve the contour of the gluteal region [15]. These procedures include liposuction and lipofilling, the use of silicone implants or the use of local dermofat flaps. Beside these “invasive” procedures, there are some less invasive techniques used to improve the contour of the gluteal area and these include thread lift and endopeel gluteopexy. However, in most cases, no single procedure can achieve an optimum result or meet the expectations of the patient and/or the surgeon. For this reason, it is important to evaluate each case individually and to follow some clear guidelines.

Gluteal Lipofilling with perigluteal liposuction (Brazilian Butt Lift)

The accumulation of excess fat in the perigluteal regions gives square-shaped buttocks. Accumulation of fat at the supragluteal and paralumbar regions disturbs the natural supragluteal fossettes and the V-shaped crease and partially hides the gluteal prominence. Lipodystrophy at the infragluteal area conceals the natural infragluteal fold. While fat accumulated in the hip and

trochanteric region conceals the natural depression of this areas and distorts its natural appearance. Liposculpture includes liposuction of excess fat from perigluteal areas and after some processing the aspirated fat are re-injected into the buttocks for augmentation [16]. During aspiration, processing and injection, gentle manipulation is required to maintain the integrity of the fat cells to achieve better results. In the buttock region, this procedure was popularized by Brazilian plastic surgeons and hence the name: the Brazilian butt lift. The procedure starts with sculpturing of the waistline and, then the harvested fat is processed and injected into the buttock muscle to help build a perky, youthful shape (figure 5). Some of the fat may be frozen to be available for touch-ups between 4 weeks to 6 months following the procedure.

Although not acting directly, liposuction of the perigluteal areas can reshape the buttocks, giving an impression of augmentation and lifting of this region achieving a satisfactory appearance (figure 5) [17, 18]. On the other hand, with autologous fat transfer, there is no risk of tissue rejection or foreign body reaction as in artificial fillers. The procedure is also less invasive than buttocks implant surgery and is associated with faster and easier recovery. Although, there may be minor post-operative bruising and swelling the patient may be able to resume normal activities within two weeks of the procedure.

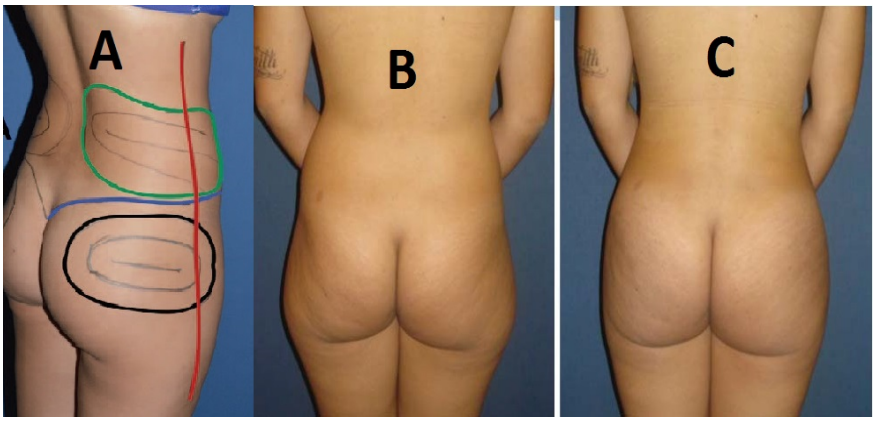

Fig 5: A Preoperative marking; liposuction from the green area and lipofilling of the black area limited anteriorly to the red line, B preoperative view and C 6-months postoperative [17].

Liposuction with tumescent technique is the most commonly used method to improve the buttock contour [19]. A small, 2-4 mm cannula is used, and the incision hidden in the buttock crease or the upper-outer buttock area. Ultrasonic-assisted liposuction may be used in large volume of lipodystrophy of the buttock or the areas around it [20]. Superficial liposuction is another method of reshaping the buttock with 2 mm cannula and gentle manipulation to ensure a smoother result [21]. It is of particular importance in fine irregularities and cellulites.

Gluteal Implants

The implants are simple and easy to perform. The procedure is usually performed under general anesthesia as a one-day surgery but the patient needs about 4 to 6 weeks to resume normal activities. On the other hand, using an implant to enhance the buttock projection is not an easy choice; this implant is supposed to withstand the patient's weight and daily life activity. Also, implants are a lifelong foreign material that is placed in the body and are liable to complications.

The first augmentation gluteoplasty was reported in 1969 by Bartels and colleagues who inserted a mammary implant above the gluteal muscles to correct unilateral gluteal ptosis [22]. Bilateral subcutaneous implants were then used to correct platypygia [23]. Gonzalez-Ulloa placed almond-shaped implants in a subcutaneous plane through bilateral infragluteal crease incisions [24]. To avoid implant migration and capsular contracture, Robles et al. introduced the prosthesis in the 'sub-gluteal space' between the gluteus maximus superficially and the gluteus medius and piriformis muscles deeply [25]. In 1996, the anatomic teardrop-style implant was designed for intramuscular placement [26]. This intramuscular implant is better protected from trauma but it may become more noticeable when the muscle contracts [7, 27]. Placing the implant either in the intramuscular or subfascial plane is largely determined by the surgeon's preference, but there is no evidence-based superiority of one plane or the other [15]. Gluteal implants can improve the upper and midbuttock contour, but they will not correct the lower buttock deformities [28]. Infra-gluteal incisions were firstly used to insert the implants, then bilateral parasacral incisions and finally a single median incision in the intergluteal cleft was used for both sides (Figure 6) [7].

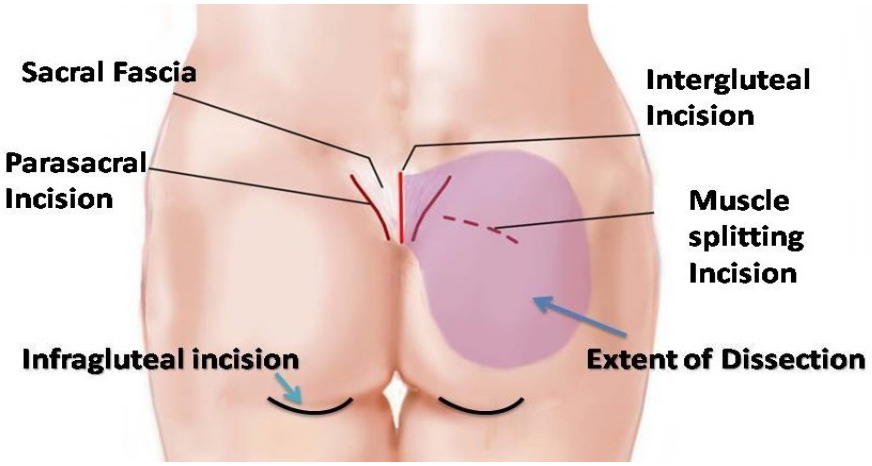

Fig 6: Illustration demonstrating the implant dissection and incision options to consider during preoperative planning [15].

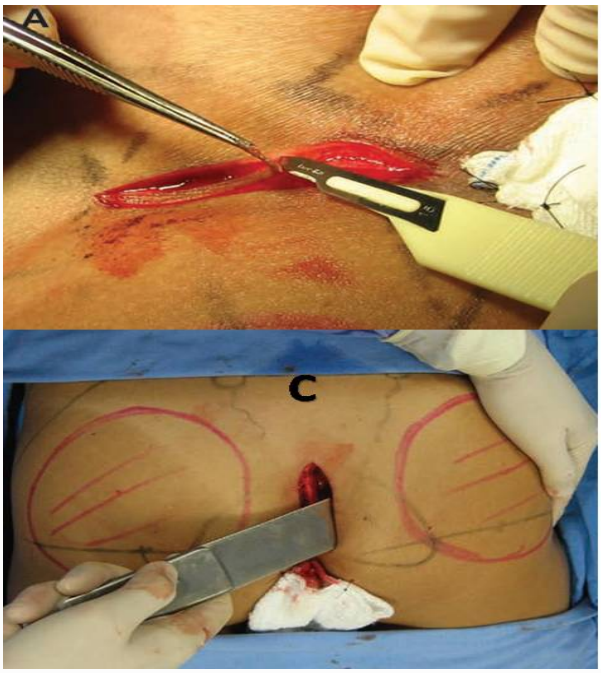

Figure 7: Preparing the pocket
A The median intergluteal incision;
B Subcutaneous detachment;
C Intramuscular blunt dissection [25].

Postoperative recommendations: Patients remain in the prone position as much as possible immediately following surgery and avoid sitting for 3 weeks. Early ambulation is encouraged to reduce the risk of venous thrombosis. Exercise is discouraged for 8 weeks. Muscle relaxants may be needed especially in patients with intramuscular implants [15].

Gluteoplasty with Dermofat flaps

Patients who have underprojected buttocks together with some degree of ptosis may not get satisfactory results after gluteal implants or fat injection alone. For those patients, autologous dermofat flaps allow a buttock lift along with augmentation. Dermofat flap is dissected from the supragluteal lumbosacral region and transposed downward to augment the buttock as an autologous implant [29]. The flap has an ample amount of tissue with wide range of mobility and reliable vascularity. These autologous tissue augmentation stands as a very viable option for post-bariatric patients undergoing belt abdominoplasty or torsoplasty after massive weight loss [30]. With these belt lipectomies, the lumbar dermofat flap augmentation gluteoplasty provides a voluminous autologous tissue to enhance buttock projection and give a more natural appearance to the gluteal contour [31]. It can provide a durable aesthetic result with more satisfaction for both the physician and the patient. Lumbar dermaofat flaps have been described by different techniques (figure 8 and 9) with reliable prognosis and satisfactory esthetic results.

Another dermal flap was described for lifting of ptotic buttocks with ill-defined infragluteal fold. This deepithelialized dermal flap allows for the creation of a well-defined stable infragluteal fold. The technique can be used for patients who have lost their natural gluteal sulcus, with a resultant altered buttock shape, after trauma or other causes [32-34].

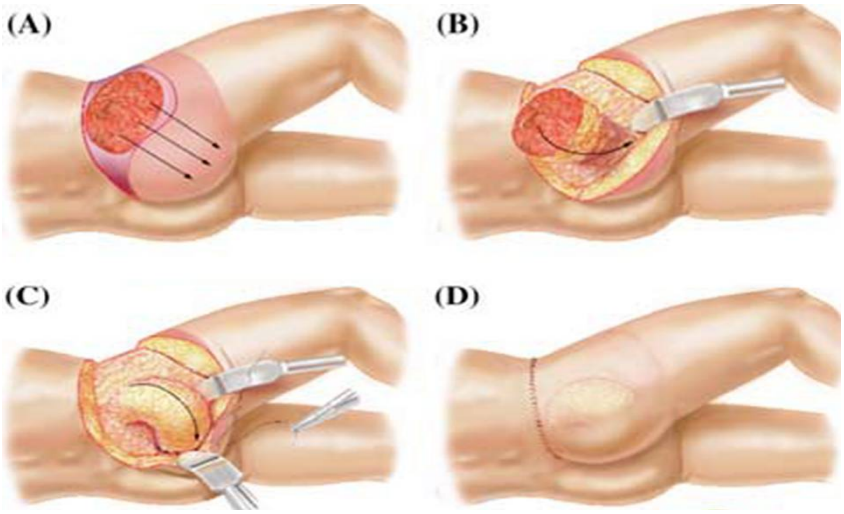

Fig 8: Surgical steps of the perforator-based dermofat flap. (A) positioning of the patient and marking of the flap; (B) flap dissection; (C) caudal rotation of the flap and suturing it to the gluteal fascia; (D) skin is closed on drains [35].

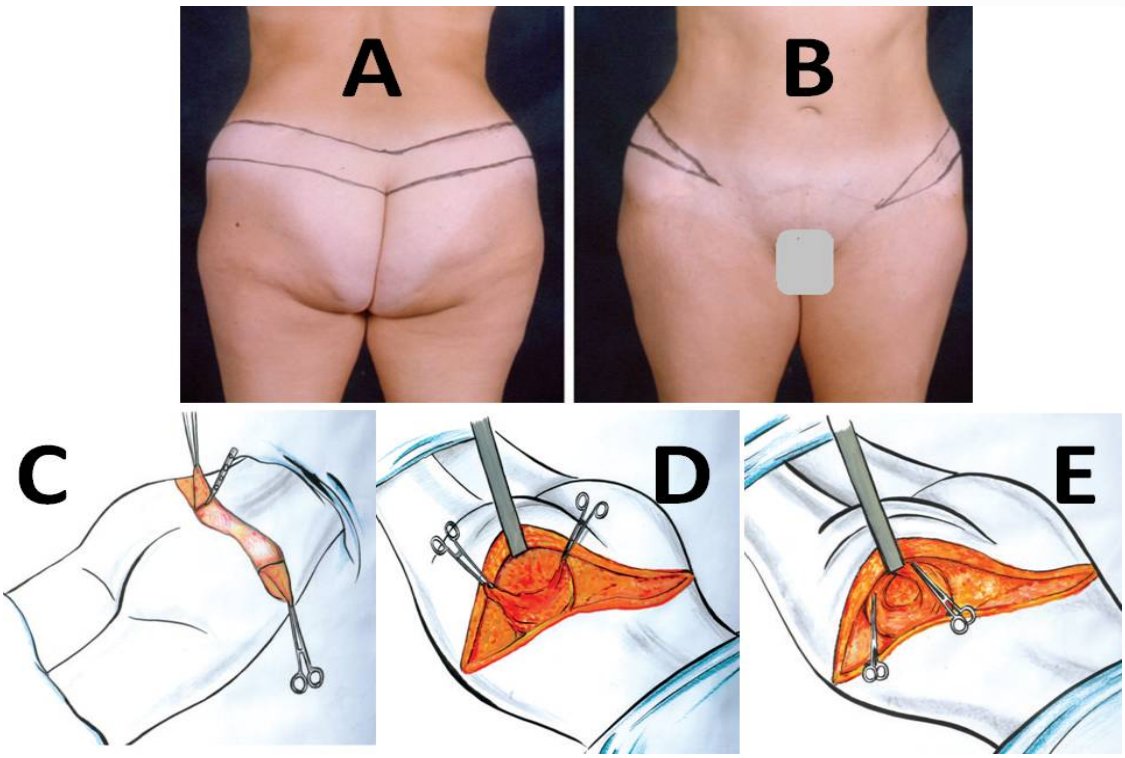

Fig 9: The technique of dermofata flap. A and B preoperataive marking of the incisions; C the flap is deepithelialized and an incision is made on the medial and lateral segments; D fat flap is undermined medially and laterally, maintaining the central pedicle; E the two segments of the flaps are rotated and sutured together in the muscle plane [31].

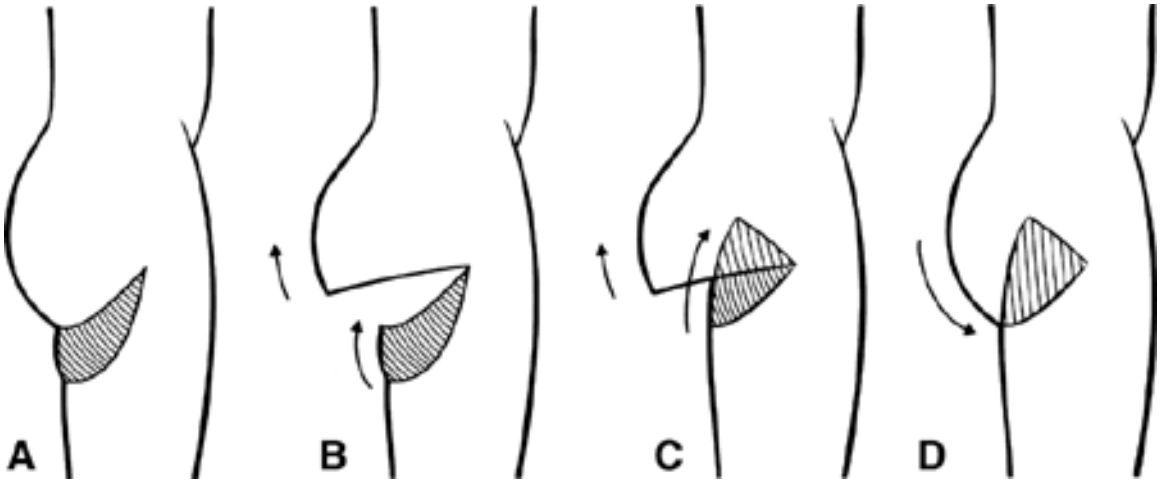

Fig 10: Correcting gluteal ptosis banana fold by dermotuberal anchorage. A deepithelization of banana fold; B incision of the infragluteal fold and exposure of ischial tuberosity; C dermal flap is anchored to the ischial tuberosity; Dredraping of the gluteal skin and closure [36].

Mini-invasive options

Butt Thread Lift with Silhouette Sutures

During the thread lift procedure tiny barbed suture threads are placed from a hidden point above the buttock to the bottom of each buttock cheek. The threads are tightened and the small incision is closed. Three months later the threads are tightened a bit more and the buttock achieves a higher and tighter lift (figure 11). This 2-step suture technique is simple, with no traumatic effects, and is performed with local anesthesia. It can be combined with lipofilling or liposuction techniques. The disadvantage of this procedure is that it requires the patient to undergo 2 separate surgeries [37].

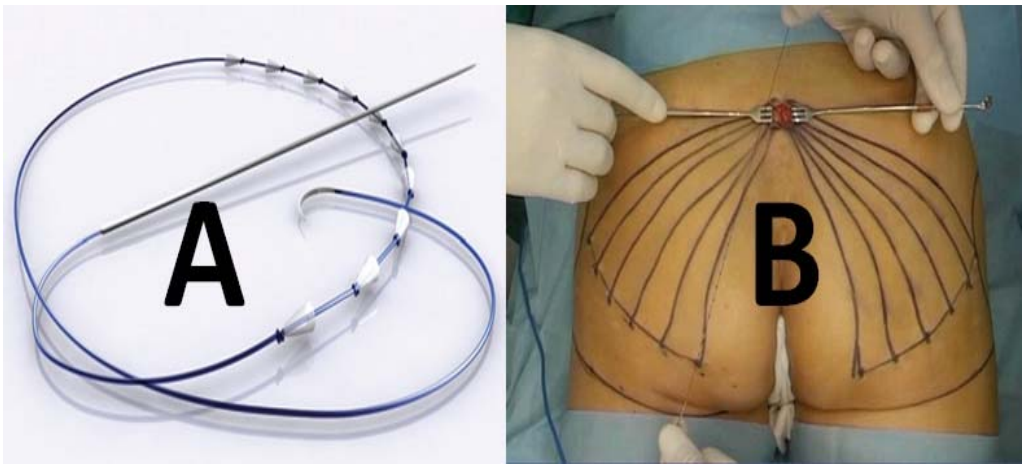

Fig 11: A the silhouette suture and B the incision and the arrangement of the 6 pairs of sutures on both sides [37].

Silhouette suspension sutures are subcutaneously for vertical traction. The procedure has two stages: after the initial placement, the cones induce fibrous tissue reaction enough to guarantee a good lift when the sutures are tightened in the second stage after 3 months. This will maintain the suspension of the buttocks tissues [37]. The procedure is ideal for those patients who don't have enough fat for the Brazilian fat transfer technique, although those patients with enough fat can even combine the two procedures for an even greater looking lifted and rounder buttocks (Figure 12).

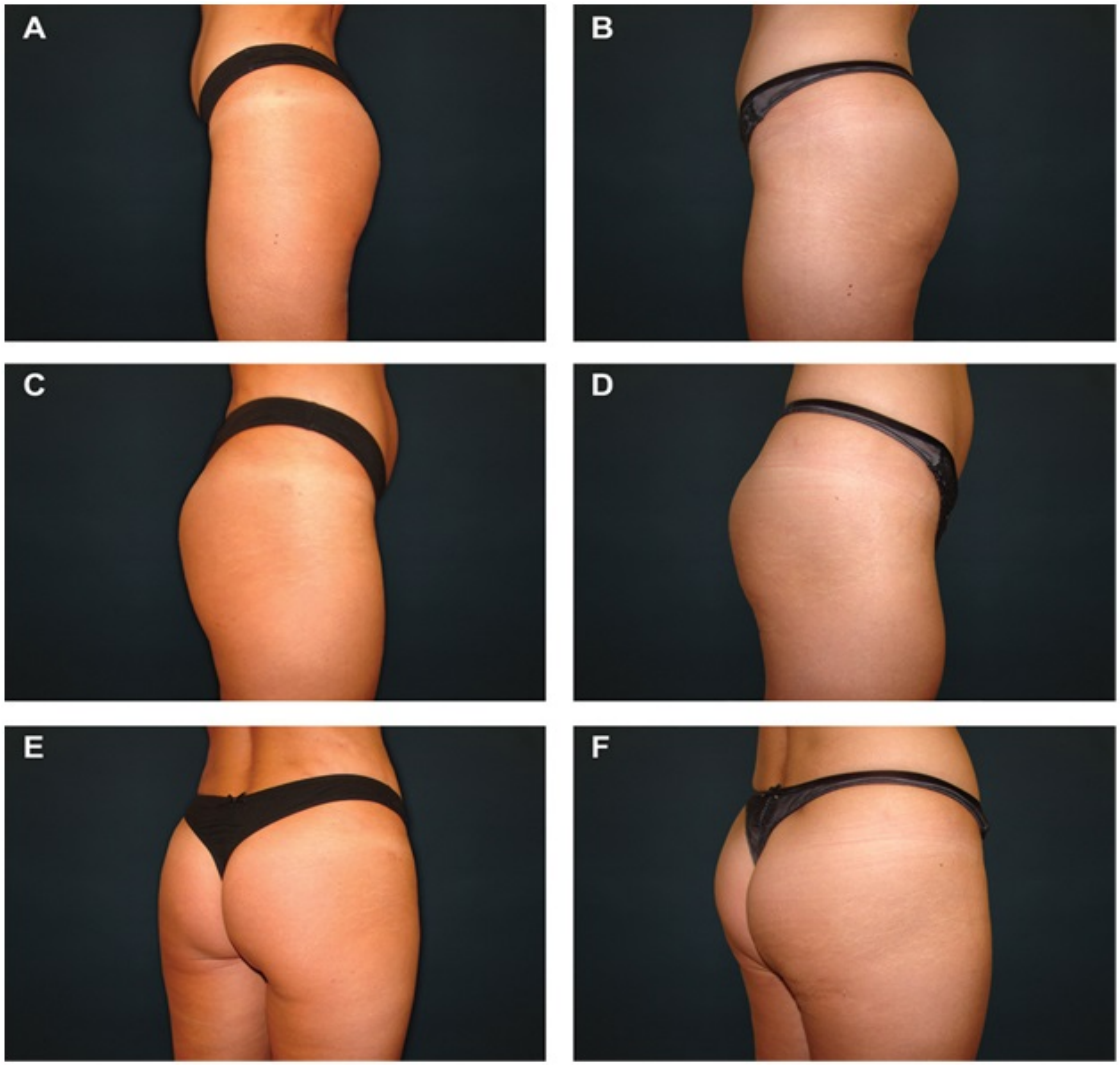

Fig 12: (A, C, E) Preoperative views of a 43-year-old woman desiring improvement in her buttocks contour. She also underwent liposuction of the love handles. (B, D, F) One year after gluteopexy [37].

Filler Gluteoplasty

Stabilized hyaluronic acid (HA) gel (Macrolane) is composed primarily of water (98 %) and HA (2 %). It is biocompatible and biodegradable and, like implants and fat grafts, it can be used for volume augmentation by occupying space within the tissue [38]. Being biodegradable the treatment effects of the gel are not permanent and may require retreatment as the body changes with time. The gel provides a safe and effective temporary aesthetic augmentation of the buttocks [14, 38]. Although the substance degrades over time, a good percentage of patients still finds some esthetic improvement in their buttocks' appearance and express their satisfaction with the results. Although small gel HA acid has been approved by the FDA, and many reports have documented its benefits and safety in perioral rejuvenation, the use of such filler into the buttocks has not achieved much popularity due to the concern possible complications and late consequences.

Endopeel Gluteopexy

Medical Gluteopexy induced by injection of chemical substance onto the muscles of the buttocks is a new technique called endopeel. It is claimed to induce immediate enhancement of the appearance of the buttock that lasts up to 6 months. Oily carbolic acid is injected by 25-gauge flexible needles in the subcutaneous plane to obtain the wished lifting effect using crisscross-technique. Always aspirate before injection to avoid intravascular injection of carbolic acid.

Although the term endopeel gluteopexy has almost become a fixed title in every esthetic meeting, yet there isn't much scientific literature about it. The word "endopeel" is not found in the www.pubmed.com.

Practical Guidelines for Buttock Contouring Options

Buttock contouring surgery requires careful patient evaluation and calls for adherence to the proper techniques and guidelines. With a proper and thorough evaluation of the patient's anatomic and clinical aspects can clinicians determine which procedure or combination of procedures will achieve the desired results [6].

The buttock is divided into 3 sections: upper, middle, and lower. Each section must be evaluated and managed independently to achieve optimal result. The upper buttock is subdivided into an outer and a central zone. This section should be round with most of the fat located directly posterior. When the outer zone is disproportionately large, the buttocks will look square and less attractive. Liposuction will correct the problem. However, the central zone may require volume augmentation with fat or an implant. The mid-buttock is also divided into a central and an outer zone which usually has a depression. The lower buttock is the most difficult area to address. It is divided into an inner, a central, and an outer zone. Key elements to be evaluated include the infragluteal crease, the gluteal fold and the outer thigh skin fold [28] .

There are 5 options proposed by Lázaro Cárdenas and his colleagues that a surgeon can choose which of them will achieve the best result for a particular patient [39].

1- Liposuction with gluteal lipoinjection

This procedure is indicated for patients with fat excess or lipodystrophy of the perigluteal areas. The fat excess is removed with liposuction and then infiltrated in the gluteal areas where additional volume and contour improvement are desired.

2- Liposuction with gluteal implants

This surgical combination is indicated when there is minimal lipodystrophy in the regions adjacent to the buttocks. However, elimination of this fat still improves the contour of these peripheral areas. Because the amount of fat removed by liposuction in these cases is insufficient for the purpose of fat grafting, buttock implants are used.

3- Liposuction with lipoinjection and gluteal implants

This technique is indicated for patients with minimal lipodystrophy in the areas adjacent to the gluteal region but with significant hypoplasia of the buttocks and the tronchanteric region. Lipofilling augments the tronchanteric region and the implants to improve the buttocks.

4- Liposuction with gluteal implants and a buttock-lift

This approach is beneficial for patients who have lost weight and present with minimal lipodystrophy but have hypoplasia and ptosis of the gluteal region. In these cases, liposuction is done in the necessary areas, and buttock volume is enhanced with the implants. In addition, ptotic tissues are surgically lifted.

5- Liposuction with lipofilling, gluteal implants, and a buttock-lift

This mix of procedures is appropriate for patients who have lost weight and present with ptosis but whose lipodystrophy persists. For these patients, additional projection is needed in the gluteal and tronchanteric areas. Liposuction is performed in the required areas, and fat is transferred to the tronchanteric region. Gluteal implants also are placed, and tissues are surgically lifted.

Complications of Gluteoplasty

Like all other surgical interventions, the buttock contouring procedures are not without complications [40, 41]. In esthetic procedures, unmet patient's expectation is included as a complication because patients often desire unrealistic results. This should be avoided by careful preoperative counseling and proper patient selection. Fat grafting is often met with some disappointment, as some of the fat grafts do not survive. Many other complications are possible including anesthesia reactions, toxicity from Xylocaine or epinephrine, remaining local areas of numbness and remaining contour problems in the form of unevenness or irregularities [42]. With fat injection, the most commonly reported complications are fat resorption, asymmetry, irregularity, paresthesias, seroma, abscess, and cellulitis [17, 43]. However, a fatal case of pulmonary fat embolism has been reported [44].

With buttock implantation, complications include infection, wound dehiscence and implant exposure, reoperation, rupture of the implant, seroma, capsular contracture, asymmetry, implant shift, overcorrection, sciatic nerve injury, and paresthesia [45-47]. Liquid silicone was used as a soft-tissue filler for patients seeking rapid soft-tissue augmentation of the face, breast, and buttock, but this was associated with devastating complications [48, 49]. Reduction of the subcutaneous undermining, application of adhesion stitches, and gentle tissue handling to maintain good vascularization in the sacral region are the keystones to reduce wound complications after buttock implant placement [50].

Future Prospect

The future of contour surgery continues to be positive. More superficial irregularities will be safely addressed with less surgical risk. The rapidly growing technology of autologous fat

transfer and the possible incorporation of stem cells is very promising. Fat transfer cannulas and instruments will continue to undergo refinement, becoming more affordable and more applicable.

Conclusion

Buttock-contouring is a complex process which requires individualized patient evaluation and proper choice of the surgical procedure(s) to accomplish the desired results. It is getting more and more popular with increasing number of patients asking for it. There are several available surgical modalities that can be used independently or in combination. The proper choice and combination of these procedures will determine the degree of achievement and maintenance of favorable results. Good results are achieved with thorough evaluation of the problem, careful planning, good selection of patients and procedure, and refined surgical techniques.

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