

Augmentation Gluteoplasty: The XYZ Method

Raul Gonzalez, M.D.

Ribeirão Preto, Brazil

Abstract. Gluteal implants offer a good way not only to correct hypoplasias, but also to remodel and give rounded shape to buttocks, achieving beauty and sensuality. However, until recently, only a few surgeons have used this procedure. An intramuscular introduction of the implants may be a good means of reaching this goal, but because the undermining is performed without direct view, difficulties may occur in obtaining a symmetric and safe plane, and this can lead to unpleasant results. This report presents an intramuscular method based on geometry, in which three points (X, Y, and Z) and a line (G) in the pelvis define the plane in which the dissection must be performed, allowing more precise and safe undermining. From 1986 to 2003, 746 patients underwent surgery using this technique, achieving good results. This technique has proved to be a safe and reproducible way of performing augmentation gluteoplasty.

Key words: Buttocks—Gluteus maximus—Silicone implant—Gluteus—Augmentation gluteoplasty

Augmentation gluteoplasty has been performed since 1969 [3]. Initially, its use was described as a way of modeling atrophies in the gluteal area for aesthetic and reconstructive purposes [2–7,13]. The techniques described at that time introduced smooth implants in the subcutaneous tissue and resulted in a great number of complications such as dislodgements, asymmetry, and capsular contracture [8,10,11,20]. Therefore, their use was discontinued. Lipografting has been performed [6,10,11,17,18], but does not apply for all cases.

In 1984 Robles et al. [20] described a technique that involved the possibility of inserting implants anteriorly to the gluteus maximus in the subgluteal cellular space through a vertical incision in the sacrum. This technique immediately solved the complications that occurred with the subcutaneous implants and gave new drive to interest in this subject [10,11,21]. However, with this method the pocket has some limitations. The undermining must not pass down the inferior border of the pyramidal muscle to avoid sciatic compression by the prosthesis, leaving it placed too high in some cases, resulting in poor aesthetic outcome.

In 1996, Vergara and Marcos[21] reported the possibility of using implants inside the gluteus maximus, but did not establish a method for doing so. They did not show the levels and limits of the undermining in detail. They described the same kind of preoperative skin marks used by Gonzalez-Ulloa [13] to mark the location of the prosthesis with the patient in standing and seated positions. However, when the patient is in surgical position, the skin changes positions, and all the previous marks are no longer useful in showing the exact site where the prosthesis is to be placed.

The gluteus maximus, being very thick and ample, can perfectly receive an implant, as described [21], but without proper references, this undermining inside the muscular mass may be made incorrectly. Because the initial undermining is performed through an incision no wider than 5 cm, it is rather difficult to know where to drive the dissectors.

The goal of this study was to present a safe and reproducible technique for performing the undermining inside the gluteus maximus to introduce the gluteal implants oriented by three references points (XYZ) and a line (line G) serving as a guide. A new instrument set appropriate for intramuscular undermining is introduced.

Anatomy

Both sides of five fresh cadavers were dissected. The anthropometric relations between the gluteus maximus and other structures of the gluteal area and the palpable points of the pelvis were studied. This series of dissections confirmed that the three reference points we created and use are good and safe guides for the operation. We also studied the line we created to indicate the lateral limit and middle of the muscle according to the origins and insertion of the gluteus maximus. For a better understanding of the XYZ method, an anatomy review is needed. Accordingly, we selected the following topics.

The Gluteus Maximus Muscle and Its Insertions

The gluteus maximus is very thick and within nearly 6 to 7 cm of the sacrum. At its origin, it spreads to include part of the iliac bone, sacrum, coccyx, sacrosacral ligament, and tuberosity ischiatica. The gluteus maximus, like all muscles in the area, has its origin in the pelvis, but it is the only muscle not inserted in the trochanter. It rather has its location in the rough line of the femur and the fascia lata. The muscle covers only the posterolateral face of the trochanter, making a "bursa." A point close and tangential to the posterolateral trochanter's face is always inside the gluteus maximus.

The Innervation

The motor innervation of the gluteus maximus is performed by the inferior gluteus nerve, a ramification of the sacral plexus. The nerve comes from the pelvis to the gluteal area, crossing the great sciatic foramen posteriorly and in a way medial to the sciatic nerve. It divides into three collateral branches: the gluteus (motor nerve of the gluteus maximus), the perineal, and the femoral (sensitive nerves) branches. The gluteus branch is the first collateral (inferior gluteal nerve) and arises very close to its emergence in the area, next to the inferior border of the pyramidal [19]. As soon as it arises, the inferior gluteal nerve divides into four or more fillets. These fillets run in a crow's foot shape between the muscle and its anterior fascia. The thickest of them are the most superior and the most inferior fillets. The most superior of these fillets runs almost vertically near the sacrum and innervates the superior portion of the muscle. The most inferior fillet, also the most calibrous of these fillets, runs very close and parallel to the sacrotuberous ligament and gives fine branches, which enter the muscle by the anterior face. The undermining inside the muscle must never be performed too near the sacrum, the sacrotuberous ligament, or the sciatic tuberosity. This action could isolate the posterior muscular portion and lead to a denervation.

Vascularization

The superior and inferior gluteal arteries and veins are responsible for the irrigation of the gluteus maximus. The entrance is made in the anterior face of the muscle very close to the sacrum. As the arteries and veins enter the muscular mass, they divide into thinner ramifications, resembling a tree with horizontal branches. Most of these branches are parallel to the muscular fibers, and an undermining that separates the fibers without cutting causes less damage to the irrigation. Because the major branches of both arteries are very close to the sacrum and sacrotuberous ligament sharp dissection near this area must be avoided.

Materials and Methods

From 1986 to 2003, we operated on 746 patients using this method. The age of these patients varied between 16 and 64 years (average, 32 years). There were only seven male patients. Aesthetic correction for the gluteal hypoplasia was the predominant indication (86%). We also used this technique for secondary gluteoplasty in the treatment of sequelae from augmentation gluteoplasty attributable to badly positioned implants in 67 cases (9.1%), and to reconstructive surgery for the treatment of congenital or acquired problems in 26 cases (4.6%). In three cases of poliomyelitis sequelae, the implant was unilateral. We used implants made especially for the gluteal area. For 743 cases, we used smooth implants. Texturized implants were used in only three cases. The sizes of the implants varied from 180 to 300 ml. And were in two shapes: round (72%) and oval (28%). The size was larger than 300 ml in only four cases.

Surgical Technique

The Surgical Plane and the Geometric Plane

A surgical plane offers a good way to undermine and separate two structures or to bipartition one in the easiest and safest manner possible. Ordinarily, the surface of one structure is used as a guide to undermine and to separate the two structures. This concept is not easy to use when it is not possible to see the structures during the procedure, and there is no surface to direct the undermining. For this reason, we opted to use a geometric concept of plane in the intramuscular space. Using three points and a line that are transoperatively identifiable, we were able to establish a plane for the intramuscular undermining.

A geometric plane is a level or flat surface generated by a straight line moving with respect to a fixed point. If we have two points in the means of the muscle, one situated in the upper part of its lateral limits (point Y) and other near the sacrum (point X),

we can join them to obtain a straight line in the middle of the muscle. If we move this line with respect to a third and fixed point (point Z), we can have a plane. Our X, Y, and Z points, when joined with lines, form a triangle in the middle of the muscular mass and establish a pattern level for the undermining.

The G Line and the Lateral and Depth Limits

The origin and lateral limits of the gluteus maximus are variable, and there is not a described reference that helps indicate it in live individuals. In our anatomic dissections in fresh cadavers, we found the lateral limit of the gluteus maximus' origin over the iliac crest located 4 to 5 cm lateral to the posterior superior iliac spine (PSIS) in all the corpses we dissected. A straight line joining a point 4 cm lateral to the PSIS in the inferior border of the iliac crest and the posterolateral surface of the trochanter was inside the muscle in all the dissections. The gluteus maximus is the only gluteal muscle that has no insertion in the trochanter, but covers it in a tangential way. If this line is tangential to the trochanter's posterolateral face, it will always be inside the muscle. In all our dissections, this line was coincident with the means of the muscular mass. We call this line G (Fig. 3a). This line can be used in the surgery to guide our undermining because it contains the points Y and Z and serves as the guide for finding these points. Although a line can be mark on the skin of the patient in the operating room, as an indication, the surgeon must keep in mind the imaginary straight line described earlier. It is very important to understand that the line G is not only the lateral limit of the intramuscular undermining, but also the limit of its depth in the lateral portion of the muscle. A deeper undermining may be excessive anteriorly, damaging the Gme. innervation, whereas a superficial undermining may let the prosthesis out of the muscle.

The Points XYZ

Point X is the first point to be identified, indicating the site where the dissections must begin. It is near the sacrum, inside the muscular opening made to introduce the dissectors. Point Y is the second point. It is higher inside the gluteus maximus and reachable by a straight dissector from point X to the lateral limit of the muscle in line G. Point Z is the third point, also in line G. It results from the rotation of the dissector that has point X as its axis.

Access to the Musculature

The access incision is performed entirely in the intergluteal sulcus, achieving an incision that is totally

hidden when the patient is standing up. We make a preoperative mark at the most cephalic point of the intergluteous sulcus and call that line A (Fig. 1). It is necessary to mark it when the patient is still awake and standing up because in the ventral decubitus, the intergluteous sulcus loses its definition. We make all the other marks in the operating room with the patient lying down. From line A down, the incision must be 5 to 7 cm long, according to the size of the implant. Also starting from line A, we draw a figure in the shape of an inverted heart that has the sulcus incision as the medial line. This will guide the bilateral undermining to expose the fascia and give access to the muscular mass (Fig. 2a). Because the muscular fibers have lateral caudal direction, the undermining in the inverted heart shape helps to expose the muscular fibers better than the round one. This drawing must be approximately 7 cm long on each side (Fig. 2b).

Preservation of the Sacrocutaneous Ligament

The intergluteal sulcus must not be incised directly. We make a 0.5-cm fusiform incision in the skin (Fig. 2a). After the skin cutting, we incise the subcutaneous tissue at 45° on both sides, forming a pyramid that has the sacrum as the base. This pyramid comprises the ligaments that the sacrum has with the gluteal sulcus [10,11]. A direct incision in the sulcus loosens these ligaments and, in many cases, leads to the effacement of the sulcus in the late postoperative period [10,11]. At the end of the surgery, we deepithelialize this fusiform flap and sepult it in the wound closure, using it as a very strong anchorage, remaking the sulcus (Fig. 5a).

The Muscular Opening and Point X

Once the fascia is exposed, muscular fibers can be seen through it. We palpate the border of the sacrum, and from there we make an incision approximately 6 cm long (Fig. 2b), opening the fascia and following the direction of the muscular fibers. Through this fasciomuscular incision, and along its entire length, we create a fissure approximately 3 cm deep, undermining with the tip of the index finger to reach the middle of the muscular mass (Fig. 2c). This depth offers an approximately equidistant point between the posterior and anterior faces of the gluteus maximus, which will be the initial point of the muscular undermining, namely point X, the start point (Fig. 2d).

Intramuscular Undermining

A dissector in the shape of a right blade measuring 2 cm wide and 35 cm long creates a path from point X



Fig. 1. The most cephalic point of the intergluteal sulcus is marked when the patient is standing up (line A).

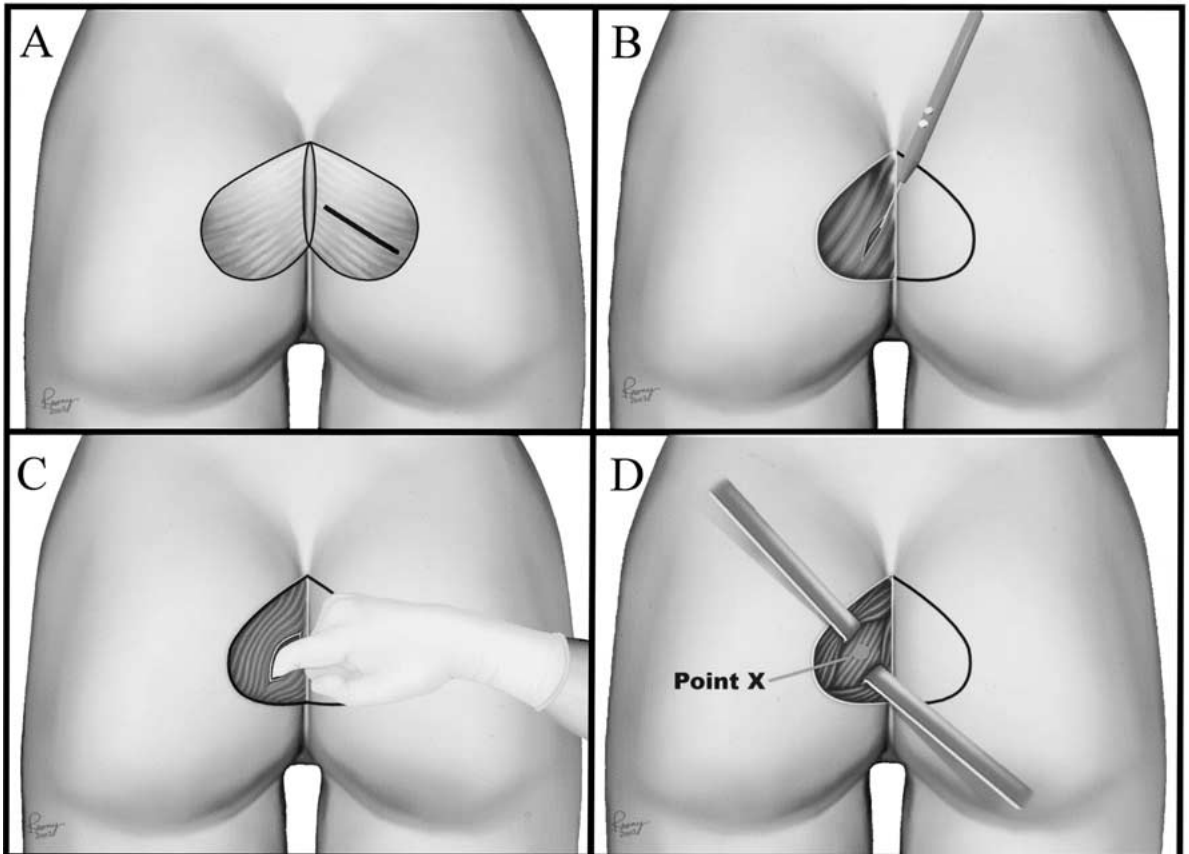


Fig. 2. (a) From line A downward, a drawing in the shape of an inverted heart guides the undermining that exposes the gluteal fascia. (b) The gluteal fascia is opened in the sense of the muscular fibers. (c) The divulsion of the muscular fibers is made through a digital maneuver and complemented with scissors, if necessary. (d) Point X is obtained through divulsion to half the muscular thickness.

to point Y. The introduction of this dissector is made with relatively vigorous movement and without direct vision. The tip of the dissector is addressed to the point where line G meets the inferior border of the iliac crest. While the dissector is pushed from X to

this point, it meets the posterior inferior iliac spine on its way, blocking its advance. At this point, the direction of the dissector is rectified and readdressed to a new, more caudal point, always on line G. The surgeon must feel the medial edge of the dissector

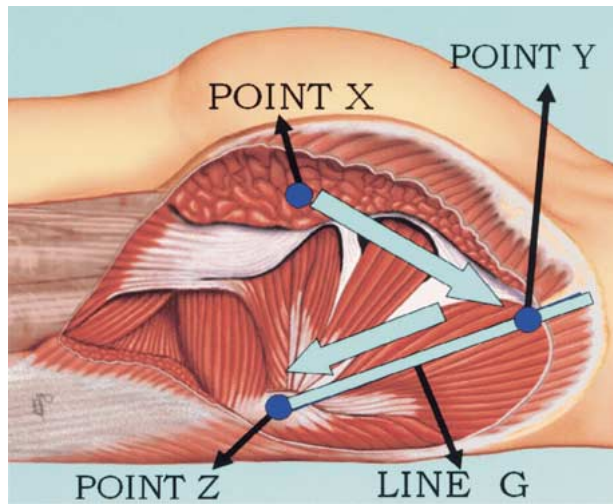


Fig. 3. Point X represents the center of the gluteus maximus muscular mass on the site of the access incision. From this point the retraction extends into the highest possible point on the G line; after bypassing the lower iliac spine it reaches point Y. By rotating the retractor from Y to Z, the first undermining is performed.

touching the posterior inferior iliac spine. With this new direction, point Y is where the dissector meets line G (Fig. 3).

Using the strong muscular fibers near point X as a support, we make the dissector rotate such that the tip traverses a path from point Y, going in a tangential direction to the posterolateral face of the trochanter, where it meets point Z (Fig. 4a). Point Z is a position inside the gluteus maximus where it covers the trochanter. The tangential movement follows the direction of the fibers, which also are tangential to the trochanter. The underminer easily separates the fibers, with practically no disruption of fibers. There is minimal blood loss in this undermining, and there rarely is a need for hemostasia. Thus we obtain a space that allows for the introduction of long retractors also and creates visualization space. We term this space “basic undermining.” The reverse way (Z to Y), from the trochanter to the iliac bone, is more difficult because we cannot take advantage of the hard fibers near the sacrum for use as a good support for the rotation of the dissector.

Definitive Undermining and the Choice of Implants

With direct visualization, we perform the supplementary undermining (Fig. 4b), using an instrument created to facilitate the enlargement of the basic undermining. By opening instrument’s branches with fast and delicate moves at the same time that we push, we can easily direct this augmentation, separating the muscular fibers. The branches are curved to allow for cephalic separations right next to the sacrum and iliac bone, at a place where the cannot be seen. The space can be augmented according to the form and size of the chosen implant. When we want it to be higher, we persist more in the cephalic and less in the caudal undermining. The oval implants can be used with the smaller part directed to the side to fill

the trochanter depression. This complementary undermining can be performed only inside the gluteus maximus, avoiding its innervation. Because the entrance of the inferior gluteal nerve in the muscle is very close to the sacrotuberal ligament, we must avoid underminings that get too near this area to prevent damage to the innervation. The pocket’s size must be exact for the prosthesis. Tight or oversized pockets must be avoided.

Closing of the Incisions and Postoperative Care

Before introduction of the implants, the tubes of the suction drainage are positioned inside the intramuscular space. The musculature is closed with nylon 2-0 nonabsorbable thread. The deep subcutaneous tissues are approximated to the base of the sacrocutaneous flap with three or four stitches on each side. The flap is deepithelialized and serves as anchorage for the closing of the subcutaneous planes and the dermis (Fig. 5a). At each 1-cm interval, we make a stitch with nylon 2-0 thread involving the flap, the subcutaneous tissue, and the deep dermis of both sides (Fig. 5b). For closure of the skin, we use simple stitches of 6-0 nylon or silk in the skin. No type of compressive girdle is needed, and walking and sitting are allowed the day after the surgery. Dorsal decubitus must be avoided for a week. Driving is allowed after 7 days, providing there were no problems with the incision.

Results

All patients who underwent surgery with this technique were greatly satisfied with the results. The most frequently reported problem was pain during the immediate postoperative period, especially during the first 24 h. We had 3 cases of infection in the first 35

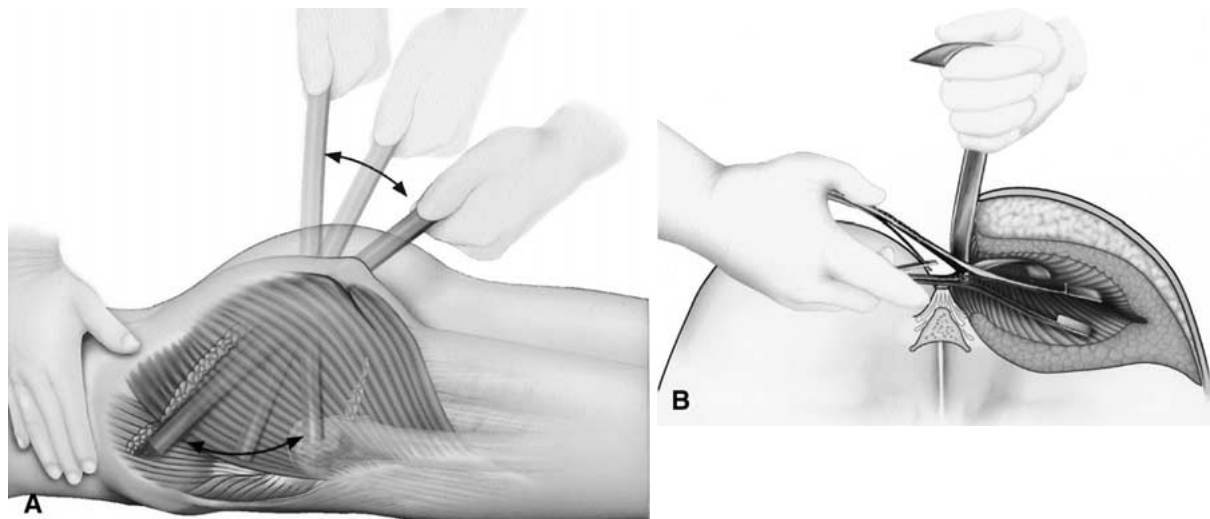


Fig. 4. (a) The dissector is rotated from point X to Z easily, opening the muscular fibers without rupture. (b) The instrument the authors developed for complementary undermining. The surgeon must gently open its branches, pushing it at same time.

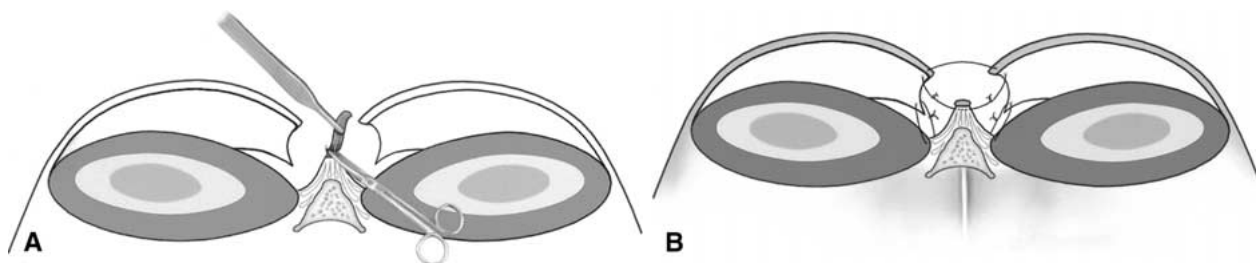


Fig. 5. Closing scheme. (a) The fusiform island of the sacrocutaneous ligament is deepithelialized. (b) The closing is performed in three planes: 1—the deep subcutaneous of the wound edge close to the base of the ligament, 2—the dermis of both sides of the wound with the ligament, 3—the skin.

cases. In two of these cases, the infection occurred approximately 15 days after the surgery and was preceded by spontaneous seroma drainage through the incision. This led to dehiscence, and later to infection. Introduction of sacrocutaneous ligament preservation, systematic use of suction drainage for 24 to 48 h, and a sewn bandage isolating the anal area during the surgery changed this situation. After these steps were taken, we had only one case of infection, which we attributed to the fact that the patient had a small pilonidal cyst discovered only during the surgery. The combat against infection using antibiotic therapy aimed at culture and antibiogram of secretion and the constant washing of the spaces with physiologic solution allowed for the maintenance of the implants in all these cases. One case of seroma (approximately 500 ml) occurred 1 year after the surgery among the four cases in which we used a texturized implant. Since then, we have discontinued use of this implant type. Cases of late hematoma and seroma with texturized implants are reported in the literature [14,16]. We had no cases of capsular contracture.

Small dehiscences in the incision in the intergluteal sulcus, with spontaneous resolution, represented the most frequent complication, occurring in 14% of the cases. Resuture at the ambulatory level was necessary in seven cases. Two patients underwent reoperation for replacement of implants with bigger ones. Two other patients underwent reoperation for better rearrangement of the implants, one because of a small asymmetry and the other for lowering of implants that were somewhat high. In two cases of ruptured implants with more than 10 years of use, simple replacement of the implants was performed. Rupture of the implants also was described by other authors [8]. These failed implants were manufactured before 1992. Since then, implants have been made with high density, cohesive silicone, and with more resistant shells. No other type of complication was noted.

Discussion

In 1984, we started to perform lipografting for modeling and augmentation of the gluteal area [9,12].

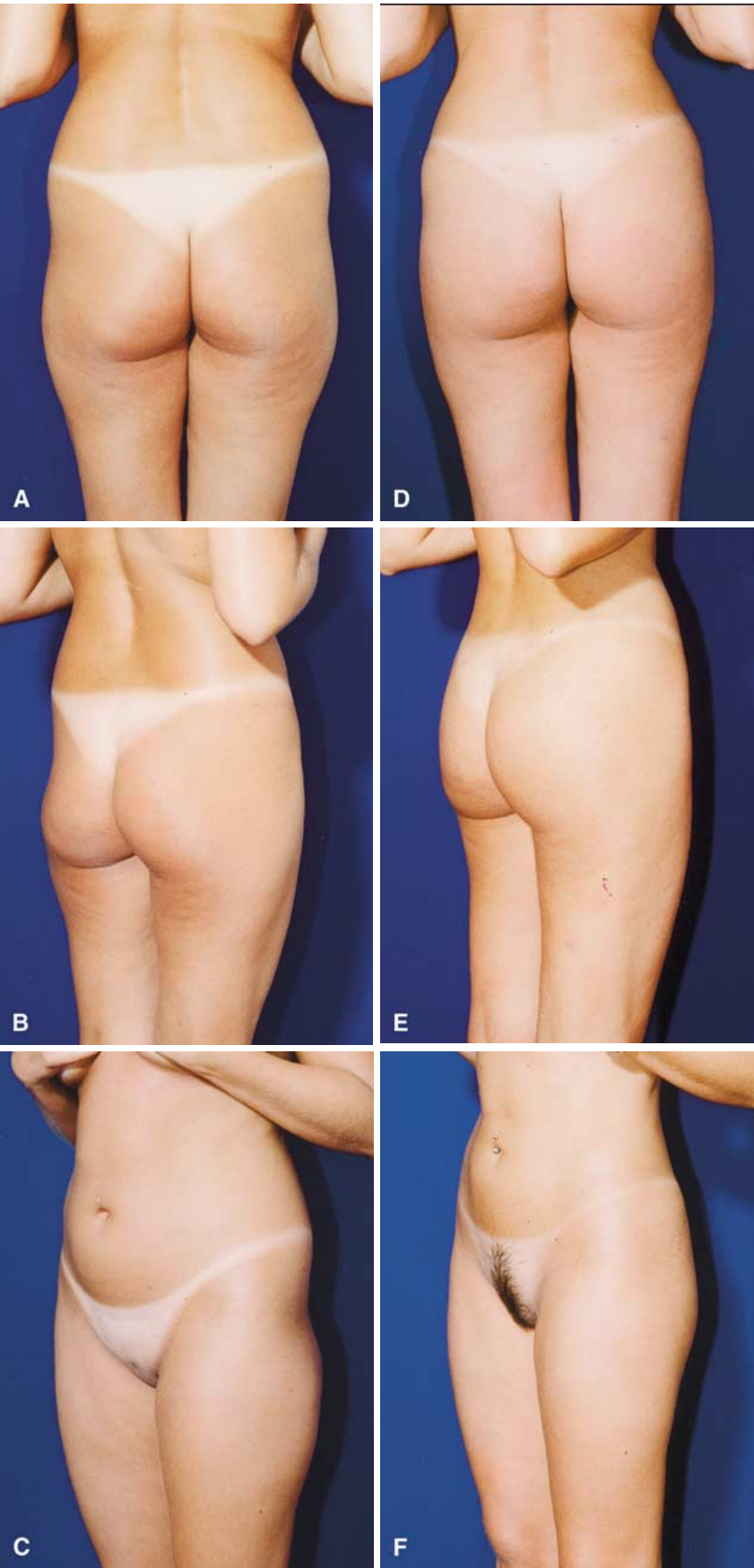


Fig. 6. 33-Year-old patient showing 250-ml oval prostheses, flanks, and abdominal liposuction. (a) Preoperative posterior view. (b) Posterior oblique view. (c) Anterior oblique view. (d, e, f) Postoperative view 6 months later.

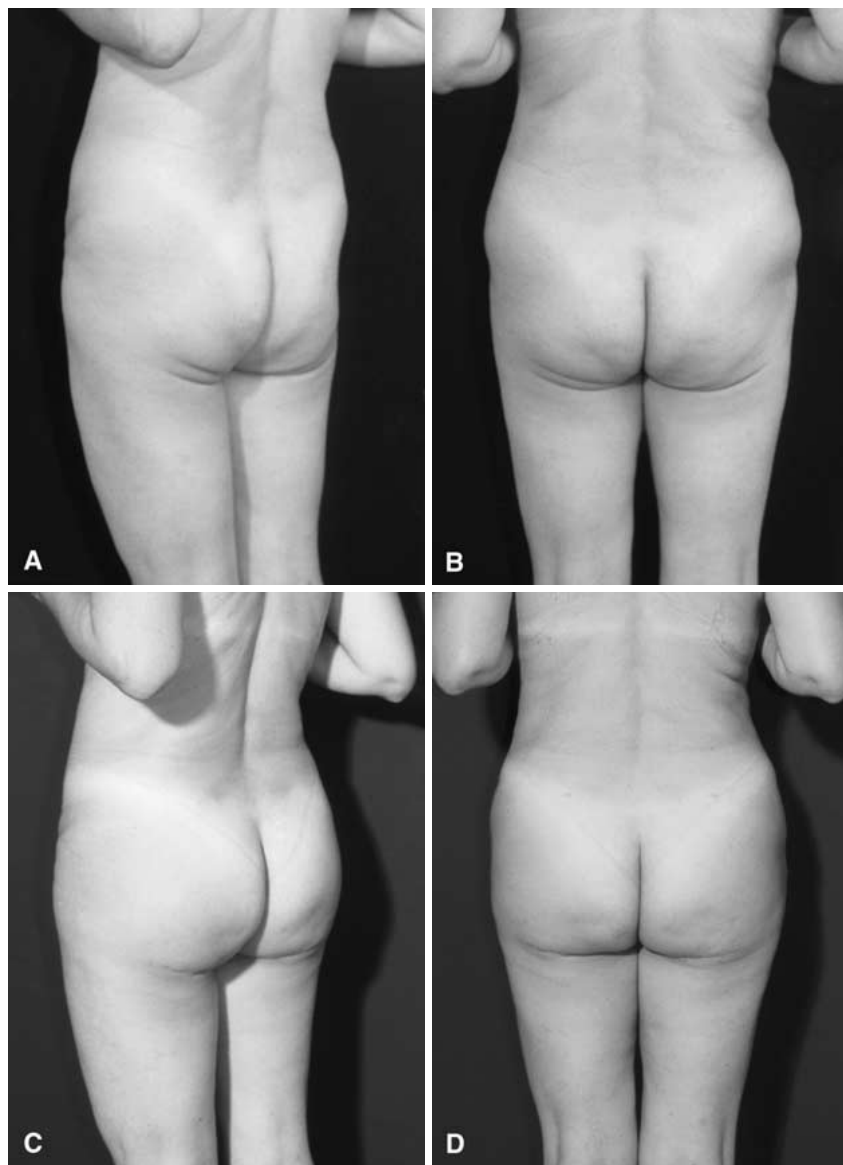


Fig. 7. 52-Year-old patient with 300 round implants. (a) Preoperative oblique view. (b) Posterior view. (c, d) View 8 months later.

Although we obtained good results in thin patients and those who had severe hypoplasia, the results fell short of expectations. At the beginning of 1986, we began treating these cases with implants using the Robles technique.

We realized that the space Robles et al. [20] described was quite limited. The pyramidal muscle cannot be surpassed in the caudal direction because the implant may compress the sciatic nerve exposed in the intergluteal space below this muscle. This would leave the implant in an excessively high position in some patients, impairing the aesthetic result. We also realized that the implants slid down in time, so we began considering the possibility that the implants could come to occupy a lower place than that designed by the surgical undermining and the inferior limit of the pyramidal muscle, which could cause complications. In an effort to minimize these prob-

lems, we began to introduce the implants intramuscularly in most of the cases, reserving the use of the submuscular technique for patients who needed higher implants.

During intramuscular surgery, it is not always possible to determine the depth of the surgery. For this reason, we have come to prefer guiding undermining through references in the pelvis. With ventral decubitus, the adipose mass, the superficial muscular layer of the gluteus maximus, and the skin of the area change positions. Therefore, previous marks are of little use.

In most of the 67 patients undergoing a second gluteoplasty whose first gluteoplasty had been performed by other surgeons trying to carry out intramuscular implants, we found the implants visible and too palpable, going out in the lateral area of the subcutaneous plane with no muscular covering on the

side, or with very superficial intramuscular implantation.

The deeper the undermining, the greater the muscular covering and the better the aesthetic result. However, we also realized that starting from half of the muscular thickness, the results continued to be identical. With the deepest dissections made near to the nerve entrance, the danger of isolating the nerve increases. Because the points X and Y are directly responsible for the depth of the undermining, we have placed them in such a way as to keep the undermining in the middle of the muscle's thickness for most of its extension.

Conclusion

Considering the high level of satisfaction shown by the patients, augmentation gluteoplasty with silicone implants proved to be a valid surgery. Despite the increasing demand for this surgery, not many surgeons currently perform it. The XYZ intramuscular method allows for the clear understanding needed to learn and reproduce augmentation and reshaping gluteoplasty. This procedure has proved to be a safe method that produces very natural and long-lasting results, with very low rates of complication.

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