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# Echo-guided Lower-back Sculpture and Volumization as a Complement to High-definition Liposuction (XPINE-FAT)

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**Background:** Knowledge about lower-back aesthetics is very limited, especially regarding surgical techniques that improve its appearance. Thus, this study aimed to describe a high-definition liposuction technique with intramuscular grafting of erector spinae muscles (longissimus).

**Methods:** A total of 15 female patients 25–48 years of age were recruited between November 2021 and January 2022, who underwent body contouring surgery and subsequently underwent a low-back lipodefinition and echo-guided intramuscular erector spinae (longissimus) fat graft to complement the procedure. As part of the study, measurements were performed before surgery and in the immediate postoperative period. The data were stored in a database and analyzed with the SPSS Version 25 statistical software.

**Results:** The patients' ages ranged from 25 to 48 years (mean: 37 years), with a body mass index of 18.6–29.3 (mean: 25.5). The surgical times ranged between 1 and 8 hours (mean: 3.73 hours); hospitalization times were 0.7–1 days (mean: 0.940 days). Lipograft was performed on the erector spinae muscles (longissimus), the right one with a range of 20–60 $cm^3$ (mean: 43.33 $cm^3$) and percentage increase of 65.3% ($P < 0.0001$). Regarding the left erector, similar volumes between 20 and 60 $cm^3$ (mean: 44.67 $cm^3$) were grafted with a percentage increase of 66.4% ($P < 0.0001$).

**Conclusions:** XPINE-FAT is a safe technique that allows an increase in the immediate intramuscular thickness of the erector spinae muscles (longissimus). We observed no adverse events during the study. *(Plast Reconstr Surg Glob Open 2022;10:e4424; doi: 10.1097/GOX.0000000000004424; Published online 20 July 2022.)*

## INTRODUCTION

Nowadays, the description of a beautiful body varies significantly, and is determined by several factors that make up the perception of individuals, including geography, sex, ethnicity, age, etc. Preferences regarding procedures correspond precisely to these beauty trends, wherein an athletic figure and a sculpted slim body are often considered desirable.[1–4]

With the evolution and development of liposuction, today we can attest that high-definition liposuction complies very well with highlighting the body aesthetic of our patients; however, in some cases, not only is liposuction performed, but also fat grafting in muscle groups to be able to add volume and dynamism that harmonizes what is achieved through liposuction.[5]

Regarding the above, there are several surgical techniques that allow fat to be grafted at a muscular level, such as in the upper limbs, where Hoyos and Perez[6] performed grafting in the deltoids and pectorals. Similar procedures include those by Matlock and Simopoulos[7] in the biceps and triceps; Viaro et al[8], who performed grafting in the rectus abdominis through ultrasound guidance for the UGRAFT technique; Danilla[9], who performed fat grafting in the rectus abdominis during lipoabdominoplasty using the RAFT technique; and Cipriani et al,[10] who described a fat grafting technique in the lower limbs called VDVFAT and used the FAT-TRAP technique in the trapezoids.

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Although several studies mention the back as part of beauty and masculinity, considering the muscle groups such as trapezoids and latissimus dorsis,[5,11,12] there is little information about the lower back and techniques that allow the beautification of this area. Our objective was to describe a new surgical technique in the erector spinae muscles (ESMs), specifically echo-guided longissimus muscles fat grafting in its thoracic portion associated with high-definition liposuction, allowing the enhancement of lower-back beauty.

## MATERIALS AND METHODS

We evaluated 15 female patients, aged 25–48 years (mean: 37 years), who were admitted for outpatient treatment requesting evaluation for body contouring surgery between November 2021 and January 2022. All the enrolled patients were evaluated by a certified plastic surgeon and attended a medical evaluation, during which it was decided to perform lower-back sculpture and fat grafting in the ESMs (longissimus) using the XPINE-FAT technique as a complement to the high-definition surgery plan. It should be noted that some patients also had fatty grafts from other muscle groups (deltoids, pectorals, rectus abdominis, vastus, trapezoids, etc.) performed on them.

All the patients included in the study met the following criteria: age 18–60 years, body mass index (BMI) ≤30 kg/m$^2$, surgical risk (RQ) according to Goldman index ≤II, no flaccidity in the lower back, and no history of previous back surgery (aesthetic or other specialties). In addition, the real goals and clear objectives determined by the patients themselves were considered. During the preparation of the surgical procedures, safe surgery measures were guaranteed, in addition to anticoagulation protocols, according to modified Caprini stratification and Panucci validation,[13] intermittent lower-limb compression equipment, standardized equipment for monitoring vital functions, antibiotic prophylaxis for every patient according to their surgical plan, and guidelines established by the consensus reached by the American Association of Plastic Surgeons.[14,15]

The patients underwent body contouring surgery (abdominal lipomarking, chest, and upper and/or lower limbs). Additionally, they underwent lower-back sculpture and ESMs (longissimus) volumization by fat grafting using the XPINE-FAT technique. This procedure was performed by two plastic surgeons trained in the same technique, in a private clinic in Lima, Peru, and at the UNIMED Hospital in Santa Maria RS-Brazil, between November 2021 and January 2022.

All the participants underwent ultrasound examinations in the lower third of the thoracic longissimus (ESM) muscles, 5 cm above the posterosuperior iliac spine (Fig. 1), to measure the thickness before and after surgery was completed. (**See Video 1 [online]**, which displays ultrasound measure.) All the data obtained were entered into a database in Microsoft Excel v19.00. The statistical analysis was performed using the SPSS software, version 25. (**See Video 1 [online]**.)

Our usual follow-up protocol for patients undergoing this type of surgery is through evaluations on the first, seventh, fifteenth, and thirtieth days. In this period, there were no observed adverse events. The ultrasound measurements corresponding to the thoracic longissimus muscles

### Takeaways

**Question:** Is the XPINE-FAT technique safe and efficient for increasing the thickness of the erector spinae muscles?

**Findings:** A lipograft on the right erector spinae muscle was performed with a volume of 20–60 cm$^3$ (mean 43.33 cm$^3$) and a percentage increase of 65.3% ($P < 0.0001$). With respect to the left erector spinae muscles, similar 20–60 cm$^3$ (mean of 44.67 cm$^3$) volumes were grafted with a percent increase of 66.4% ($P < 0.0001$).

**Meaning:** XPINE-FAT is a safe technique and allows a statistically significant increase in the immediate intramuscular thickness of the erector spinae muscles.

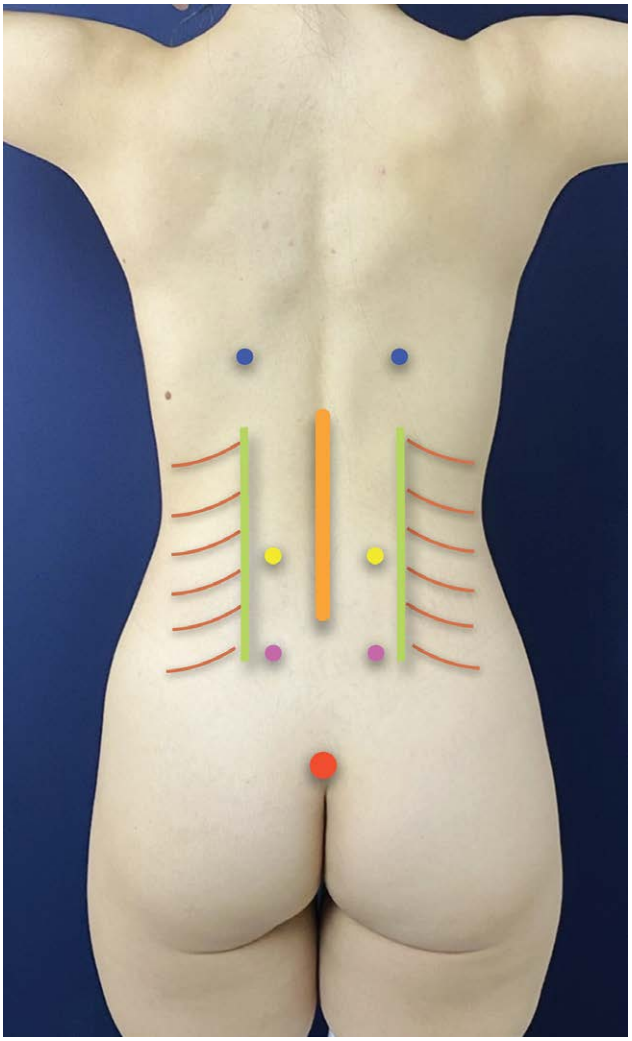

**Fig. 1.** Presurgical design. Yellow dots: standardized area of ultrasound measurement. Red dot: lower incision. Blue dots: upper incisions. Purple points: points where the dimples of Venus will be defined. Green lines: lateral edges of ESMs to be defined. Orange line: midline of both ESMs to be defined. Red lines: regions lateral to the erector spinae where liposuction will be performed.

(ESMs) were not included here due to the requirement for a long-term follow-up (6 months to 1 year).

This study was conducted in accordance with the provisions of the Declaration of Helsinki and approved by the ethics committee of the San Martin de Porres University of Lima, Peru, and by the ethics committee of the UNIMED Hospital of Santa Maria-RS, Brazil. All the participants signed an informed consent form for the performance of body contouring surgery and ESMs (longissimus) fat grafting (XPINE-FAT); they also consented for the use of information and images for the purpose of publishing this work.

## LOWER-BACK SCULPTURE AND FAT GRAFTING IN THE THORACIC LONGISSIMUS ESM (XPINE-FAT)

A midline is drawn from the beginning of the intergluteal line extending to the point where both erector spinae converge, concluding at the T11 (Fig. 1). Subsequently, the posterosuperior iliac spine is located, and the anatomical depressions known as the dimples of Venus are designed. From this point by palpation, the lateral edges of the thoracic longissimus muscle in its lower third are located, and the edges to be defined are designed (not necessarily straight) (Fig. 1).

It should be noted that the lower-back sculpture and longissimus ESM volumization procedure are part of a surgical planning of body contouring surgery. Therefore, before working in this area, liposuction is performed with sculpture and/or volumization of other areas, such as the abdomen, upper and lower limbs, upper back, and buttocks. The fat is obtained from liposuction through decantation, without using fat washing or centrifugation, and subsequently placed in 20-$cm^3$ syringes for fat grafting.

With the patient in the ventral position, a 0.5-cm incision is performed in the upper region of the intergluteal line, followed by two bilateral 0.5-cm incisions at the lower scapular edge (symmetrical to the lateral edges of the thoracic longissimus ESMs). Subsequently, the lower back is infiltrated using a modified Klein solution (normal saline and epinephrine) (1:1,000,000).

With a 4-mm basket cannula, deep and superficial liposuction of the lateral area of the thorax longissimus muscles (waist) is performed, taking into account that the differentiation obtained by liposuction must have a harmonious transition visual effect between the back and the buttocks. When performing superficial liposuction in this area, an unnatural concavity is generated, giving the impression of an irregularity between the continuity of the back toward the buttocks. (**See Video 2 [online]**, which shows a demonstration of the XPINE-FAT technique.)

With a 5-mm angled basket cannula, through the intergluteal incision, lipomarking of the lateral area of the thoracic longissimus muscles (ESM), the dimples of Venus, and the midline that marks the differentiation of both right and left muscles are performed, considering that this line must be approximately 2 cm wide and should not be drawn below the posterosuperior iliac spine. (**See Video 2 [online]**.)

Through the upper incisions (lower scapular border), liposuction is performed on the lateral areas of the longissimus muscles of the thorax, and in the same way, the upper marking of these is completed. (**See Video 2 [online].)** Subsequently, with the 4-mm straight basket-type cannula through the lower incision, deep liposuction of the fatty tissue that is found above the spinal erector muscles is performed.

Once the marking is completed, the thoracic longissimus muscles (ESMs) in their lower third are volumized with ultrasound guidance, for which a Mindray Z60 ultrasound scanner with linear transducer and serial number HF9-08000472 with Mindray Digital Ultrasonic Diagnostic Imaging System software and a FUJIFILM SONOSITE L25X13-6 MHz ultrasound scanner are used, with which the thoracic longissimus muscles are located with their respective fascias. (**See Video 2 [online]**.)

Once the muscles are located by ultrasound performed with the nondominant hand, entry through the lower intergluteal incision is made with a straight 2.5-mm-diameter and 25-cm-length Viaro cannula at approximately 30 degrees, parallel to the direction of the linear transducer, feeling a click after its puncture. When verifying the intramuscular location of the cannula by ultrasound, the direction of the transducer is changed, placing it perpendicular to the direction of the cannula. This maneuver is performed to be able to have a better perspective during grafting. (**See Video 2 [online]**.)

Approximately 20–60 $cm^3$ of fat are grafted by bolus diffusion, from the cephalus to the caudal region, ensuring intramuscular placement and proportional diffusion of fat in the lower third of the muscle through intraoperative ultrasound use (Fig. 2A, B). (**See Video 2 [online]**.)

Upon completion of the procedure, placement of tubular drains under negative pressure, the closure of the operative wound, and compressive measures (foam and girdle) are performed. Patients are allowed to rest (they were able to wander, go to the bathroom, and feed themselves) during the hospitalization time and thereafter scheduled for lymphatic drainage massages from a trained physiotherapy personnel as part of our protocol to reduce the risk of fibrosis, seromas, and pain.[16] The drainage system is removed on postoperative day 7 by trained personnel.

## RESULTS

We recruited 15 female patients undergoing body-contouring surgery and volumization of ESMs (thoracic longissimus) between 25 and 48 years of age (mean: 37 years), with BMI ranging between 18.66 and 29.3 (mean: 25.5). With respect to the surgical risk (RQ), 14 patients had an RQ I (93.3%) and one patient had an RQ II (6.7%). The 15 patients were under general inhalation anesthesia (100%). The hospitalization time ranged from 0.7 to 1 day (average: 0.940 days); after hospitalization, all patients had a satisfactory recovery, without postoperative complications (infections, thromboembolisms, bleeding requiring blood transfusions, or death) (Table 1).

The volume of liposuction fat was between 1100 and 5000 $cm^3$, with an average of 4000 $cm^3$. To perform volumization, the intramuscular fat was grafted into both the thoracic

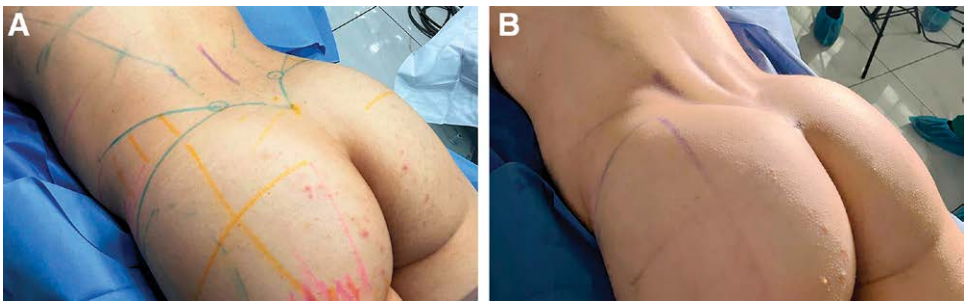


**Fig. 2.** Immediately before (A) and after (B) in the operating room.

longissimus bilaterally and symmetrically according to the XPINE-FAT technique with a range of 20–60 $cm^3$ (right half 43.33 $cm^3$ and left half 44.67 $cm^3$) of fat, thus obtaining a variation in thickness of the right muscle by immediate 14.22-mm postoperative ultrasound of 14.22 mm on average, which is equivalent to increasing 65.3% ($P < 0.0001$) of the initial average muscle thickness. Likewise, a variation of the thickness of the left muscle of 14.37 mm was obtained by 14.37-mm immediate postoperative ultrasound, which is equivalent to increasing 66.4% ($P < 0.0001$) of the initial average muscle thickness (Tables 1 and 2). There were no adverse events and no complications during the time of hospitalization or in subsequent evaluations.

## DISCUSSION

Fat grafting has been used in different forms for aesthetic purposes, especially in the reconstruction of oncological pathologies and deformities.[17,18] Body contouring procedures have currently set a trend, especially when beauty concepts seek to stylize the athletic figure with increased muscle volume. Therefore, intramuscular fat grafting in surgery is a fundamental part for complementing these procedures. The regions where intramuscular fat grafting is performed, such as the deltoids, pectorals, trapezoids, latissimus dorsi, rectus abdominis, vastus, and trapezoids, allow symmetry to be provided to the desired athletic figure.[6–10]

Intramuscular fat grafting, compared with the one used in the subcutaneous plane, allows the development of a symmetrical anatomical effect according to the grafted muscle, providing greater dynamism and athletic appearance, and improving the effect in the subcutaneous plane where the volumization is irregular with nonhomogeneous distribution.[6,8–10]

In our opinion, the concept of beauty in the lower-back region is not very developed, considering that this area helps to highlight the projection and beauty that can be generated in body contouring surgery, especially in the buttocks and lower limbs. To ensure good-quality fat tissue for grafting, we used liposuction for the collection and decantation of the extracted fat, and no additional procedures were performed.[19]

At the time of this study, our objective was to describe our surgical technique of echo-guided intramuscular volumization by fat grafting in the thoracic longissimus muscles (ESMs), alongside lower-back liposculpture. For this, we used ultrasound immediately before and after the procedure in the operating room, to objectify the increase obtained and statistically analyze volumization, obtaining a 65.27% increase for the right thoracic longissimus volume and 66.36% for the left one, both at a statistically significant level ($P < 0.0001$). This allowed us to understand that the technique helps in effectively volumizing these muscle groups in the immediate postsurgical period (Fig. 2A, B).

In our work, we do not determine the permanence of the grafted fat, since it is beyond the scope of this study. Despite this, it is known from studies on fat permanence that the intramuscular region is one of the most successful regions for permanence and volumization.[6,20]

Body contouring procedures are currently one of the most requested procedures, which is why the implementation of safety protocols to protect our patients is

**Table 1. Descriptive Data from the Study Group**

| Variables | No. | Minimum | Maximum | Mean |
|---|---|---|---|---|
| Age (y) | 15 | 25 | 48 | 37.00 |
| Weight (kg) | 15 | 49 | 80 | 64.53 |
| Size (m) | 15 | 1.5 | 1.7 | 1.6 |
| Body mass index | 15 | 18.6 | 29.3 | 25.5 |
| Hospitalization time (d) | 15 | 0.7 | 1.0 | 0.940 |
| Surgical time (h) | 15 | 1 | 8 | 3.73 |
| Lipoaspirated fat | 15 | 1100 | 5000 | 4000 |
| Right ESMs fat graft ($cm^3$) | 15 | 20 | 60 | 43.33 |
| Left ESMs fat graft ($cm^3$) | 15 | 20 | 60 | 44.67 |
| Percentage variation (%) | 15 | 27.4 | 121.1 | 65.3 |
| Percentage variation (%) | 15 | 27.4 | 121.1 | 66.4 |
| Surgical risk I | 14 (93)* | — | — | — |
| Surgical risk II | 1 (6.7)* | — | — | — |

*Percentage.

**Table 2. Analysis of Significant Changes in Ultrasound Measurements of the ESMs**

| Variable | Measurement | n | Mean | Deviation | Z | *P* |
|---|---|---|---|---|---|---|
| ESMs | Preoperative right ultrasound measurements (mm) | 15 | 22.973 | 5.8864 | –3.41 | <0.0001 |
| | Postoperative right ultrasound measurements (mm) | | 37.193 | 8.2763 | | |
| | Preoperative left ultrasound measurements (mm) | 15 | 22.873 | 6.0313 | –3.41 | <0.0001 |
| | Postoperative left ultrasound measurements (mm) | | 37.240 | 8.4344 | | |

Applying Wilcoxon t-test

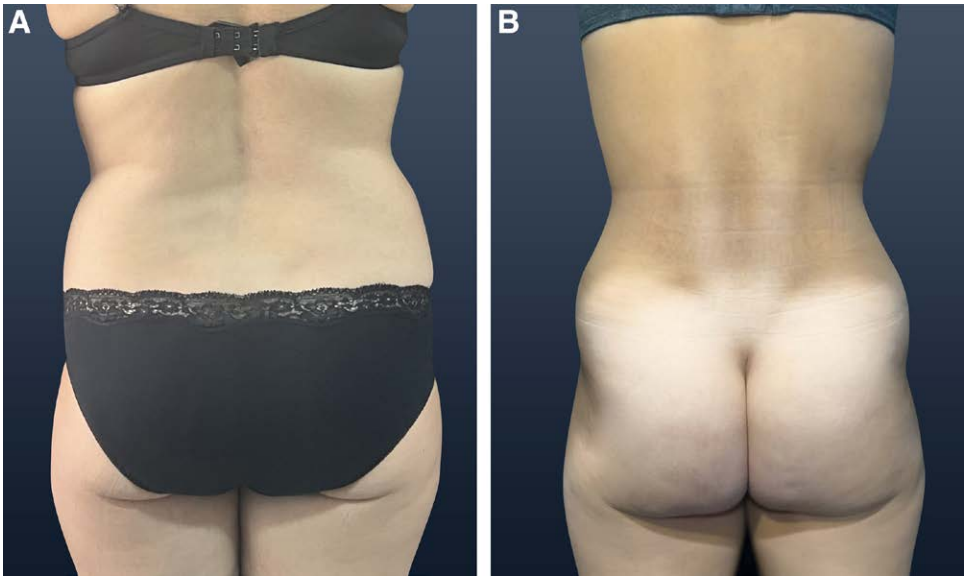


**Fig. 3.** Figure before (A) and 1 month after (B) the procedure wherein the female patient is seen in a standing position without muscle contraction.

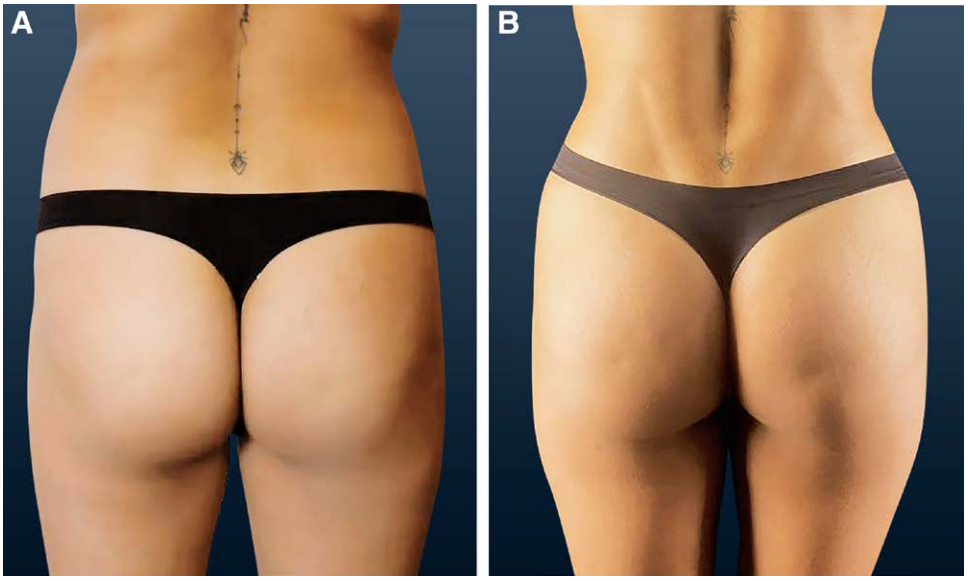


**Fig. 4.** Figure before (A) and 1 month after (B) the procedure wherein the female patient is seen in a standing position without muscle contraction.

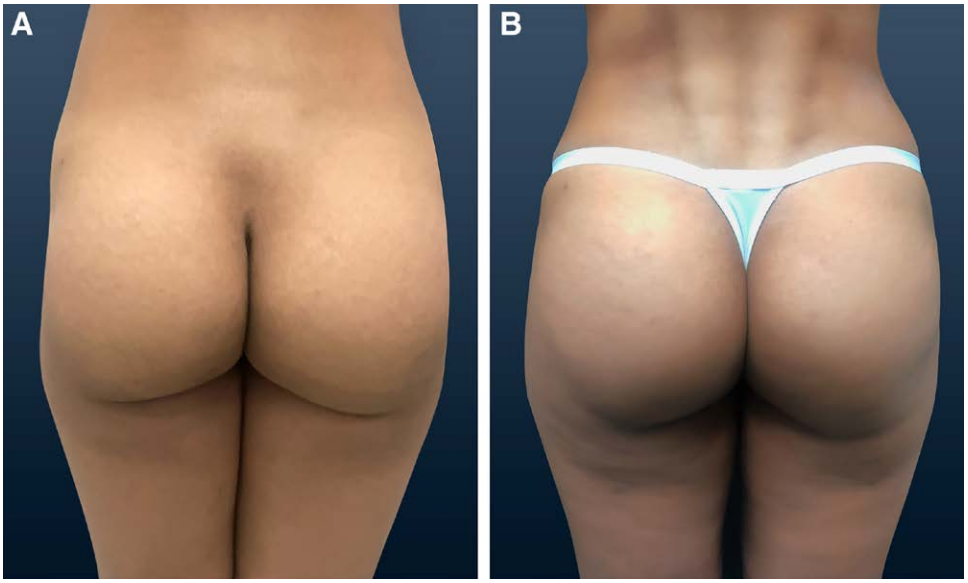


**Fig. 5.** Figure before (A) and 1 month after (B) the procedure wherein the female patient is seen in a standing position without muscle contraction.

considered as a top priority in the approach and evaluation of each of them.[21] For this reason, the first step of our procedures was the selection of our patients, for which we decided to include individuals older than 18 years but younger than 60 years; this is because older age is known to be more frequently associated with adverse events.

Another point in consideration was the degree of cardiovascular risk according to Roh et al,[22] Goldman et al,[23] Gupta et al,[24] and Cipriani et al[25] for which we decided to include only those with RQ between I and II for the known risk of possibility of cardiovascular events. Similarly, we excluded patients with BMI of 30 or greater, owing to the risk of ventilatory pulmonary complications, seromas, and the greater requirement of patients with higher BMIs, given their fat volume, which increases the risk of complications.

Second, the anatomical characteristics of the ESMs were also considered. For this, it is important to know that the ESM group is formed by the spino-thoracic, longissimus, and iliocostal muscles, which form a joint tendon that provides support and continuation to the thoracic and pelvic regions. Among these muscles, the one with the greatest

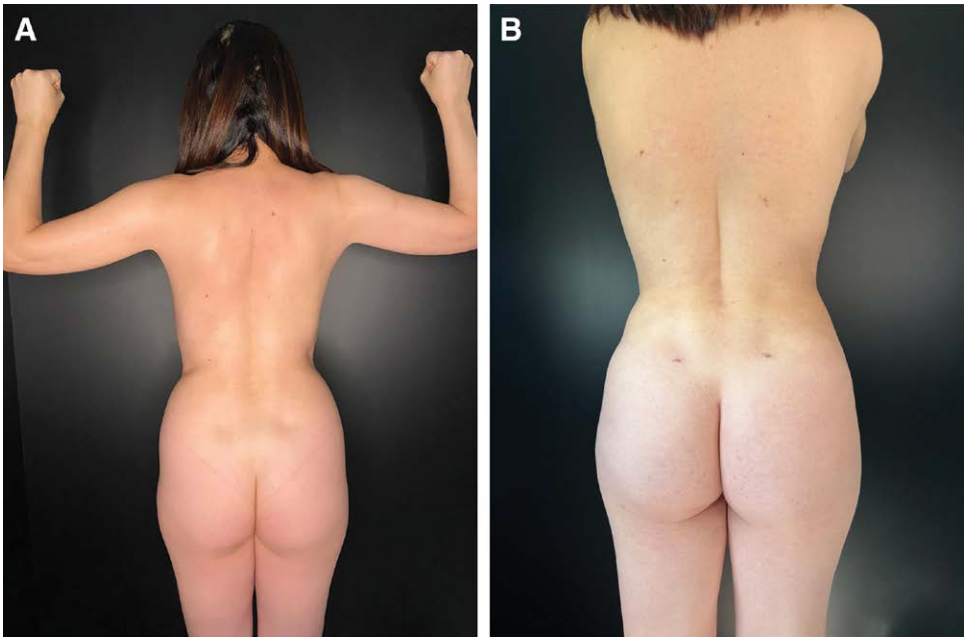


**Fig. 6.** Figure before (A) and 1 month after (B) the procedure wherein the female patient is seen in a standing position without muscle contraction.

projection and that forms a large part of the lower back is the longissimus muscle. This, in turn, has three fascicles: one superior (cephalic longissimus), one medium (neck longissimus), and one inferior (thoracic longissimus), with the inferior being the main target, especially in its lower third where the fat graft is performed.[26] Similarly, the type of vascularization according to Mathes[27] must also be considered, which corresponds to a type IV with multiple pedicles, which are branches of the intercostal and lumbar arteries. In this regard, the thoracic longissimus being a long muscle with a well-known location, performing an echo-guided intramuscular graft with good anatomical references allowed us to have a good approach and control during this procedure.

The third point is to prevent risks that may be caused secondary to the surgical procedure. Protocols were developed for the prevention of adverse events, such as thromboembolisms, ischemia due to vascular injury, bleeding that generates symptomatic acute anemia, seromas, operative site infections, and death. Methods of prophylactic anticoagulation associated with intraoperative intermittent compression and postoperative compression measures were implemented according to the Panucci-modified Caprini scale, as described in Materials and Methods. Similarly, we have complied with the guidelines validated by the American Association of Plastic Surgeons about antibiotic prophylaxis.[13–15]

The risk of thromboembolic events or fat embolism at the time of fat grafting is always discussed, especially when considering muscle regions with a higher risk of ischemic embolic events, such as the gluteus muscle, where due to their large caliber, the lateral varicose veins associated with the piriformis muscle are more prone to injury as a result of the placement of fat into the deep muscular plane. Moreover, the negative pressure gradient in the injured gluteal vessels increases the risk of fat embolism. Regarding vascularization of the ESMs, provided by branches of the intercostal and lumbar arteries, the vessels in this region have a smaller caliber; hence, the risk of injury and thromboembolism is lower.[10,28,29]

During follow-up, no changes were observed in muscle function, deformities, or asymmetries in the muscle groups under treatment (Figs. 3–6).

## CONCLUSIONS

The technique of high-definition liposuction with intramuscular fat graft (XPINE-FAT) in the thoracic longissimus muscles is a safe and reproducible procedure and allows the increase of intramuscular thickness in the immediate postoperative period efficiently, being corroborated by immediate postoperative ultrasound, and contributing to the athletic harmonization of body contouring surgery. During this study, no adverse events associated with the technique were reported. With respect to the durability of the fat graft, it is necessary to perform similar studies with a longer follow-up time. (**See figure 1, Supplemental Digital Content 1**, which displays before and 3 months after the procedure wherein the female patient is seen in a standing position without muscle contraction, **http://links.lww.com/PRSGO/C93**.) (**See figure 2, Supplemental Digital Content 2**, which displays before and 6 months after the procedure wherein the female patient is seen in a standing position without muscle contraction, **http://links.lww.com/PRSGO/C94**.) (**See figure 1, Supplemental Digital Content 3**, which displays before and 1 year after the procedure wherein the female patient is seen in a standing position without muscle contraction, **http://links.lww.com/PRSGO/C95**.)

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