

# Revision Abdominoplasty with Truncal Liposculpting: A 10-Year Experience

Aris Sterodimas<sup>1</sup> · Filippo Boriani<sup>1,2</sup> · Beatriz Nicaretta<sup>1</sup> · Luiz Haroldo Pereira<sup>1</sup>



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## Abstract

**Introduction** Abdominoplasty is one of the most popular body-contouring procedures. Despite its popularity, classic abdominoplasty is still associated with a significant rate of complaints from patients such as: fullness of flanks and epigastric areas, lack of a posterior lumbar curve, hanging skin over the incision line, and visible scars over the flanks and beyond underwear or swimming suit coverage. This study reviews the authors' experience in redo abdominoplasty when the patient is not or partially satisfied with the primary procedure.

**Patients and Methods** A total of 115 female and 32 male patients underwent revision abdominoplasty with truncal liposculpting between 2007 and 2016. The age distribution of patients ranged from 33 to 73 years, with a mean of 43.1 years. All the patients included in the study had undergone classic abdominoplasty in a different institution. Overall satisfaction with the body appearance after the combined procedure was rated on a scale of 1–5, where 1 is 'poor,' 2 is 'fair,' 3 is 'good,' 4 is 'very good,' and 5 is 'excellent.' The evaluation was made 12 months after the composite body-contouring procedure.

**Results** Four hundred to 1500 ml of fat were obtained with liposuction (mean 840 ml). The amount of clean, adipose tissue transplanted to the buttocks varied from 95 to 425 (mean 286 ml) and to the lower limbs from 75 to 270 ml

(mean 195 ml). The stromal-enriched lipograft technique was used in all the cases to enrich the fat transplantation. There was no hematoma, infection or deep vein thrombosis. Seventy-five percent reported that their appearance after composite body contouring was 'very good' to 'excellent' (30% 'excellent' and 45% 'very good') and 20% responded that their appearance was 'good.' Only 5% of patients thought their appearance was less than good ('fair'). The average follow-up time for this group of patients has been 6.3 years (range 1–10 years).

**Conclusion** Truncal liposculpting with modified abdominoplasty accomplishes very good aesthetic results in a single surgical procedure with a low rate of complications and high patient satisfaction in cases of revision abdominoplasties.

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**Keywords** Revision abdominoplasty · Lipoabdominoplasty · Abdominoplasty · Body contouring

## Introduction

The shape, volume, and size of the body contour vary greatly. These variations can be observed in the same person during his/her lifespan. Ethnic background, sex, genetics, hormones, physical exercise, and diet are some of the factors that influence body contour [1]. True body sculpting demands a three-dimensional understanding of the anatomical and surgical adipose layers of the abdomen and the trunk when performing liposuction [2, 3]. The

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Aris Sterodimas and Filippo Boriani equally contributed to the idea and the development of this paper both as first authors.

✉ Filippo Boriani

<sup>1</sup> Department of Plastic Surgery, LH Clinic, Rua Xavier da Silveira 45/206, 22061-010 Rio de Janeiro, Brazil

<sup>2</sup> Bologna, Italy

abdominal area, the banana fold and the sensuous triangle are difficult regions responsible for serious local sequelae that are difficult to correct [4–10].

Abdominoplasty is one of the most popular body-contouring procedures. Despite its popularity, classic abdominoplasty is still associated with a significant rate of patient complaints [11]. Abdominoplasty procedures involve a high risk of early complications, including hematomas, seromas, necrosis, and wound-healing problems. Their rationale is evident from the vascular anatomy of the abdominal wall, as traditional abdominoplasty includes a division of the main perforating vessels. These data indicate that conventional abdominoplasty including extended undermining and division of the superficial and the deep arterial systems causes profound devascularization of the abdominal flap. This might explain the high incidence of complications following this procedure [12]. The problems that generate complaints from patients and dissatisfaction with classic abdominoplasty surgery are: fullness of flanks and epigastric areas, lack of a posterior lumbar curve, hanging skin over the incision line, and visible scars over the flanks and beyond underwear or swimming suit coverage.

During the past decade, many combinations of operative techniques for abdominoplasty have evolved to suit the individual requirements of the patient. Truncal liposuction with modified abdominoplasty and gluteal lipografting has been applied by the authors to treat patients with abdominal deformities marked by lower abdominal skin excess, abdominal muscle laxity, and excess adipose tissue on the abdominal wall and in adjacent contours [13]. This technique allows sculpting of full-thickness abdominal subcutaneous tissue and achieves a natural abdominal contour. Truncal liposuction with modified abdominoplasty is not associated with a statistically significant increase in perfusion-related complication rates as compared with traditional abdominoplasty, despite the fact that it involves potential trauma to the vascularity of the elevated abdominoplasty flap. This holds true even in patients who are at increased risk for perfusion-related complications secondary to a history of active smoking or a previous supraumbilical scar [14]. As in every redo procedure, each individual case is specific and the procedure is customized. With this study, we aimed at retrospectively evaluating patient satisfaction with this combined technique of revision abdominoplasty and truncal liposculpting.

## Patients and Methods

A total of 115 female and 32 male patients underwent a redo lipoabdominoplasty during 2007–2016. The age distribution of patients ranged from 33 to 73 years, with a

mean of 43.1 years. All the patients included in the study had undergone classic abdominoplasty in a different institution. Table 1 describes secondary deformities noticed and procedures performed. Overall satisfaction with the body appearance after truncal liposculpting with modified revision abdominoplasty was rated on a scale of 1–5, whereas 1 is ‘poor,’ 2 is ‘fair,’ 3 is ‘good,’ 4 is ‘very good,’ and 5 is ‘excellent.’ The evaluation was made 12 months after the composite body-contouring procedure. With the same rating scale, a specialist plastic nurse performed the same outcome evaluation on all patients as an independent observer.

## Surgical Technique

1. Marking of the areas for liposuction and fat grafting is made, while the patient is in standing and sitting position. Marking of the suprapubic incision and of the infraumbilical flap is also done (Fig. 1).
2. Preoperative sedation in the surgical suite is administered. Anesthesia consists of an epidural block and intravenous sedation. The patient is placed in the prone position.
3. After the injection of normal saline wetting solution containing 1:500,000 of adrenaline by a small-bore cannula and waiting 15 min, a 60-cc syringe attached to a 4-mm blunt cannula is inserted through small incisions in the intergluteal fold as well as two incisions in the iliac crest and two more in the gluteal fold. Each incision is less than 1 cm long.
4. Adipose tissue is aspirated from the lumbar region (Fig. 2a, b). According to the stromal-enriched lipograft technique [15], the aspirated fat tissue is processed in the following manner. Two-thirds of the aspirated fat is used to isolate the stromal vascular fraction (SVF). Digestion is done with 0.075% collagenase (Sigma, St. Louis, MO) in buffered saline and agitated for 30 min at 37 °C. Transfer in 10 ml syringes is performed. Separation of the SVF containing ADSCs is then done by using centrifugation at 1200×g for 5 min. The IEC Medispin Tabletop Centrifuge, Needham MA, is used. The SVF is located in the pellet derived from the centrifuged fat at the bottom of the lipoaspirate. The remaining one-third of the aspirated fat is treated in the following way: With the syringe held vertically with the open end down, the fat and fluid are separated. Isotonic saline is added to the syringe, the fat and saline are separated and the exudate discarded. The procedure is repeated until the fat becomes yellow in color, free of blood and other contaminants. Mixing of the SVF containing ADSCs and the purified fat is done and transferred into 10-ml syringes for application. This whole procedure is done

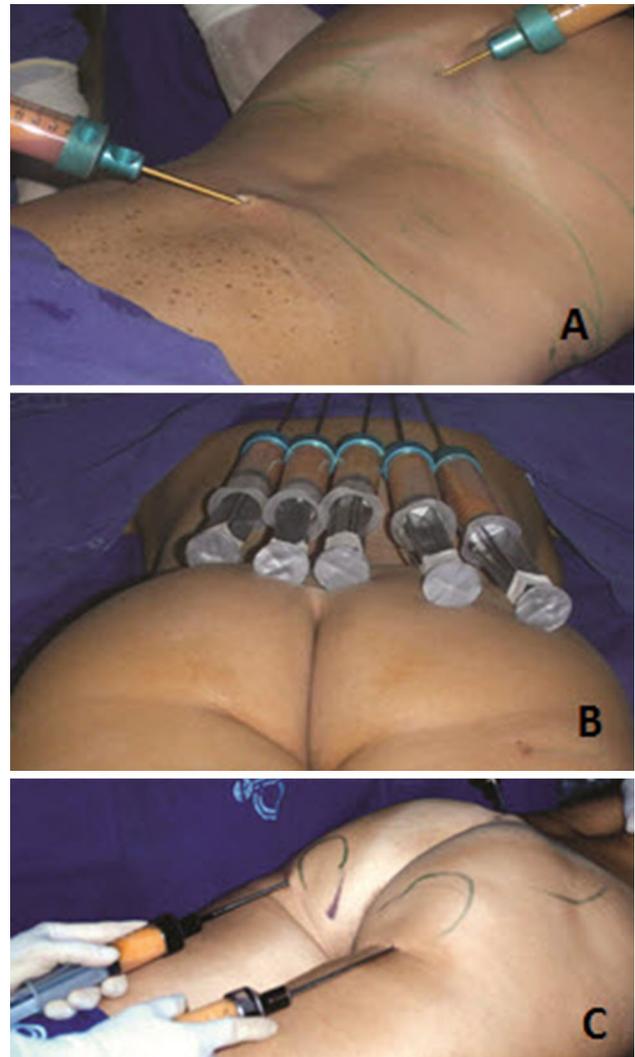
**Table 1** Type of deformity needing revision and related procedure

Type of residual deformity	No. of patients (%)	Procedure performed
Truncal fat deposits	17 (12)	Lipoaspiration
Abdominal skin laxity	7 (5)	Revision abdominoplasty
Combination of fat deposits and skin laxity	123 (84)	Revision lipoabdominoplasty
Visible incision scar	28 (19)	Scar repositioning
Gluteal hypotrophy	115 (78)	Stromal-enriched lipograft

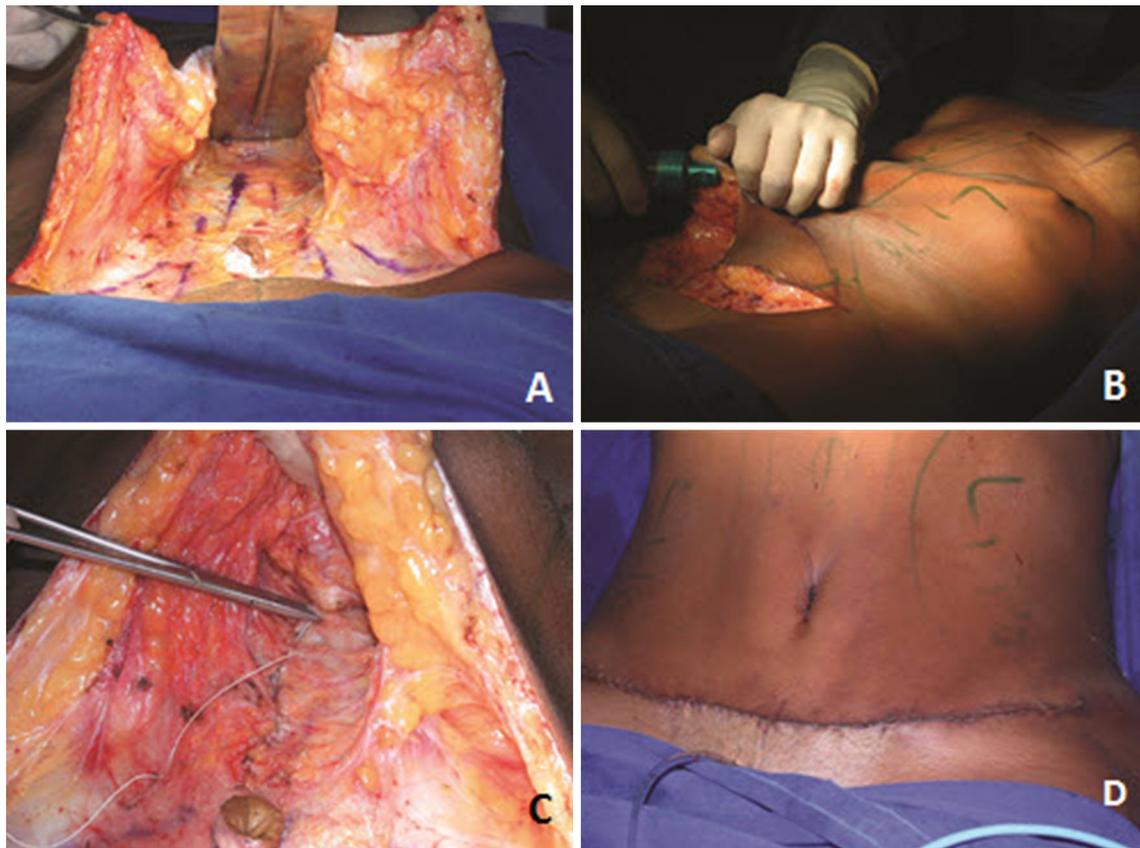
**Fig. 1** Marking of the areas for liposuction and fat grafting is done, while the patient is in the standing position

inside the operating theatre, by 2 tissue engineers, manually, and the time required is about 90 min.

- Initially, a deep plane to the gluteal muscles is created by the 4-mm cannula. Then other intramuscular planes are created by the same cannula in different trajectories, always from the deeper aspect to the gluteal surface (Fig. 2c). The fat is inserted into these tunnels beginning at the deep layer and working up into the intermediate fat compartments. The fat is injected as the cannula is withdrawn. Care should be taken to avoid injection of excessive fat in the superficial subcutaneous compartment [16]. Separate incisions, if necessary, can be used to treat the whole gluteal region. The autologous fat transplantation is done by retrograde intramuscular and subcutaneous injection.
- After turning the patient from the prone to the supine position, injection of normal saline wetting solution containing 1:500,000 of adrenaline by a small-bore cannula is done in the whole abdomen. Incision of the premarked infraumbilical flap is done. The flap is undermined over the rectus and external oblique fascia in the infraumbilical area. Dissection above the

**Fig. 2** a Fat liposuction by syringe method. b Washed fat with saline solution ready for lipografting. c Autologous fat transplantation by creating planes in different trajectories, always from the deeper aspect to the gluteal surface

umbilicus up to the xiphoid along the midline is done within a narrow tunnel of less than 8 cm width just enough to plicate the recti muscles (Fig. 3a). The 60-cc syringe attached to a 4-mm blunt cannula is inserted, and fat is aspirated using the syringe method in the whole abdomen (Fig. 3b). A diamond-shaped incision is made around the umbilicus.



**Fig. 3** **a** The abdominal flap is undermined over the rectus and external oblique fascia in the infraumbilical area and dissection above the umbilicus up to xiphoid along the midline is done within a narrow tunnel to plicate the recti muscles. **b** The 60-cc syringe attached to a

4-mm blunt cannula is inserted, and fat is aspirated using the syringe method in the whole abdomen. **c** The use of Baroudi points between the undermined flap and the aponeurosis is done. **d** Closure of the transverse suprapubic incision is done in anatomical planes

7. Diastasis repair and anterior sheath plication are performed, and the umbilicus is anchored to the fascia. The use of Baroudi stitches between the undermined flap and the aponeurosis is done (Fig. 3c). Neo omphaloplasty is performed. Closure of the transverse suprapubic incision is carried out in anatomical planes, including deep VYCRIL 0 stitches to deep fat, a continuous 3/0 MONOCRYL to the SFS (scarpa fascia layer) and a 4/0 MONOCRYL subcuticular (Fig. 3d).
8. No drains are used. Immediate postoperative dressing is done in the area that was lipoaspirated, avoiding any pressure in the gluteal areas where autologous fat transplantation has been performed.
9. The patient remains hospitalized for 24 h. Antibiotics, analgesics, and anti-inflammatory medications are prescribed during the following 7 postoperative days. Return to mild physical activities is allowed after the third postoperative week and lying down supine after 2 weeks. A non-zippered pull over female body vest is placed on the second postoperative day and is kept on for 1 month.

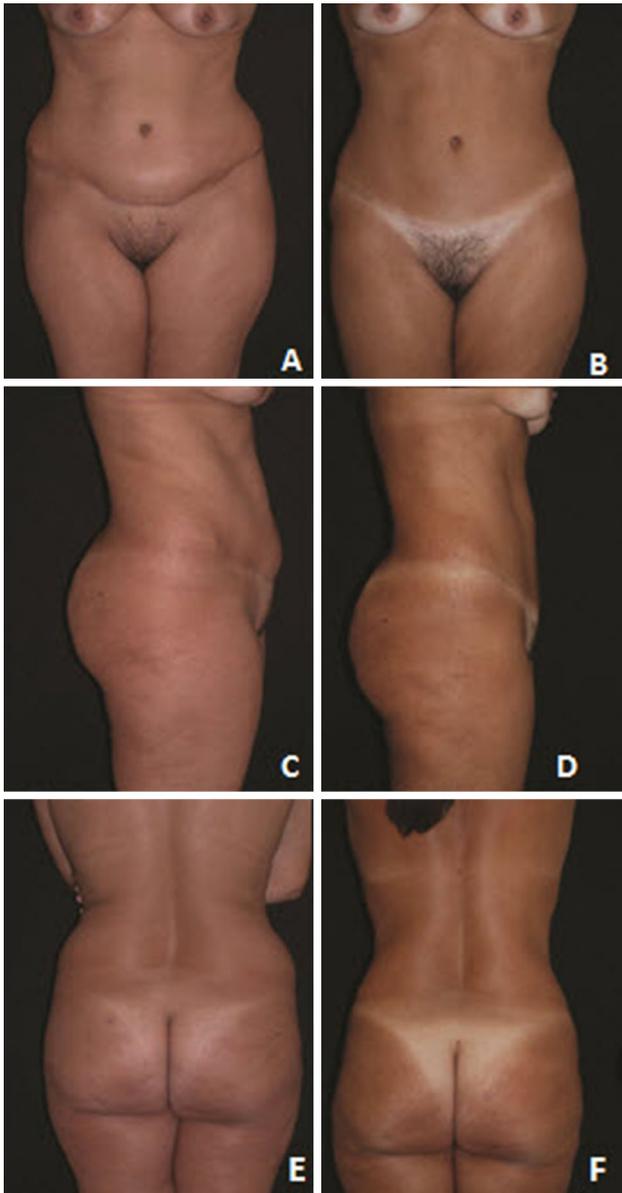
## Results

Four hundred to 1500 ml of fat were obtained with liposuction (mean 840 ml). The amount of clean, SVF-enriched adipose tissue transplanted to the buttocks varied from 95 to 425 (mean 286 ml). There was no hematoma, infection or deep vein thrombosis. Seventy-five percent of patients reported that their appearance after this combined procedure was ‘very good’ to ‘excellent’ (30% ‘excellent’ and 45% ‘very good’) and 20% responded that their appearance was ‘good.’ Only 5% of patients thought their appearance was less than good (‘fair’). The average follow-up time has been 2.3 years (range 1–4 years).

The independent assessor expressed similar ratings (excellent 26%, very good 42%, good 27%, fair 7%).

## Patient 1

This 44-year-old woman presented complaining of a flaccid abdomen and fat excess after she had undergone an abdominoplasty 2 years before (Fig. 4a, c, e). Truncal liposuction with modified abdominoplasty was offered to

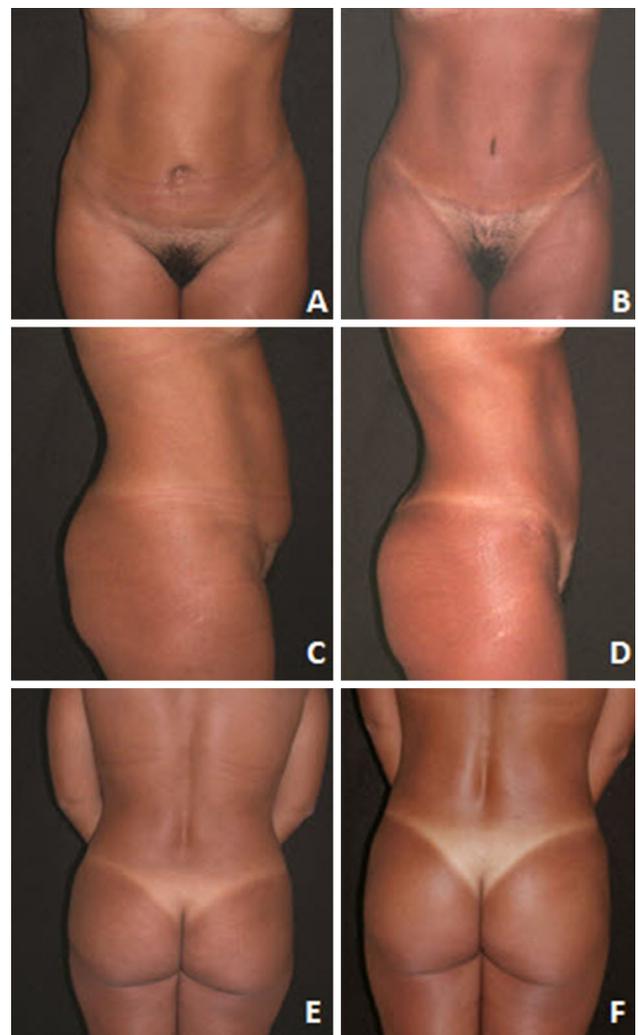


**Fig. 4** **a, c, e** Preoperative views of a 44-year-old woman complaining of a flaccid abdomen and fat excess after she had undergone an abdominoplasty 2 years ago. **b, d, f** Postoperative views of a 44-year-old woman, 2 years after undergoing truncal liposuction with modified abdominoplasty

her, commencing with liposuction of the back, flanks, and abdomen and abdominoplasty. Gluteal fat transplantation was performed. The following volumes were placed in one procedure: right gluteal area 180 ml; left gluteal area 190 ml. Photographs are taken 2 years after the procedure (Fig. 4b, d, f). Patient satisfaction was rated as very good.

## Patient 2

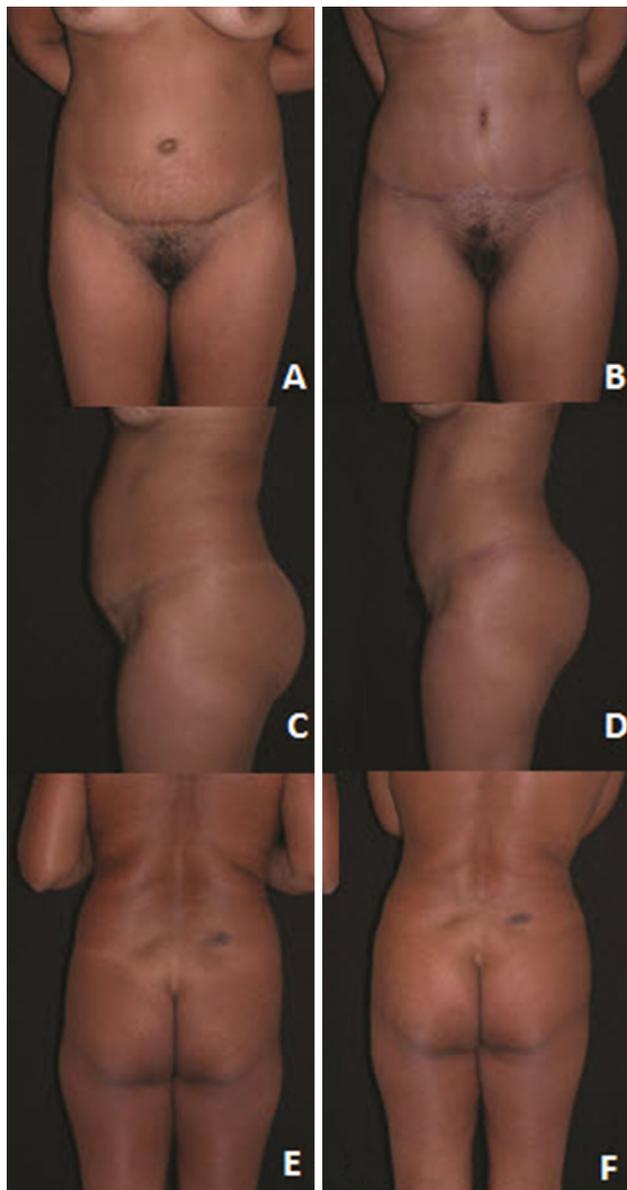
This 37-year-old woman presented for treatment of her abdominal flaccidity and local fat lipodystrophy after she had undergone an abdominoplasty 3 years before (Fig. 5a, c, e). Liposuction of the back, flanks, and abdomen was done complemented by modified abdominoplasty. Gluteal fat injection was performed. The following volumes were placed in one procedure: right gluteal area 80 ml and left gluteal area 90 ml. Postoperative photographs are taken 2 years after the procedure (Fig. 5b, d, f). Patient satisfaction was rated as excellent.



**Fig. 5** **a, c, e** Preoperative views of a 37-year-old woman complaining of her abdominal flaccidity and local fat lipodystrophy after she had undergone an abdominoplasty 3 years ago. **b, d, f** Postoperative views of a 37-year-old woman, 2 years after undergoing truncal liposuction with modified abdominoplasty

### Patient 3

This 51-year-old woman complained about her ‘floppy tummy,’ generalized fat excess and ‘loose buttock’ after she had undergone an abdominoplasty 1 year before (Fig. 6a, c, e). Liposuction of the back, flanks, and abdomen was done as well as a modified abdominoplasty. Gluteal autologous fat transfer was performed. The following volumes were placed in one procedure: right gluteal area 320 ml; left gluteal area 340 ml. The result is shown



**Fig. 6** a, c, e Preoperative views of a 51-year-old woman complaining about her ‘floppy tummy,’ generalized fat excess and ‘loose buttock’ after she had undergone an abdominoplasty 1 year ago. b, d, f Postoperative views of a 51-year-old lady, 1 year after undergoing truncal liposuction with modified abdominoplasty

1 year after the procedure (Fig. 6b, d, f). Patient satisfaction was rated as very good.

### Discussion

With the overall acceptance of aesthetic surgery diffusion, the number of patients undergoing abdominoplasty increasing, an aging population, and the safety of secondary abdominal contour surgery, it is likely that plastic surgeons will see more patients requesting secondary abdominal and truncal contour surgery in the future [17]. In the cases reported, the primary abdominoplasty was very poorly performed initially. Based on the visible skin overhang, there was probably no superficial fascial system (SFS) closure in these patients; in addition there was no concurrent liposuction and minimal or no muscle plication apparently. All of these surgical maneuvers were carried out in the revisions, with visible improvement. This case series indicates that revising abdominoplasties is possible, safe and effective and the technique we propose has proven to determine high rates of patient satisfaction. The principle of truncal liposuction and lipografting with modified abdominoplasty attracts a more ample spectrum of patients and addresses their modern queries. The procedure is based on liposuction and autologous fat transplantation. The modified transverse abdominoplasty is an adjunctive procedure that complements the contouring effects of the liposuction and the lipografting [13]. In a secondary abdominoplasty, performing lipoaspiration to the upper abdomen is usually safer than in the primary case because during the initial abdominoplasty most perforator vessels are usually divided and this creates a delay phenomenon on the raised abdominal flap, thereby increasing the lateral perfusion. This implies that in secondary abdominoplasty the tunnel type of undermining of the upper abdomen is not strictly required while performing simultaneous liposuction. Due to the mentioned delay phenomenon and strengthened lateral circulation, the upper abdomen can be safely detached up to the costal margins, to both abdominal sides, as pointed out by Hunstad and coworkers [18]. A recent study by Smith and Smith [19] reconfirms the opportunity to combine abdominoplasty and abdominal liposuction and suggests the identification of perforator vessels to make this association safer.

Liposuction is more of an art than a surgical procedure [20]. It entails a practical application of scientific knowledge with precision and craftsmanship and is a skill attained with clinical experience [20]. The goal of liposuction is the reduction in localized fatty tissue to produce well-proportioned body contours. A liposuction cannula 4 mm in width and no bigger minimizes the vascular damage by protecting the medium-sized perforators [21].

Changing the patient from the prone to the supine positions assists in better suctioning and reduction in the fat on the flanks. This aims at making a natural flank concavity, minimizing lateral extension of the incision, and reproducing the lordotic back and natural hip curvature. Limiting the extent of abdominal undermining preserves the perforator vessels [22] and eventuates less damage to intercostal nerves thereby preserving better sensation at the hypogastric areas [23]. The *redo* abdominoplasty technique with limited undermining and preservation of the flap perforator vessels makes it possible to reduce the complication rate and in particular flap necrosis and seroma [24]. Vertical rectus plication with a non-absorbable suture appears to have a significant effect on the final aesthetic result of the corrected diastasis [25]. The use of a pressure stockinet and an intermittent leg inflation instrument decreases venous stasis in legs [26]. The use of warm tumescent fluid decreases bleeding and intra- and postoperative shivering. There is no limitation or contraindication to a revision abdominoplasty due to a previously performed abdominal dermolipectomy as long as the vascular zones of the abdomen are respected. The abdominal wall dissection is limited to allow only the plication of the musculoaponeurotic system, and aggressive liposuction is avoided. The use of Baroudi stitches plays an important role in the decrease of the dead space created after abdominal undermining, making the use of drains unnecessary and contributing significantly in the prevention of seroma.

Gluteal fat injection was performed intramuscularly, which is no longer recommended by the recent ASERF guidelines [27]. However, since the publication of these guidelines, we have limited intramuscular injection to the superficial most part and just 10% of all the injected volume. In addition, as per guidelines [27], injecting is from above and not below, only on withdrawal and the cannula is a 4-mm caliber or greater; injected volumes are small and at low pressure.

## Conclusion

Truncal liposculpting with modified abdominoplasty accomplishes very good aesthetic results in a single surgical procedure with a low rate of complications and high patient satisfaction in cases of revision abdominoplasties.

## Compliance with Ethical Standards

**Conflict of interest** The authors declare that they have no conflicts of interest to disclose.

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