# Omphaloplasty

## A Surgical Guide of the Umbilicus

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*This book is dedicated to all those who had to do with my learning process in all levels. To my dear parents and siblings. To my beloved wife Gloria Isabel and my kids Martha Lucia, Flor de Anicia, Nathalie, and Julian for their kind and sweet support. To all my contributors for believing in this project and making it become true. Finally to the patients, direct beneficiary of this work.*

# Foreword

If my knowledge does not fail me, currently, no other book is exclusively dedicated to navel surgery. And this is the only scar we all carry from birth!

The word "navel" comes from the Latin root "umbilīcus" (which is the diminutive of "umbo") and also from the Greek word "omphalos." The term "umbo" comes in turn from the Indo-European origin "ombh" and from a variant of "ombh", "nobh" comes the German and English names "nabel" and "navel". Using "omphal-" or "omphalo-" as prefixes allows the creation of other words in the medical field relating to the navel. The aesthetic importance of the navel is increasingly significant, as swimming costumes are becoming more revealing. An abdominal wall surgery can vary the original shape and spoil the beauty of an abdomen. To this we can add umbilical hernias, which are often congenital but can also be the result of bad surgery. In his work, the author analyses all the surgical varieties that can affect this region.

The author has more than 24 years of experience as a surgeon in Brazil, the United States of America (USA) and several European countries. He is currently a professor at the Universidad del Valle in Colombia and at the Louisiana State University in the USA.

His broad imagination and scientific restlessness have allowed Dr. Murillo to create new techniques in umbilicoplasty, which are described in great detail and with magnificent illustrations in this book. The book also provides access to explanatory videos.

Now that the period after bariatric surgery is gaining more attention, the main victim here is the abdomen, including the belly button, which undergoes noticeable deformations. In creating this book, the author has been advised by a group of distinguished collaborators who lend their studies to the work. This book analyses details of anatomy and creation of the new navel in dermolipectomy, correction of post-surgical traits, and different forms of the navel, among others.

I am sure its superior quality will make it a success in the medical field.

Felipe Coiffman
Colombian Society of Plastic Surgery
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# Umbilical Anatomy and Position

David Guarin

The navel, umbilicus or belly button is maybe the most significant birthmark and reminds us of our physical link with our mother and humanity. This area in the middle of the abdomen was once the door that held vital structures to support the life, development and growth of every human being. After birth, the remaining umbilical stump falls off and the resulting scar forms. It is also an important medical landmark that divides the abdominal wall for physical exploration and surgical planning.

In this chapter, we review basic concepts about the development, anatomy, landmarks, and the normal position of the umbilicus.

## Embryology

At the fourth week of fetal life, the umbilical ring forms when the embryonic disk folds and becomes cylindrical. This fold separates the yolk sac into internal and external compartments. The inside compartment forms into the digestive tract and the outside compartment forms into the yolk sac (i.e., amnion). The compartments are joined by the vitelline duct (Fig. 1) [1].

As the amnion expands, the stalk gets close to the vitelline duct, the allantoid (a diverticulum from the hindgut), and the yolk sac. All of these structures are covered by an amniotic membrane and this creates the umbilical cord. Six weeks after fertilization, the developing gut in the fetus grows faster than the abdominal cavity and it bulges through the cord. As the abdominal cavity enlarges, the gut loop moves back inside the abdominal cavity close to the 11th week. The mature umbilical cord is made up of two arteries and one vein embedded in Wharton's Jelly and surrounded by amniotic membrane. The umbilical vein carries the main arterial blood supply to the fetus liver and so to the rest of the fetus body [1, 2].

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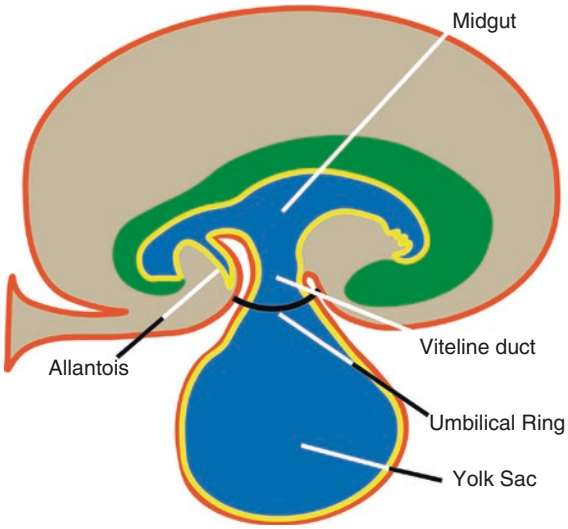


**Fig. 1** 4-week old embryo

The umbilical arteries originate from the internal iliac arteries in the fetus and these vessels carry fetal blood to the placenta.

At birth, the vitelline duct and yolk sac normally disappear. After the cord is sectioned, the vessels rapidly contract and constrict due to the large amount of elastic fibers present in the cord.

The cord elements degenerate into fibrous structures: the ligamentum teres replacing the umbilical vein, the lateral umbilical ligaments replacing the umbilical arteries, and the medial umbilical ligament replacing the allantois [3, 4].

## Adult Umbilicus

The normal umbilicus consists of a depressed scar surrounded by a skin fold. The umbilicus has a diameter between 1.5 and 2.5 cm of variable shape according to the amount of skin present, the amount of fat tissue over the abdominal wall, age, pregnancy, and presence of hernias [5].

The umbilical shape is the final outcome of the scar and it comes from a cylindrical structure (round in a sagittal view). The basic shape changes as the scar develops, with changes in weight, or the presence of hernias or other conditions that expand the surrounding skin [6]. Craig describes five main umbilical shapes: T, oval, vertical, horizontal, and distorted (Fig. 2). The aesthetically pleasant shape is between the vertical and the T shape and it is most commonly found in young people. When the skin from the upper abdomen expands (from pregnancy or fat deposits) or loses its normal elasticity (aging), the effect of gravity will pull this skin on top of the umbilicus and change it from a vertical to a horizontal shape.

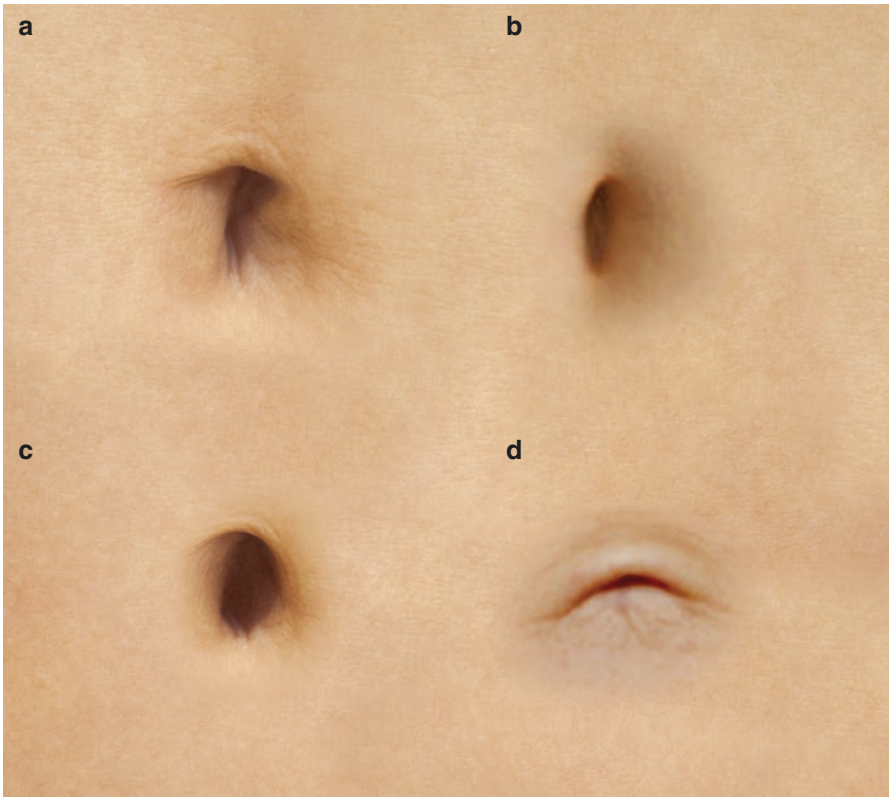


**Fig. 2** Umbilical shapes: (**a**) T, (**b**) Vertical, (**c**) Oval, (**d**) Horizontal

The normal skin flora colonizes the umbilical groove. *Staphylococcus aureus* is a commonly found bacteria in the umbilicus and this area must be carefully sterilized before surgery.

## Blood Supply and Drainage

The work in angiosomes for perforator flaps of Taylor has explained the vascular supply for the mesogastric area, including the umbilicus. This area is supplied by perforator branches that are mainly from the inferior epigastric artery. The superior epigastric artery joins with the inferior, creating a plexus capable of maintaining the whole abdominal dermal flap with either artery [7].

The main drainage is via a superficial venous network arranged as a plexus around the umbilicus, traveling with the arterial branches. The para-umbilical veins are connected to this plexus with the portal vein through the ligamentum teres. This has clinical implications where portal hypertension is presented (Fig. 3) [7].

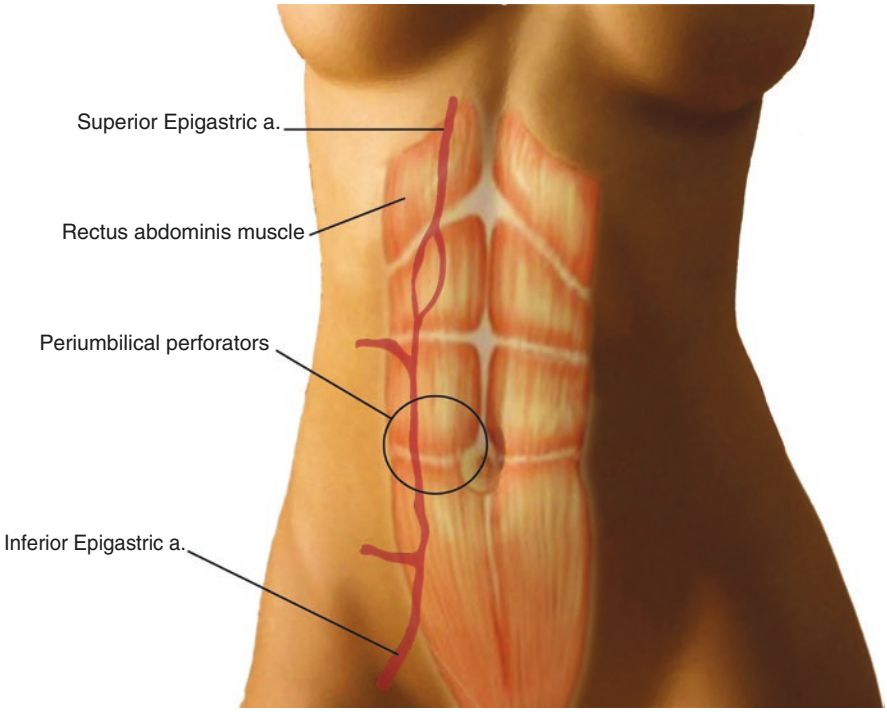


**Fig. 3** Anterior abdominal blood supply

## Lymph Drainage

The lymph drainage of the anterior abdominal wall can be divided by the umbilicus. Everything above it in the superficial plane drains into the anterior axilar lymph nodes and in the deeper plane to the parasternal lymph nodes. Below it in the superficial plane, the lymph drains into the inguinal lymph node and in the deeper plane, into the external iliac lymph nodes.

## Innervation

The anterior wall of the abdomen is innervated by the anterior division of the nerves from T7 to L1 through the intercostal, subcostal, and ilioinguinal nerve. Typically, T10 has been found to be responsible for the umbilicus innervation in most of the cases and this anatomical landmark is a reference guide to the T10 dermatome.

## The Umbilical Position

Knowing where the umbilicus is placed in an aesthetically pleasant abdominal wall is critical for the reconstruction of the umbilicus and abdominal enhancement.

Early descriptions locate the umbilicus using anatomical landmarks as follows:

1. centrally at the midpoint of the abdominal wall
2. on the highest point of the iliac crests
3. on the level of the vertebrae L3 or L4
4. at 60 % of the line extended from the xiphoid process to superior border of the symphysis

Most of these descriptions are based on expert opinions and they differ greatly when compared to each other. To begin, the concept of the midline or linea alba position is incorrect [8]. The work of Rohrich describes this in detail in their study of 136 subjects. They saw that 100 % of the subjects had the umbilicus positioned off the midline. This must be taken into account when analyzing and planning umbilical surgery.

To try to find the ideal position with objective measurements, many authors have conducted observation trials and these are further described below.

Abhyankar et al. [9] studied 75 Indian females and found the relationship between the xiphoid-umbilicus distance and the umbilicus-pubic symphysis to be 1.6:1, which is close to ideal proportions. They also found a relationship between the anterior inter-iliac crest and the umbilicus of 1:0.6. In the work of Visconti et al., the umbilical position was also located using the ideal proportions aided with a Fibonacci caliper.

Dudukovic et al. [10] studied 95 Croatian females and found that, in the young patients, the umbilicus—pubic symphysis mean distance was 23.61 cm and the xiphoid-umbilicus distance was 15.81 cm. They also developed a complicated formula to predict the ideal position and describe the changes of these proportions as the subjects aged.

Rodriguez-Feliz studied 40 Albanian women and found that the umbilicus—pubic symphysis distance of 15.05 cm is only accurate for women with a height of 145–178 cm [11].

Using a different approach, Lee et al. assessed the umbilical positionon photographs of aesthetically pleasing women and they found a ratio of xiphoid-umbilicus—pubic symphysis of 46:54 [12].

In our experience with women of Latin origin, we have found a xiphoid-umbilicus—pubic symphysis ratio of 44:56 and an umbilicus—pubic symphysis distance of 15 cm.

According to published data, there seems to be ethnic differences between the height of the umbilicus. However, most of the works agree with a xiphoid-umbilicus—pubic symphysis ratio that is close to the ideal proportion. Every

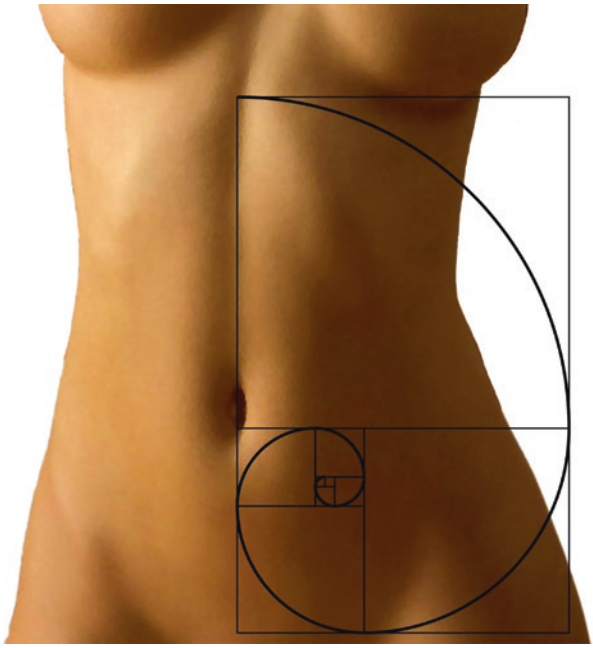

**Fig. 4** Umbilical position. Fibonacci spiral with ideal proportion and its relationship with the xiphoid, umbilicus, and pubic symphysis

patient must be seen as an individual. The surgeon should consider that having a ratio rather than a single measurement seems more accurate when the umbilical position is assessed (Fig. 4).

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# The Navel's Vascular Anatomy and Its Surgical Application

César Kelly Villafuerte Velez

## Introduction

The umbilical scar forms a basic structure of aesthetic harmony on the abdominal wall and the corporal contour. Multiple surgical techniques of dermolipectomy include the detachment of an abdominal dermo fat flap with the release of the navel's cutaneous perimeter, admitting its vascular network through the umbilical pillar linked to the deep fascia or releasing the posterior implantation, assuming its perfusion through the skin [1–11]. To help clarify the macro- and micro-vascular systems that allow for, in most cases, success with any of the techniques described, the histological study of the anatomy of 15 cadavers is presented here, and the results suggest some possibilities of application in future surgeries.

## History

The study of circulatory anatomy of skin had its beginning with the agreement on cutaneous perforation by Manchot (1889), Salmon (1930), Tansini (1900), Blair (1921), Esser (1929), Webster (1937), and Bakanjian (1965). The 1970s was a revolutionary time, during which many investigators described their discoveries: Daniel and Williams described the basic concept of patchwork, McGregor and Morgan differentiated the types of circulation between anatomical and embryological, Taylor and Daniel described the flaps as free, and Mc Crau described the flaps as myocutaneous.

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The 1980s introduced research on fascio cutaneous flaps described by Pontem (1980) and the concept of corporeal angiosomes by Taylor and Palmer (1987). Regarding the circulatory anatomy of the abdominal wall, research by Elbaz, Pardoux, Riebourg (1975) and Boyd and Taylor (1984). Abnormal anatomical circulation of the abdominal wall was described by Elbaz, Pardoux, Riebourg (1975) and Boyd and Taylor (1984).

In Brazil, clinical applications of navel treatment in tummy tucks are described by Callia (1965), Pontes (1966), Pitanguy (1967), Sinder (1973), Baroudi (1974), Avelar (1978), Souza Pinto (1982), Hakme (1982), Dulce Maria Fonseca (1982), and Bozola (1988).

## Casuistry and Method

This investigation was based on 15 fresh cadavers; nine female and six male. Fourteen of the cadavers were aged between 20–60 years and one cadaver was of a 6 month old baby. The study was conducted in three stages: dye injection in the abdominal wall, dissection of the wall and umbilical area, and histological analysis.

### Dye Injection

In 14 cadavers, inguinal oblique incisions approaching the deep inferior-epigastric-artery (DIEA) were made, through dissection of the femoral artery and external iliac. The DIEA was catheterized using an epidural catheter n° 18, injecting 10–20 cc of Parker black ink (Nankin) for each hemi-abdomen, through a syringe injection of 20 cc at a medium pressure of 40–80 mm Hg. This pressure had been previously calculated by the digital pressure of a syringe plunger connected to a common tension gauge (Tykos). The infusion was done in two steps, first the right hemi-abdomen was injected with pigments and then the left side. Average infusion time was 5 minutes.

### Dissection

In all of the 15 cadavers, two dissection steps were used. The first stage consisted of the dissection of the umbilical piece through cutaneous incision to 1 cm of the umbilical margin. This dissected the skin, subcutaneous and umbilical pillar until its base of facial implantation was reached. The umbilical pillar was exposed with mapping and photography of vascular findings stained by Nankin. The second step exposed the abdominal wall, through a supra-median and infra-umbilical incision, from the xiphoid appendix to the pubis, continued to the inguinal arcade and anterior superior iliac spine comprising of skin and subcutaneous tissue. The subcutaneous plane was detached from the anterior aponeurosis of the rectus to observe the

perforating vessels. This was followed by an incision in the linea alba until the parietal peritoneum, taking off the posterior aponeurosis of the rectus muscle and evaluating the perforating vessels at this level.

### Histological Analysis

Nine umbilical pieces were studied histologically through a set of five transversal cuts; two of which were superficial (reaching the skin and subcutaneous layer), two intermediaries (superior area and pillar inferior), and one a posterior cut. Two pieces were prepared with two sagittal cuts (medial and lateral) reaching all the layers of the umbilicus for documentation.

The plaques were covered with HEMATOXYLIN-EOSIN and studied using microscopy of 40–90×. Mapping and photographs were recorded.

## Results

### Injection

By utilizing Nankin's infusion through the DIEA, a cutaneous pigmentation of the two respective hemi-abdomens was achieved, starting at the periumbilical area, continuing in the superior area and ultimately ending in the inferior area. Similarly, a pigmentation of the counter-lateral abdomen on a medium range of 2–3 cm parallel to the linea alba was achieved. The umbilical and periumbilical areas were reached in all the infusions, with a good degree of pigmentation. With the counter-lateral infusion through the DIEA, a pigmentation of characteristics similar to those described was obtained (Photograph 1).

### Dissection

During the dissection of the navel, diffuse pigmentation of the subcutaneous tissue was observed, with the presence of small blood vessels of up to 1 mm diameters in a radiated arrangement. In the region of the umbilical pillar, the presence of two blood vessels was observed, which ran along its vertical axis from the posterior fascia to the subcutaneous layer, with a medium diameter of 1–2 mm at the level of posterior aponeurosis and progressively decreasing in size towards the subcutaneous layer. These were closely related to the pillar through an aponeurotic sheath and were found to be positioned in the inferior quadrants of the pillar, between the 3 o'clock and 9 o'clock positions (Photograph 2).

During the dissection of the abdominal wall, subcutaneous tissue had been found to be pigmented through terminal branches of myocutaneous perforating arteries that cross the straight anterior aponeurosis, with greater concentration in the periumbilical area. In the posterior plane, in 72 % of the cadavers, an artery branching

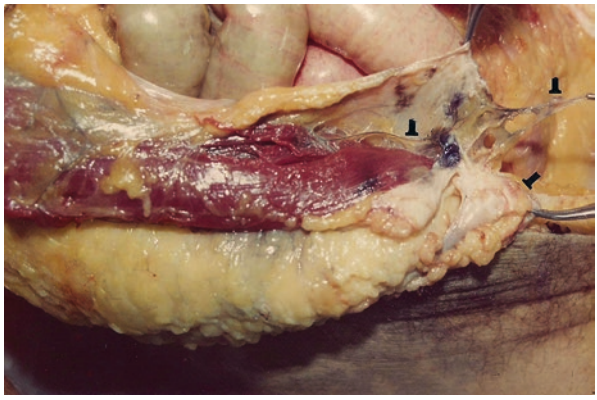
**Photography 1** Cutaneous pigmentation by Nankin's infusion through DIEA

**Photography 2** Dissection of the navel. UFCA around the inferior quadrants of the umbilical pillar

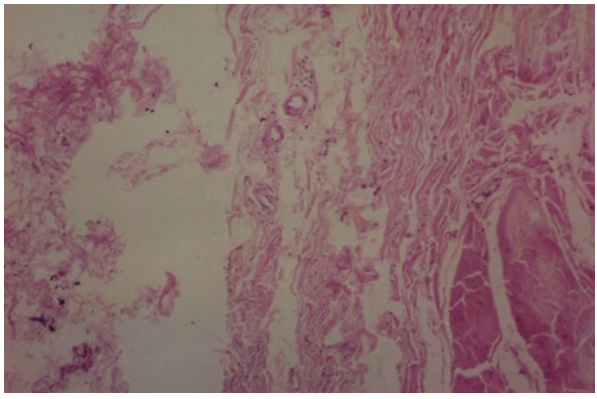
off the DIEA was found. It begins approximately at the level of the union of the middle third with the straight muscle inferior and it later goes between this and the posterior aponeurosis, heading up to the umbilical pillar and ascending as previously described. We have called this vessel the Umbilical Fascio Cutaneous Artery (UFCA) (Photograph 3).

## Histology

The histological cuts showed three defined areas; the outermost conformed by a less dense connective tissue (loose and thin); an intermediary area of little thickness with adipose tissue and medium-sized arterial vessels; and a big central area of dense collagen with circular arrangement, emphasized through the absence of significant circulation. In these cuts, it was not possible to establish quadrant positions of the blood vessels, excluding the knowledge that the largest and central vessels have been located in the peripheral intermediate area (Photograph 4).



**Photography 3** Dissection of the abdominal wall. UFCA (T) artery branching off the DIEA



**Photography 4** Histological cuts show blood vessels in the peripheral intermediate area

## Discussion

The results of pigmentation of the abdominal wall corroborate the findings of Boyd, Taylor and Corllet, demonstrating that cutaneous nutrition comes from perforators derived from the DIEA.

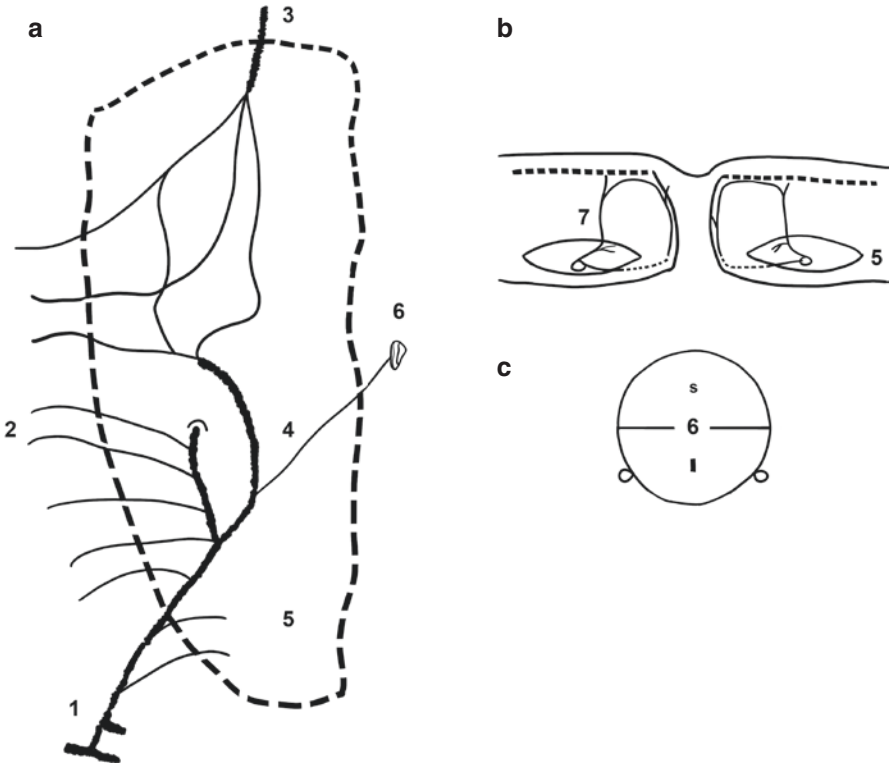
Similarly to the other authors, our investigation indicated the highest concentration of blood vessels in the paraumbilical area and in the medial and superior third of the abdomen [12–18].

We observed that the circulation of the navel depends on an anastomotic ring formed by a fascio cutaneous artery (UFCA) and medial branch of inferior deep epigastric artery (DIEA), anastomosing to the level of its terminal vessels, with the small arterioles derived from myocutaneous paraumbilical perforators, also originating from the DIEA. Boyd, Taylor and Corllet had mentioned the existence of an umbilical branch originating from the medial division of DIEA [17]; however, we did not find in our literary research any specific references to this anatomical vascular ring of the navel. Therefore, we describe the existence of double circulation at the navel, in which the arterial infusion of the skin and umbilical folds would depend on irrigation by the terminal vessels of the myocutaneous paraumbilical perforators (branch of DIEA) and the circulation of the pillar and the umbilical basis would be provided through the umbilical's fascio cutaneous artery. Both systems would end up anastomosing, thereby closing a circle at the peri-umbilical subcutaneous level (Photograph 5).

In order to define which of these two circulatory systems is the predominant one, macro- and micro-hemodynamic studies are required. However, we extrapolate that most of the blood circulation to the skin and umbilical folds depends on abdominal skin circulation (the myocutaneous perforators of the DIEA), because in the neonate, after the umbilical stump falls off, the healing phenomenon and contraction of the surrounding skin results in the external characteristics of the navel. The intraparietal umbilical area remaining suffers degeneration, evolving into a scar, whose blood supply is provided by the UFCA.

### Conclusion

The navel's circulation is provided by an anastomotic circuit between the fascio cutaneous artery (UFCA), which ascends through the periphery of the inferior pole of the umbilical pillar and the terminal skin branches of myocutaneous paraumbilical perforators. These findings demonstrate the importance of correct treatment of the navel in abdominoplasty. Liberation of tissues of the infraumbilical diameter must be made with extreme care in techniques that release it from the skin, to avoid injuring the pendulum of the two navel-cutaneous arteries, which are responsible for the umbilical cutaneous circulation, and also in the techniques that release it of its posterior implantation when the circulation is carried through the myocutaneous paraumbilical perforators.



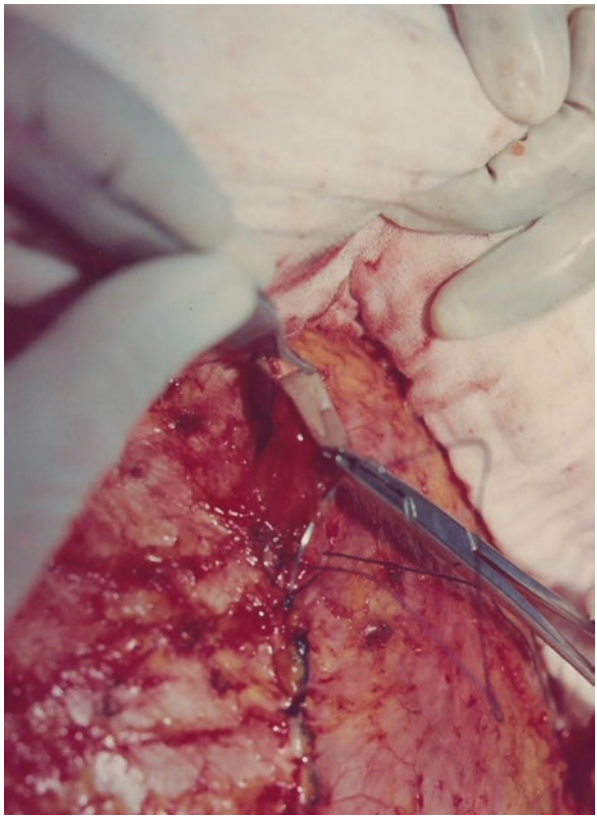

**Photography 5** (**a**) Scheme of the abdominal vascularization wall. (**b**) Ring of the navel vascularization. (**c**) Position of the UFCA around the umbilical pillar. 1. DIEA. 2. Intercostal anterior arteries. 3. Deep upper epigastric artery. 4. UFCA. 5. Rectus muscle. 6. Navel. 7. Myocutaneous perforations. 8. Posterior fascie

With respect to surgical techniques, we make the following suggestions:

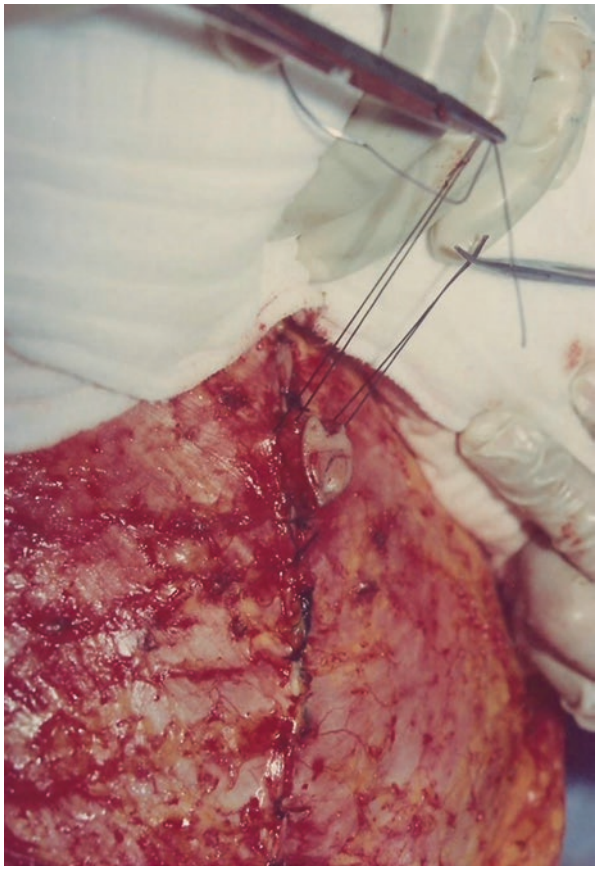
1. The liberation of the navel must maintain the tissue without any trauma or damage to its aponeurotic wrapping, which remains closely attached to the pillar, protecting the vascular circuit. To assist with this, the fat removal of the umbilical piece could be done wherever the detachment plane does not reach the peri-umbilical fascia described.
2. The ligature of the anterior abdominal fascia, in the peri-umbilical area, must respect the circulation at the level of the navel's inferior pole, avoiding excessive tension.
3. The fixation of the umbilical pillar at the posterior wall must be done with longitudinal stitches parallel to the pillar axis and preferably between the

positions of 10 o'clock and 2 o'clock and with only one stitch at the 6 o'clock position (Photographs 6 and 7).

4. In abdominoplasty associated with the treatment of umbilical hernias, we suggest an "outside table" approach (i.e., extra-hernia) and entry via the superior pole, to avoid damaging the vascular anatomy described (i.e., UFCA in the inferior pole).



**Photography 6** Fixation of the umbilical pillar at the 6 o'clock position



**Photography 7** Fixation of the umbilical pillar at the 10 o'clock and 2 o'clock position

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# Omphalo and Neo-Omphaloplasty

Ricardo Baroudi†

## Introduction

The umbilical scar is undoubtedly the only scar that is accepted as a natural aspect of the human body. Changes to its appearance or position, or even the lack of one, are seen as a distortion by the beholder, bringing about many repercussions [1–4].

The umbilicus is positioned on the xifo-pubic median line, 20 cm above the vulvar commissure in women and the same distance from the base of the penis in men. Morphological alterations due to large variations in weight, celiotomies, aging, and pregnancy affect the abdominal wall, and this causes umbilical dimorphism. Psychological reactions also differ, from adaptation to the new umbilicus to the insistent pursuit to obtain the perfect umbilicus (more frequently seen later in the aging process, after weight changes in both genders, and in women who have given birth multiple times [5–8]).

Another situation of equal importance is related to the umbilical scar left after an abdominoplasty. This new umbilical scar can sometimes be far from what is considered natural, causing patients to react in many ways, ranging from acceptance to rejection. This rejection often results in the patient seeking surgical revision (Fig. 1a–d).

Many years ago, we recorded a case in our clinic with a patient candidate for abdominoplasty. She emphasized how important the appearance of her navel was to her and let us know she was afraid the operation would change its morphology. During a party, knowing that several friends who underwent abdominoplasty would attend, many of which had been operated on by different surgeons (two of whom had been operated on by us), she took them into a private room for them to show her the results of their operations and to inquire in particular about the appearance of the

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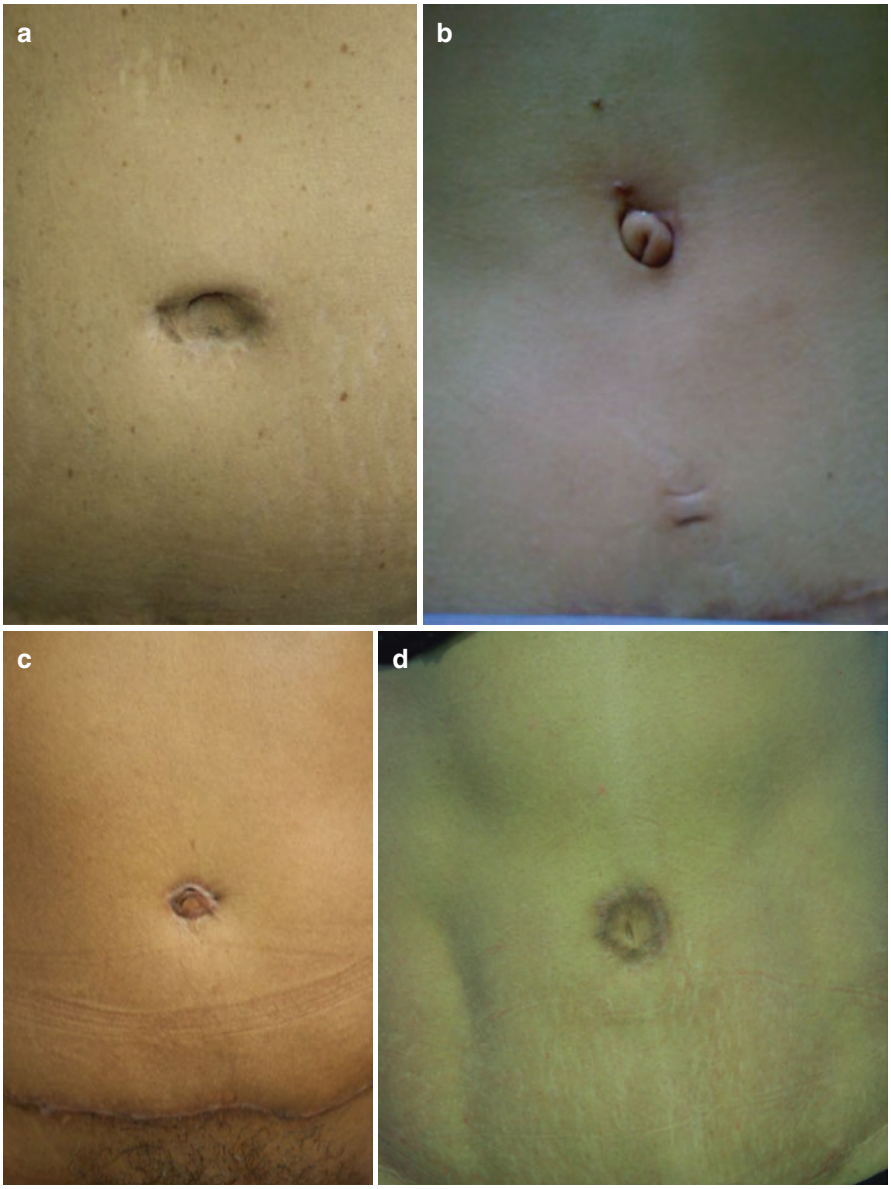


**Fig. 1** (**a–d**) Illustrations of unnatural navels after abdominoplasty performed by different plastic surgeons. This demonstrates the importance of the navel on the abdomen

navel. Satisfied by the results shown by her friends, she returned to us and we successfully operated on this patient. Literature describes numerous techniques on umbilicus and neo-umbilicoplasties, and this proves human inventiveness in this field [9–12].

## Surgical Technique

Markings are carried out (Fig. 2) and the patient is placed under the same operative conditions for abdominoplasty. A low transversal incision of the "bicycle handlebar" type is performed and a subcutaneous dissection up to the umbilical line is carried out. The release of the umbilical pedicle from the abdominal skin wall is performed by making a circular incision, with a skin island of 1 cm diameter and the dissection of the pedicle down to the base. The undermining of the subcutaneous tissue on the epigastric abdominal wall reaches close to the sternal notch, leaving the dissected

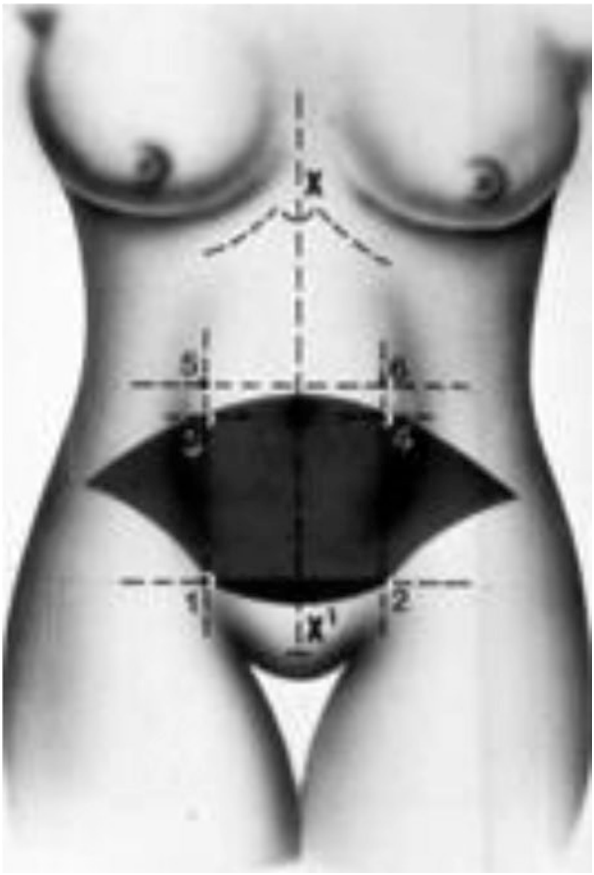


**Fig. 2** Schematic version of the "bicycle handlebars" demarcation of the abdomen begins with the **XX′** line over the vulvar xiphoid-commissure axis. Two lines (transversal and parallel) are displayed: the lower one crossing the pubis at 7 cm from the frontal vulvar commissure and the other crossing the upper pole of the navel. From each antero-superior iliac spine, an arched line reaches the upper pole of the navel. From the end of the transversal pubic line, two other lines (vertical and parallel to each other) cross both the arched line coming from the anterior superior iliac spine and the horizontal line located in the upper pole of the navel. Marks such as 1–3–5 = 2–4–6 are created to guide the bilateral symmetry before and after the excess skin resection. Often these references may be erased during surgery, so it is suggested to apply a single stitch on each mark

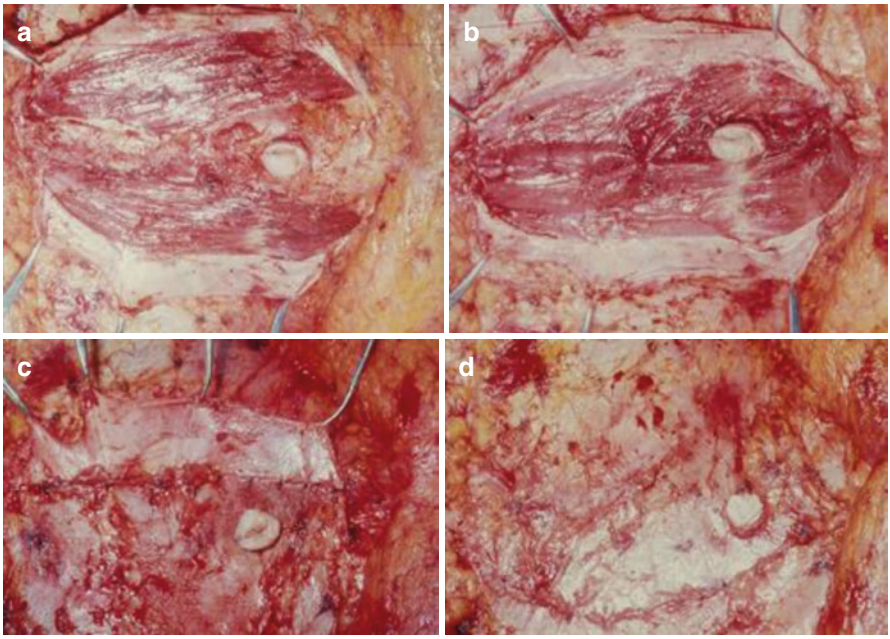


**Fig. 3** (**a**) Dissection of the aponeurosis, exposure of abdominal rectus muscles, and the umbilical pedicle with the skin island in the far end. (**b**) Suture of the rectus in the midline. (**c**, **d**). Superimposed suture of the rectus husks, transfixed by the navel making it exposed to then be positioned on the skin

section with a triangular appearance. The plication of the aponeurosis of the rectus muscles throughout the dissected length, including the umbilical pedicle, is made by positioning the attached island of skin to the aponeurosis muscle plane. The umbilical pedicle is clamped with Kocher pliers. In special cases where abdominoplasty is combined with other intra-cavity procedures (e.g., gynecologic surgery), treatment of the rectus muscles can be diverse. The aponeurosis of these muscles is dissected bilaterally. The muscles are sutured in the middle line and the superposed aponeurosis are sutured to each other while crossed by the umbilical pedicle (Fig. 3a–d).

Next, the patient is positioned with a moderately elevated upper body. Traction flow and median incision of the abdominal skin flap are performed in a cranial direction up to the resection limit, surpassing the primary position of the navel, and a fixation point on the flap is applied over the median pubis line. Two new bilaterally-positioned incisions are made on the skin flap through to the limits of the skin excesses to then be resected. Four abdomen skin flap excesses are resected. The end of the Kocher pliers trapped at the base of the umbilical pedicle is manipulated against the dissected skin, indicating the exit point of the umbilical pedicle (Fig. 4a–h).

A transverse skin incision trans-fixating 2–2.5 cm is performed, depending on the thickness of the skin layer of the abdominal flap. The guiding stitch marks on the abdominal skin flap are removed and everted.

The excess adipose from 3–4 cm around the umbilical incision is resected depending on the final thickness of the skin flap. All supraumbilical segments of the

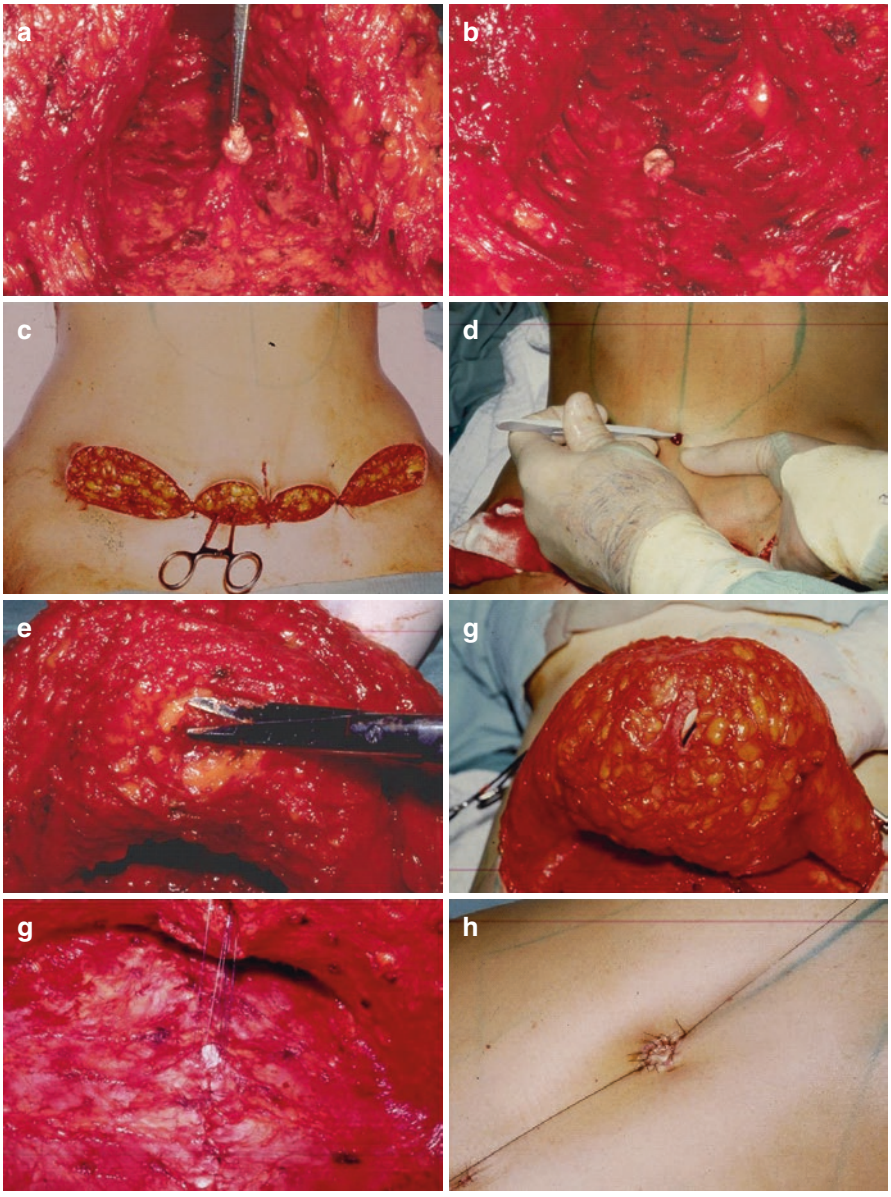


**Fig. 4** (**a**, **b**) The navel is dissected with the pedicle exposed. The island of skin (1 cm in diameter) at the extremity, before and after the plication of the aponeurosis of the rectus abdominal muscles, remains at this level. (**c**) The abdominal skin flap is sutured with two points at the pubis limit after excess skin resection, while Kocher pliers fixate the navel pedicle. (**d**) A transversal and transfixing skin incision of 2 cm in length is projected towards the belly button skin island. (**e**, **f**). The skin flap is everted and the fat tissue is resected around the perimetral umbilical skin incision. (**g**, **h**) The umbilical pedicle is dissected after plication of the rectus muscles, with the island of skin at the free end positioned level with the muscular wall. Kocher pliers (see Fig. 3c) clenched to the pedicle base, guide the transversal incision to be made for the final umbilicus position on the abdominal wall. When bound, it determines the skin umbilication. Additional isolated stitches of 5.0 complement the sutures

abdominal skin flap receive binding stitches a few centimeters above the navel pedicle. Four cardinal points transfix the edge of the periumbilical skin incision, and then the aponeurosis, the navel base, and the skin edge at the free end of the umbilical pedicle emerge through the skin incision and are united and bound by hemostatic pliers.

Following this, adhesion stitches are sewn throughout the hypogastrium, down to the edge of the inguinal-pubis incision. When tied, the four cardinal points resemble the natural effect of the navel. Separate stitches of 5.0 nylon are applied between the cardinal points to better adjust the scarring. The four cardinal points are tied onto a spherical gauze pack with antibiotic ointment. These points remain in position for about 7 days post-operation. After this period, the gauze is removed and the wound is cleaned twice daily. The 5.0 nylon stitches are removed after 2 weeks and the cardinal points are removed after the third week.

## Neo-umbilicoplasty

The neo-umbilicoplasty technique is used for specific cases of navel necrosis and other problems involving its morphology and natural appearance. These problematic navels can be caused by previous abdominoplasty, celiotomies where the final scar compromises the natural aspect of the navel, skin changes from excessive body weight, previous surgery, excessive weight loss, etc. (Fig. 5a–d).

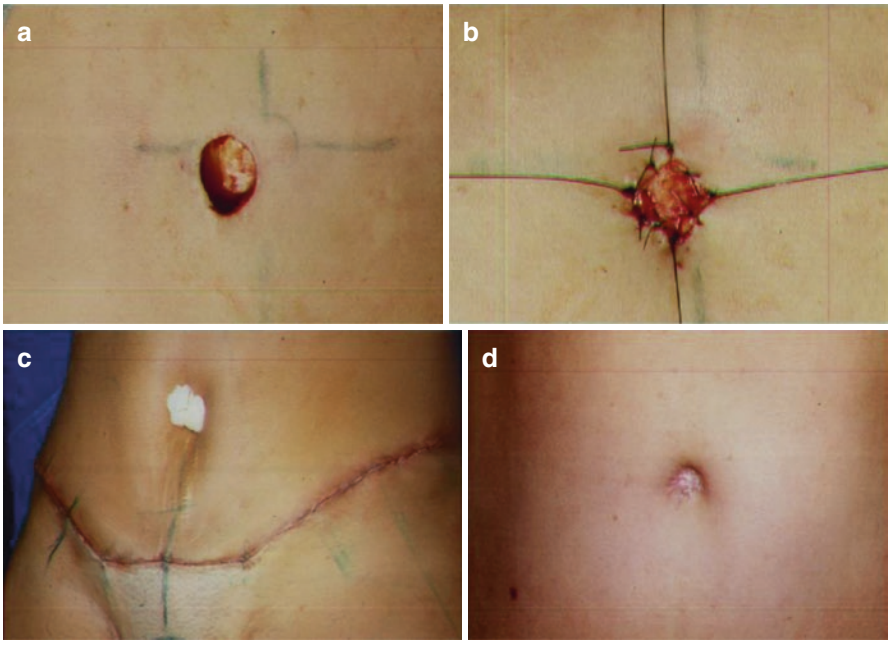


**Fig. 5** Trans- and post-operative neo-umbilicoplasty. (**a**, **b**) Umbilical orifice before and after fixation of the edges with the four repair stitches for attachment to the aponeurosis of the rectus muscles. (**c**) Healing patch covering the area of the neo-umbilicus, edges sutured and fixated by four cardinal and intermediate points. (**d**) Six months post-operative photograph

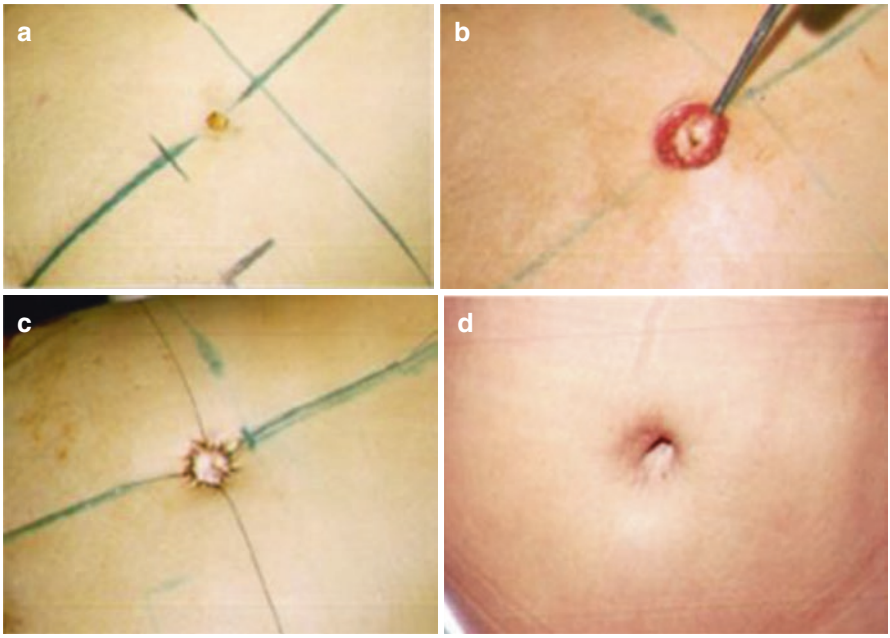


**Fig. 6** (**a–d**) If navel scar stenosis allows a simpler solution, resecting the scar ring keeps the umbilical pedicle and new suture on the new edge

This technique involves surgically removing the affected area and replenishing the natural aspect of the navel. There are no recorded cases of umbilical hernias, except for those patients with cosmetic problems. In other words, all the skin within the affected navel area down to the scar limits is resected to the aponeurotic plane below.

The free edge of the skin is sutured to the aponeurosis with two or four separate cardinal stitches of 4–0 nylon thread, keeping each stitch at approximately 10–12 cm in length. Between these stitches, isolated 5–0 stitches are made around the central open area. Gauze drenched in antibiotic ointment and formed into a ball shape is tied with four long nylon threads, compressing the open area for approximately 10 days. The patients are advised not to wet the region during this period. The healing patch is removed after this duration, continuing with daily local cleansing and application of antibiotic ointment. The average time of re-epithelialization is approximately 30 days starting from the periphery into the center of the neo-umbilicus.

## Conclusion

The umbilicus is the most remarkable aspect of the abdomen and this is why an exceptional effort must be made to achieve an aesthetically pleasing result. When performing umbilicoplasty, we can encounter all kinds of unaesthetic cases and this is why it is necessary to address each one of them with a specific solution. Among these unaesthetic cases, we can find stenosis (Figs. 6 and 7), enlarged

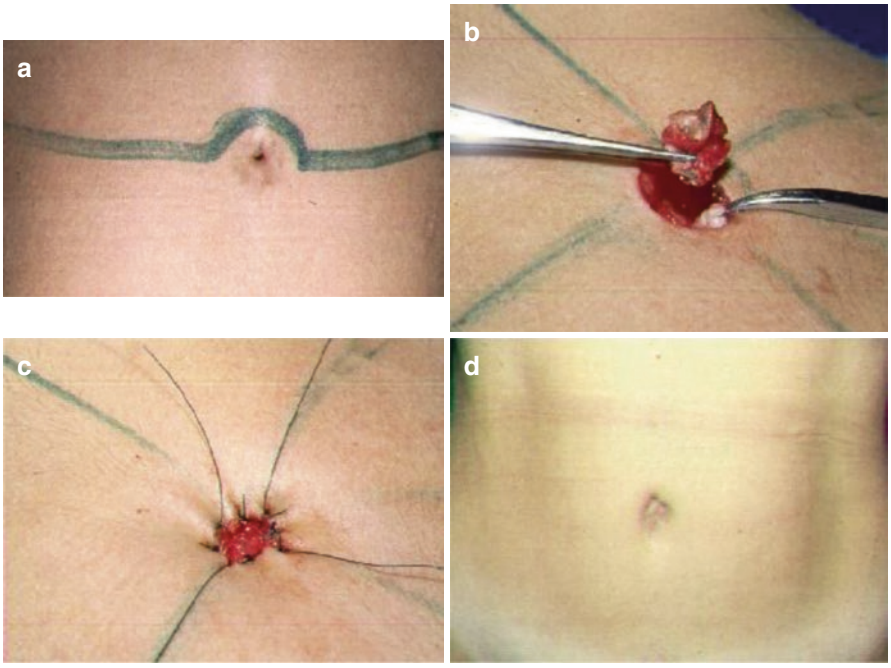


**Fig. 7** (**a–c**) Scar (from navel stenosis) was redirected to neo-umbilicoplasty by completely resecting the scar and the navel pedicle followed by suturing of the edges to bloody tissue. (**d**) Its final appearance was achieved after complete healing by "second intent" a year later

umbilical size, flat aspect of the navel, necrosis of the umbilical stalk, and widening of the scar over-stepping the umbilical area. For each situation, it is necessary to address a specific solution. In that regard, necrosis of the stalk is treated by means of neo-umbilicoplasty, resecting through the former scar or umbilicus remnant. The fat below the new hole in the abdominal flap is resected and borders of approximately 2 cm diameter. are stitched to the aponeurosis. The raw area is left to heal by second intention, which occurs in about 4 weeks. When the problem is malposition, the umbilicus is relocated to its normal position, fixing it to the fascia and redoing the suture joining the skin island to the free stalk.

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# Progressive Tunneling: The Dilson Luz Technique, Applied in Abdominoplasties and Lipoabdominoplasties and Considerations on the Umbilicus

Dilson Luz, Ivo Salgado, Salustiano Gomes, Breno Bezerra Gomes de Pinho Pessoa, and Joaquim Santino Figueiredo Dutra

## Introduction

Abdominal plastic surgery has evolved since the first tissue resection of the lower abdomen was performed by Demars and Marx in 1880 [1]. The transverse resection of the infraumbilical tissue, with navel removal in 1931, was attributed to the French Flesch-Thebesius and Weisheimer [2]. The first navel transposition was reported by Verner in 1957 [3]. Since 1960, researchers have published multiple abdominoplastic techniques and maneuvers with abdomen displacements associated with navel transposition [4–7].

Pitanguy [7] emphasizes the diastasis correction of the straight abdominal muscles by performing aponeurotic sutures without the need to open the muscular sheaths. The median vertical incision of the abdomen, now widely used after

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bariatric surgeries, was first published in 1916 by Babcock [8], followed by Fernandez and Correa-Iturraspe [9] in 1951 and Fischl [10] in 1973. These were the pioneers of the current bariatric surgeries divulged by Roxo [11] and others [12]. The authors have witnessed the first presentation by Y. Gerard Illouz [13] when he was invited by Dr. Walter H. Sandall and Vinicius Faria to demonstrate his technique at the Hospital of Servants of the State of Rio de Janeiro. This presentation made history as it was the first liposuction performed in Brazil and also outside the French territory.

After the publication by Illouz [13], some other authors published their own experiences, reporting liposuction procedures and exclusive complications associated with abdominal plastic surgery [14–18]. The publication by Avelar [19] in 2000 described performing abdominoplasties without detachment and with greasy flap resection, supporting the lipoabdominoplasty technique published by Saldanha [20] in 2001, whose technique uses the teachings of De Souza Pinto [21] in 1983 in superficial liposuction of the abdominal wall.

Research on mini-abdominoplasties associated with liposuction was first published by Willkinson and Swartz [22] in 1986 and by Storck [23], followed by Uebel [24]. All of these surgeons performed the navel desinsertion in these procedures.

In 2003, we disclosed our technique for the first time in Brazil, in the Central-West Journey of Plastic Surgery, reporting that our experience had started in 1999, using the Dilson Luz underminers. We related its applicability in detachments to the progressive tunneling in surgeries of the face, neck, calf, breast, and abdomen [25]. In 2004, Saldanha published information on the use of Dilson Luz underminers to release the abdominal flap in abdominoplasties in lean patients [26]. Our publications on the progressive tunneling applicability in 2005 appeared in *Aesthetic* [27] and in 2006 in the *SBCP Regional Book São Paulo* [28]. In 2009, we published our experiences, along with collaborators, demonstrating the progressive tunneling advantages of the underminers with their applicability in tissue expansion [29], gluteal lift execution [30], implant of silicone prostheses into calves [31], augmentation mammoplasty [32], breast reconstruction [33, 34], for multiple mastology procedures [35], abdominoplasties [36, 37], lipoabdominoplasties [26], and tissue expanders [38]. Other authors reported similar teachings in facial plastic surgeries [39–45].

In 2013, we published the expanded edition of "*Tunelizaciones Progresivas*" in Spanish [46].

In 2014, we published a chapter in *NECKLIFT*, upon the editor's invitation, in Malcolm Paul's "*Progressives Tunnelizations in Neck Face Lift Detachment"* [47].

## Technique

The progressive tunneling technique is based on progressive vascular distensions, with varied and progressive penetration of underminers, forming tunnels that progressively increase in diameter as the instrument is introduced into the subcutaneous cellular tissue, from the thinnest to the thickest, so that the vessels are stretched,

tapered and ruptured. After these events, a platelet migration to the vascular ends triggers a coagulation cascade by trauma and vascular light exposure [48].

Our technique is based on observations made by emergency services of patients who suffered amputations. In patients who suffered amputations of the hands from pulling, there was a low bleeding volume. In patients who had suffered identical amputations, but caused by sharp objects, a higher bleeding volume was seen. We found that in the pull-out, the vessels were distended and tapered. After this, their rupture occurred and immediately experienced retractions, followed by clot formation in their already tiny vascular lumens, thus impeding the blood flow (Fig. 1). Whereas, those who had suffered similar injuries but by sharp objects, presented the vessels with their lumens sectioned, as if we cut pipes, allowing for a higher blood flow with serious hemorrhages (Fig. 2).

We devised a sure way to separate the facial skin from the subcutaneous tissue and that this separation would be progressive, so that the vessels would stretch first and then break. To form tunnels, we invented surgical instruments to penetrate the facial subcutaneous tissue and form tunnels with progressive diameters. The instruments would

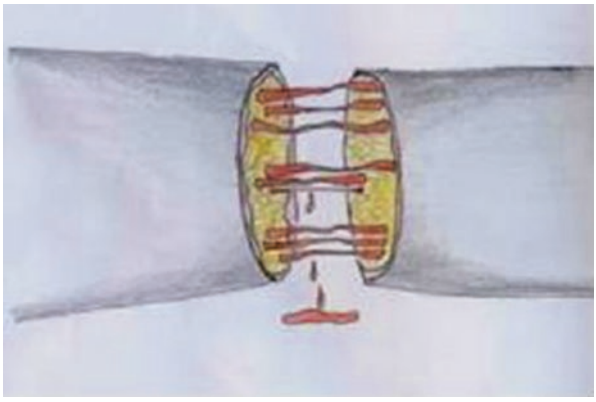

**Fig. 1** Rupture occurred and immediately experienced vascular retractions

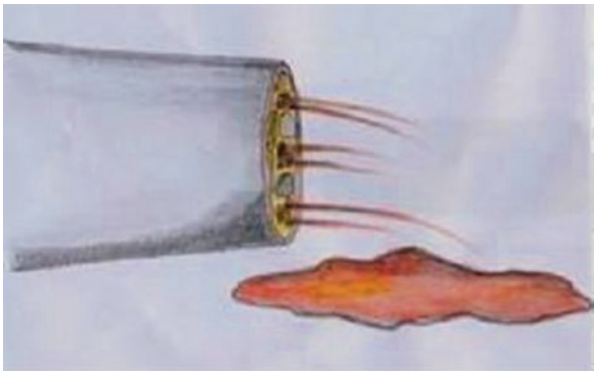

**Fig. 2** Similar injuries but by sharp objects, presented the vessels with their lumens sectioned

have varying diameters. On the sides of the tunnels, the walls became thinner, and it was up to the surgeon to decide whether to leave the flap completely detached or with vascular beams. As in the case of distension of the vascular walls until their ruptures, we would use scissors to cut them and therefore there is no need for cauterization.

## The Invention

In order to develop this pioneering technique in the prophylaxis of hematoma formation, cutaneous distress and facial nerve injuries in face lift surgery, we devised rigid metal double-sided underminers and the prototype was named Dilson Luz Underminers® (Fig. 3). They consisted of a set of six instruments with two blunt ends in each piece, totaling 12 ends with variable and progressive diameters, the thinnest being 1.5 mm and the thickest being 20 mm, each end having a 10 cm length, with a support measuring 10 cm to aid the manipulation of the instrument by the surgeon.

This instrument was initially used (1999) for face and neck detachments and has been routinely used by us and several colleagues in abdominal, face, neck, breast, prosthetic and tissue expanders, and other kind of surgeries.

## Surgical Description of Lipoabdominoplasty

After the epidural or spinal anesthesia, we proceed to the surgical procedure. The areas that will undergo liposuction, both dorsal and ventral, are previously demarcated with the patient standing and also in dorsal decubitus, considering in

**Fig. 3** Dilson Luz Underminers®

these demarcations the regions that will be submitted to deep and superficial liposuction, with the fat grafts usually placed into gluteal depletions (Fig. 4).

In the suprapubic incision, we opted for the forms with better aesthetic results, preferentially using the bicycle handlebar pattern [49].

In the area to be liposuctioned, we opted for previous tumescent infiltrations, using Klein cannulas and saline solution with 1/500,000 adrenaline.

With the patient in the ventral position, we started the surgery with liposuction in the areas previously marked in the dorsal region, always using thin cannulas, 3–4 mm with a vacuum aspirator or 60-mL syringe, when this fat is used for grafting (usually in the gluteal regions, in the superficial intramuscular plane [50], or deep subcutaneous).

After the patient is moved to the supine position, the vesical probe is installed, as well as the pneumatic pumps in the legs and the new surgical time is started.

After the tumescence described above, we start the deep liposuction in the demarcated areas and then pass the superficial liposuction through the previously marked cutaneous orifices and always use thin cannulas of 2.5–3.5 mm.

## Lipoabdominoplasty Sequence

After the cutaneous incision, in a subcutaneous suprapubic level [51], we proceed to detach the infraumbilical flap with cautery, a procedure practiced by many. The supraumbilical detachment maintains a narrow tunnel, respecting the perforating ones, knowing that when a muscle of the rectus abdominis muscles is larger

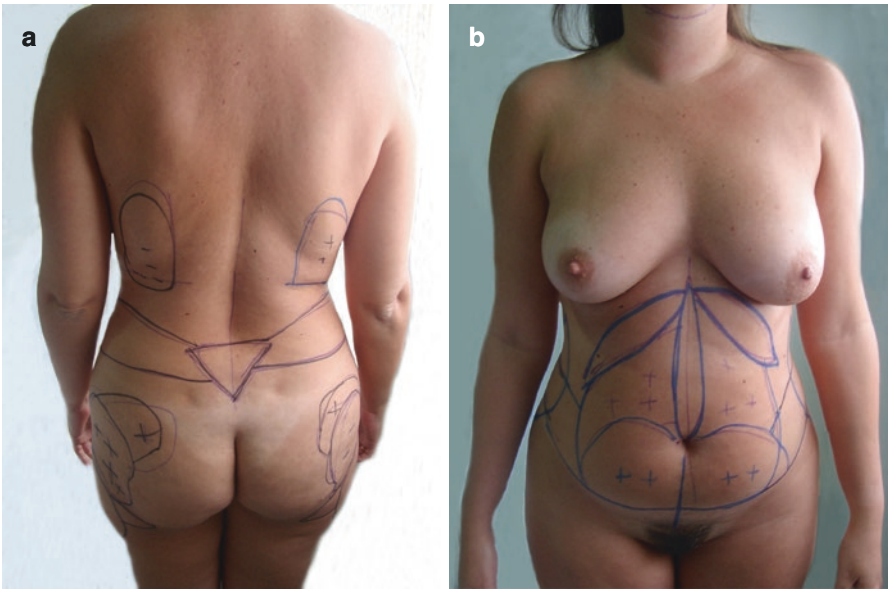


**Fig. 4** (**a**-**b**) Demarcations the regions that will be submitted to deep and superficial liposuction, with the fat grafts usually placed into gluteal depletions

(previous class of programming by ultrasound, to define herniations of wall and diseases of the abdominal cavity), the supraumbilical tunnel will be longer, since the vessels accompany the distant musculature [52] (Fig. 5). The upper limit for this detachment, if necessary, will be the xiphoid appendix (Figs. 6 and 7).

The diastasis correction of the straight abdominal muscles is performed using the classic method (i.e., without aponeurosis opening as in Pitanguy [7]). After this, the need for accommodation of the skin flap (both vertically and laterally) was observed. Using these procedures and also to descend the flap, the Dilson Luz underminers (usually beginning at number three) are used to create the tunneling (Fig. 7).

Pinho Pessoa [36] performs all supraumbilical and lateral detachment in abdominoplasty with only the use of the underminers, dispensing the scalpel, scissors and drains. Luz and Salgado Filho [37] also use the underminers for tunneling, achieving a great flap improvement.

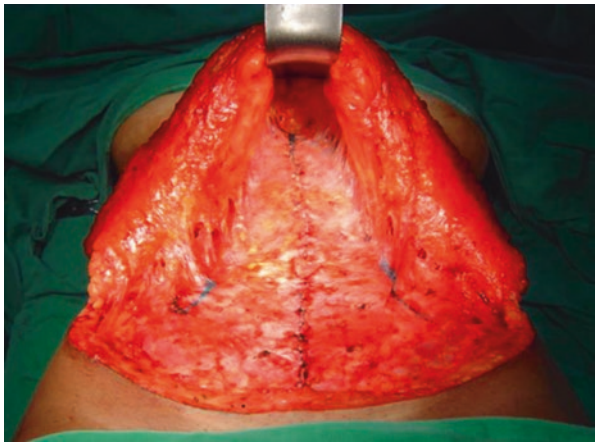

**Fig. 5** The supraumbilical tunnel will be longer, since the vessels accompany the distant musculature

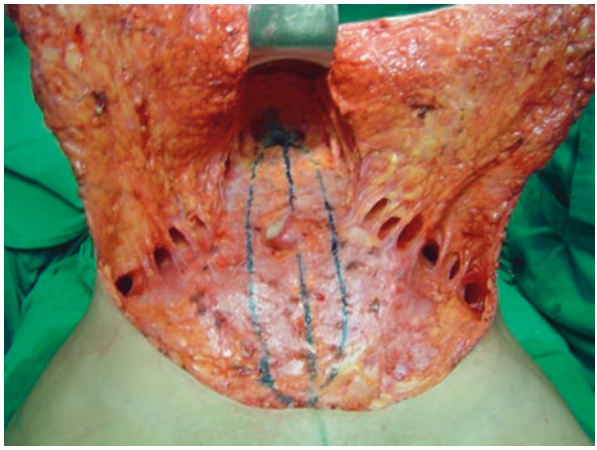

**Fig. 6** The upper limit for this detachment, if necessary, will be the xiphoid appendix

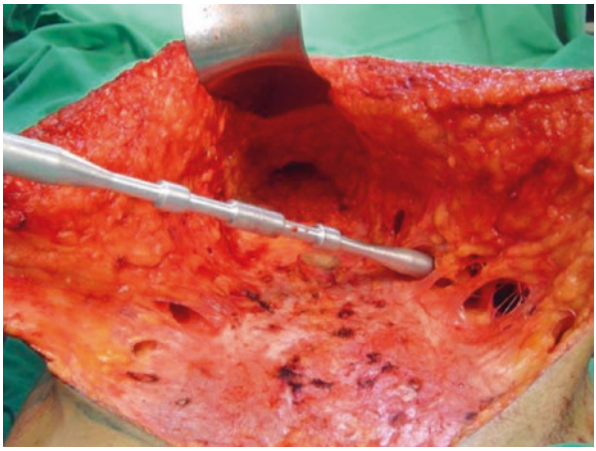

**Fig. 7** The supraumbilical detachment maintains a narrow tunnel, respecting the perforating ones


**Fig. 8** Complementary tunneling for the flap descent, which extended to the costal arches, exceeding the axillary midline

## Skin Flap Accommodation

After the hemostatic revision, we performed the complementary tunneling for the flap descent, which extended to the costal arches, exceeding the axillary midline on the sides of the abdomen (Figs. 6, 7, and 8). With these procedures, we were able to decrease the abdominal flap to 6–8 cm (Fig. 9). This has also been confirmed by others [37].

**Fig. 9** With these procedures, we were able to decrease the abdominal flap to 6–8 cm

## Umbilicoplasty

With the patient in a semi-seated position, we proceeded to mark the location of the neo-navel. As for the preferred scar shape, we generally opted for a half-moon-shaped marking of upper base concavity. We performed the degreasing of the flap in every periumbilical area, according to Hakme [53]. Our routine included making the sutures of the abdominal flap to the aponeurosis, with Baroudi [54] points in all its extension, as well as the fixation of the umbilical stump to medial aponeurosis with nonabsorbable sutures.

## Progressive Tunnels in Abdominoplasty Without Liposuction

In patients where abdomen liposuction is not needed (i.e., lean abdomens), the underminers are also very useful because with progressive tunneling, it is possible to take off and accommodate the entire abdominal flap with ease.

In ex-obese surgeries, where scissors and scalpels are contraindicated, the application of progressive tunneling allows for better refinement.

## Finalization

After the resections of the abdominal flap excess are performed, sutures of the suprapubic region with prevention of pubic ascension are made. The other deep sutures are made with nylon thread and the superficial and cutaneous sutures are made with absorbable thread, except for the navel, where we use nylon in cutaneous points.

We use aspirative drains, which will be removed when drainage is equal to, or less than 20 mL daily, which usually occurs on the second or third post-operative day. The immediate immobilization is performed at the end of surgery using cotton

bandages and colant, as well as establishing the routine for the patients to perform dressings in our clinic during the first week, only allowing them to shower after this, has resulted in the formation of seromas being drastically reduced, a fact proven by routine ultrasonography in the post-operative period.

## Discussion

### Complications and Intercurrences

We began learning about plastic surgery in 1973, participating since then in the tactics and techniques that have emerged so that in the present-day we have more quality and safety in our surgeries.

Abdominoplasty also had its evolution in several planes, mainly in extensions of the detachable areas, formats, placements and scars extensions, diastasis treatment of the abdominal wall, and also techniques and tactics applied to umbilicoplasty published by several colleagues that will be the object of study in this book.

The liposuction initiated by Illouz [13] and discussed at the first Liposuction Symposium in 1983 in São Paulo, presented to everybody the difficulties and risks of this new procedure, with complications ranging from blindness to death. Two years later in the same symposium, we already had an outline of the standards to perform a liposuction safely.

One should pay tribute to Avelar [19] and Saldanha [20] and other colleagues who believed in their original liposuction ideas associated with abdominoplasty.

We disclosed the association of progressive tunneling to abdominal plastic surgery in 2003 in Brazil [25] and in the same year in São Paulo at the Paulista Plastic Annual Meeting. Saldanha [26] has confirmed the use of our abdominoplasty detachments with the lipoabdominoplasty technique in lean patients.

### Complications and Finalizations

After the introduction of progressive tunneling in abdominoplasty and lipoabdominoplasty surgery (a procedure used today by hundreds of colleagues in Brazil and other countries), the sequelae, intercurrences, and serious complications practically disappeared.

We present a sequence of pre- and post-operative photographs and an attached video created by a resident of the Service of the University of Ceará, (demonstrating that the execution of the technique is simple and requires only a small learning curve), under the guidance of our brilliant colleague and friend Dr Salustiano Pessoa. He demonstrates his personal technique performing all abdominal detachment using only the underminers and emphasizing that with the use of progressive tunneling, it is not necessary, in most cases, to use drains.

We have used progressive tunneling since 1999 and its applicability in abdominal surgery since 2002. At that time, these procedures always presented seromas,

with varying volumes, which were treated with USG guided punctures. Recently, by associating the adhesion stitches, idealized by Baroudi, the big seromas have disappeared and the small ones are rare.

The incidence of post-operative hematomas was associated with the use of antiplatelet aggregators. In our sample of patients, all had taken these drugs.

We had cases of epitheliosis in the distal, suprapubic portion of the flap, which did not interfere in the evolution of patient relationships.

Small skin injuries in this area occurred in some patients; however, there was no need for major surgeries, in addition to small resections and outpatient sutures.

Progressive tunneling has also been used in reverse abdominoplasty performed through a horizontal incision in the sub-mammary grooves and detachment reaching the infraumbilical area, including treatment of the diastases of the straight abdominal muscles and herniations allowing the vascular-nervous adhesions to persist in the areas of unresected dermo-greasy tissue, according to a colleague's personal report and publication [55].

We conclude that abdominoplasties and lipoabdominoplasties using our detachments, to perform progressive tunneling are routinely used by many colleagues, with reports that this instrument is the most useful item in the plastic surgeon's [36] arsenal, allowing for the uniformity of the dermoadiposo flap and better skin withdrawal in abdominoplasties [37]. These concepts have been accepted by all who use our technique.

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# Umbilicus and Scar Positioning During Abdominoplasty: Main Determinants of Results

Francisco Javier Villegas

## Background

The evolution of abdominoplasty has been remarkable since the first description just over 100 years ago when skin and subcutaneous tissue were resected in a panniculectomy, to the current situation where it is safely combined with liposuction, the umbilicus is exteriorized, and some kind of tension or plication in the abdominal wall is performed.

Although the results are increasingly satisfactory, there are still difficulties positioning the navel and the transverse scar, two decisive factors in the final result of this surgery.

## The Anterior Abdominal Wall

The absence of the abdominal wall is incompatible with life, given its importance in the dynamic protection of the intra-abdominal organs, allowing their displacement during each breath, and its physiological contraction or distension.

The inner layer of the abdominal wall is the parietal peritoneum, on which is installed an intricate complex of flattened fascio-muscular layers, vertically, transversely, and diagonally arranged, joined by a median raphe, not only containing but

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**Fig. 1** Anatomy of the superficial layers of the abdominal wall. Intraoperative photograph of the abdominal wall during surgery, the skin and fat of the abdomen have been elevated off the deep level after tumescent liposuction through a transverse incision 6 cm from the anterior vulvar commissure (avc). At the level of the pubic symphysis (pb), dissection goes above the superficial fascia (sf) and continues in a central tunnel to the xiphoid (x); the umbilicus (u) has been detached from its stem in the abdominal wall. In the elevated flap, two layers of fatty tissue separated by the superficial fascia (dotted line) can be determined (a): superficial or areolar layer, (b): deep or lamellar layer, (p): perforating vessels and fibrous septa

allowing additional functions to be performed during respiration, mobility, standing, and walking.

The integument formed by fatty tissue and skin adheres to the abdominal fascial sheath. This union is made by perforating vascular and nervous structures, in addition to fibrous connective tissue trabeculae; the umbilicus is the strongest union point between the skin and the deep planes. The fat layer is divided into the superficial areolar stratum and the deep or lamellar layer, which are separated by fibrous tissue (the superficial fascia) [1] (Fig. 1). The fat of the abdominal wall is wrapped by elastic skin to complement the function of coverage with capabilities of frequent tension and volume changes.

The normal appearance of the average human abdomen can be described as a vertically-oriented semi-cylinder with some convolutions that reflect the anatomy of the deep layers. This irregular cylinder has a slight anterior convexity with some protrusion in the hypogastrium and a smooth lateral concavity, giving the thin form to the waist, which is more noticeable in women. The abdominal wall is delimited above by the rib cage margins and below by the inguinal folds, ranging from one mid-axillary line to the other (Fig. 2).

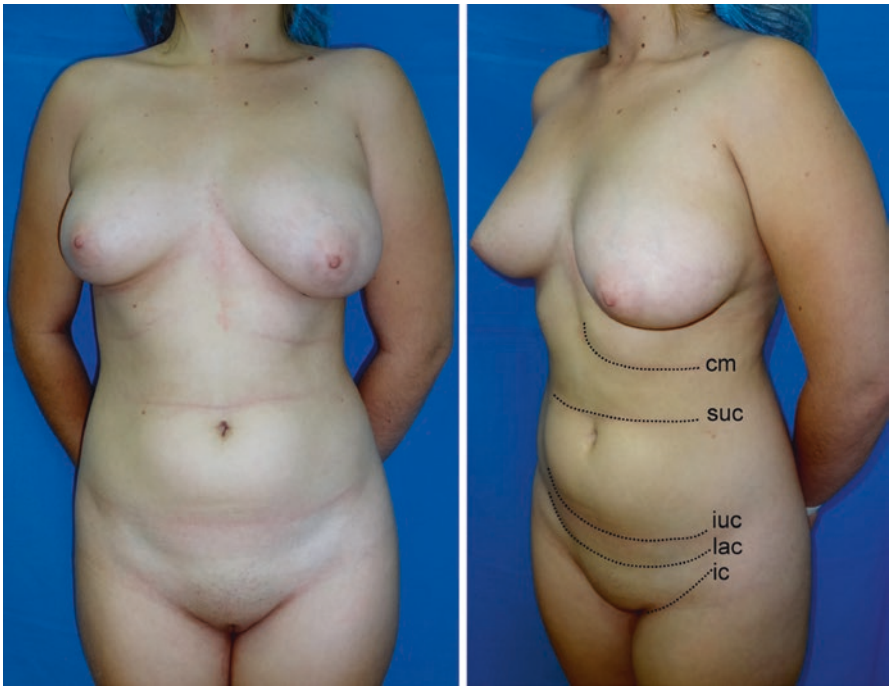


**Fig. 2** Anatomy of female abdominal surface. (cm): costal margin, (suc): supraumbilical crease, (iuc): infra-umbilical crease, (lac): lower abdominal crease, (ic): inguinal crease

The midline from the xiphoid process of the sternum to the navel can be determined based on the skin of the abdomen, where the divergence of the orientation of the hair follicles can be observed. From the umbilicus to the pubis, the middle line can have a dark color (*linea nigra*), which becomes more noticeable in pigmented individuals and during pregnancy. The umbilicus normally coincides with the union of these two linear components.

In athletic patients, a depression may be seen in the upper midline from the umbilicus to the xiphoid. On either side of this line are two longitudinal eminences, approximately 6 cm wide, that corresponding to the rectus muscles, which sometimes have three transverse tendinous intersections visible. A semilunar, vertically oriented excavation delimits these muscles laterally.

Relaxed skin tension lines, which may be more or less noticeable in the horizontal arrangement above the navel, can be noticed below the navel with a slightly curved cephalic concavity. In almost all cases, three creases are evident: the supraumbilical, infra-umbilical going from one iliac spine to the other, and the suprapubic or lower abdominal crease. Although the extent and visibility of these folds are variable, most times they can be found on physical examination. The presence of deep folds in locations different than the three described here is not aesthetically acceptable (Figs. 3 and 4).

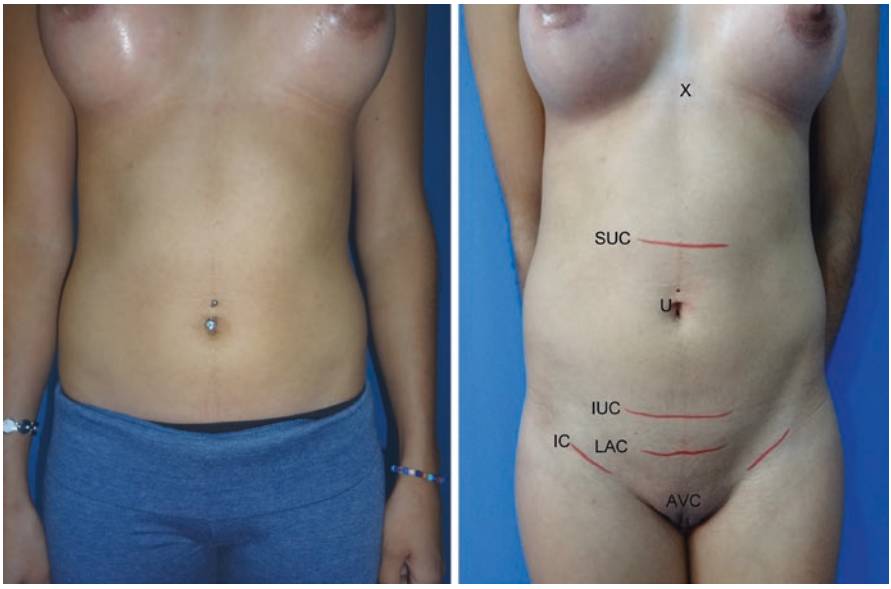


**Fig. 3** The presence of the navel is vitally important in the perception of the human body image. Left: 23 year- old woman, BMI 22, nulliparous, with no abdominal surgery, her normal navel has been pierced for aesthetic purposes, it is highlighted with jewelry to make it more eye-catching. Right: same patient, although there are not well-defined folds, they have been demarcated in red. (SUC): supraumbilical crease, (IUC): infra-umbilical crease, (LAC): lower abdominal crease, (IC): inguinal crease. Navel jewelry was removed and additional points in the xiphoid (X), umbilicus (U), and anterior vulvar commissure (AVC) have been determined to measure proportionality in Fig. 9

The supra-umbilical crease can be accompanied by a valley of gentle slopes located transversely to a variable height above the navel, separating the upper half and the lower half of the abdomen. In conjunction with the infra-umbilical crease, these gentle slopes delimit a variable fat deposit. Below the lower abdominal crease lies a different aesthetic unit, the *mons veneris*, a fat prominence covered with hairy skin that has more features of genital covering as one moves progressively down.

The aesthetically appealing abdomen in a woman should be slightly convex with some convolutions and constant depressions. Laterally, it narrows between the bottom edge of the costal margin and the upper edge of the iliac crests (i.e., the waist). The male abdomen may have some aesthetic differences because the waist is less incurved and the muscles may be more defined.

## The Umbilicus

The more central and remarkable structure of the abdomen is the umbilicus; its absence is completely abnormal, as is its malposition or deformation.


**Fig. 4** The presence of an additional abdominal crease or its abnormal position is not aesthetically acceptable. 19 year-old, nulliparous woman, whose principal complaint was the presence of an abnormal infra-umbilical abdominal fold, difficult to conceal with the underwear and normal dressing, this crease was a consequence of a transverse laparotomy at neonatal age. (SUC): supra-umbilical crease, (IUC): infra-umbilical crease, (LAC) lower abdominal crease, the black arrow indicates the iatrogenic additional abdominal fold that will be corrected with transverse plication abdominoplasty, TULUA. (See Fig. 20)

The umbilicus is located on the anterior axis of the human body, approximately half the cephalo-caudal length, being about 9–15 cm above the lower abdominal crease and having several variations on its location according to gender, age, previous pregnancy, and fat deposits.

The navel corresponds to the characteristic scar left behind by involution of the umbilical cord in all placental mammalian species. With little variation, the umbilicus is a well-defined round or oval skin depression in the center of the abdomen, of 1.5–2 cm in diameter surrounded by a depression of soft slopes in a variable diameter of 3 cm.

At the umbilicus, the muscle layers disappear and the fasciae merge, leaving the skin very close to the parietal peritoneum. It is a point of weakness at which hernias can be observed. For this reason, it is used as a route of entry for intra-abdominal procedures.

At the bottom of the umbilical skin depression can be found a small prominence or umbilical tubercle and some skin folds that look like a T or a propeller with several arms.

The umbilical cord has remnants of the omphalomesenteric duct (allantois), urachus, left umbilical vein, and two umbilical arteries. The persistence of the allantois is manifested in the presence of the omphalomesenteric ligament, Meckel's diverticulum, mesenteric intestinal cysts, umbilical sinus, and omphalomesenteric fistulae. The persistence of the urachus can also be the origin of vesico-umbilical urinary fistulae, cysts, diverticulum, and umbilical sinus.

From an internal view of the abdominal wall, the umbilical ring from which four ligaments radiate can be determined. The graphic symbol of peace and love, can serve as a mnemonic if its straight lines are longitudinally extended: the circle itself corresponds to the umbilical ring, the upper vertical line corresponds to the round ligament left by atrophy of the left umbilical vein, the vertical line down corresponds to central ligament left by the involution of the urachus, and the two oblique inverted V-shaped lines correspond to medial ligaments left by the involution of the umbilical arteries.

The presence of the umbilicus is vitally important in body image perception, reminding us of our intra-uterine origin (Fig. 5). It is a fundamental part of the appearance of the abdomen, being visible to self-inspection and within range of the hand. It is increasingly more frequent that the umbilicus is exposed in many dressing styles, also being frequently modified by tattooing and piercing to make it more attractive.

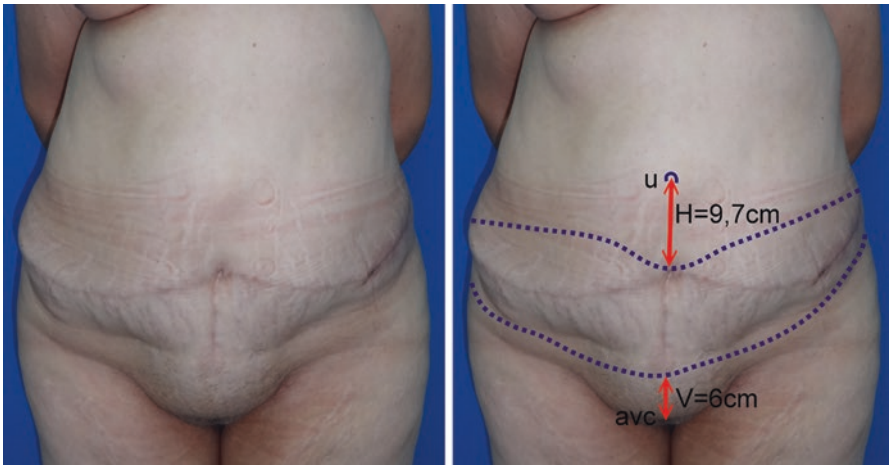


**Fig. 5** The presence of the umbilicus is vitally important in the perception of the human body image. Left: Patient without umbilicus and high abdominal scar, after TRAM flap surgery. The transverse scar was located above the lower abdominal crease which makes it more noticeable. Right: The correction plan should include scar descent, redundant tissue resection and neo-umbilicoplasty in a proper position. (u): suggested position for neo-umbilicus, (H): distance from the scar to the navel, (V): distance from the anterior vulvar commissure (avc) to the proposed incision

**Fig. 6** Congenital macromphalus, correction with omphalo-neo-plasty. Left: 13 year girl consulting for the size and redundancy of the navel, she does not have an umbilical hernia. Top center: during surgery a suture at the bottom pulls the cylindrical umbilicus transforming it into a column that is amputated. Bottom center: the dermis of the umbilical hole is firmly sutured to the fascia with 2.0 polyglactin. Right: results 8 weeks after the neo-omphaloplasty

Although there is variability in shape and depth; big, protruding, redundant, and horizontally-oriented umbilici are considered to be less attractive, while more aesthetic umbilici are the vertically-arranged or T-shaped with a U-shaped upper ridge(Fig. 6) [2–5].

The depth of the umbilicus can vary considerably with weight gain, coming to be excessive in cases of morbid obesity. An elongated and descended umbilical stem observed in obese persons hinders the exteriorization and positioning of the new navel during abdominoplasty.

The umbilicus receives its circulation by two major routes, one through the subdermal plexus from the surrounding skin and the other through perforating vessels of deep inferior epigastric arteries. During abdominoplasty, the dermal circulation is suppressed when the periumbilical incision is performed and the deep circulation may be threatened by the wall suture plication. The presence of an umbilical hernia and its correction during the procedure is an additional risk for the vitality of the umbilical stalk.

The presence of scars from umbilical hernia correction and trans-umbilical laparoscopy port can have implications on the circulation and survival of the umbilicus during abdominoplasty.

## The Umbilicus During Surgery

### Umbilical Form During Abdominoplasty

There are several techniques to achieve a normal umbilicus during abdominoplasty and these techniques usually focus on the type of skin incision. There are a variety of incision forms such as vertical, oval, triangular, rectangular, maltese cross, V-shaped,

**Fig. 7** Shape and position of the navel in abdominoplasty. Three different patients with similar post-operative complaints, the navel is large and redundant and the high transverse scar is difficult to hide in underwear

double vertically-oriented Y, X-shaped, inverted U-shaped, open semi-cone, and ace of spades, among others [6–14].

In any case, the idea is to get a depressed, small umbilicus vertically oriented, without a visible scar and a top U-shaped hood. This will meet the patient's expectations and surgeons will feel comfortable with any of the described techniques [15].

The umbilical stump itself should be shortened and left small enough to not be noticed. In some cases, total amputation by ligature or strangulation is performed, leading to necrosis with subsequent fall and closure by secondary intention. This simulates the natural process after ligation and cutting in the neonatal umbilical cord, with reasonable results [16].

Shortening and anchoring the stump to the muscular fascia will allow a deep scar placement that avoids its migration towards the abdominal skin and facilitates inconspicuous scarring.

Long cylindrical umbilici are common during or after cases of liposuction and abdominoplasties. Shortening of this type of navel, with resection of the cylinder walls, leaving only the cylinder's base about 1 cm in diameter is a useful tip. This umbilical base will be anchored together with dermis of the umbilical hole to the abdominal wall, using 6–8 stitches of 2–0 polyglactin, creating shorter and more aesthetic navels in primary and secondary cases (Figs. 7 and 8).

## Anatomical Position and Surgical Positioning of the Umbilicus

The umbilicus is approximately the center of the human in standing position with the lower limbs fully abducted; however, this parameter is not useful to define the new position of the navel during surgery.

The position of the navel may vary with situations like weight gain, pregnancy, or previous surgery. Weight gain is associated with a progressive descent of the umbilicus. This downward displacement is directly proportional to the increase in body mass index [17].

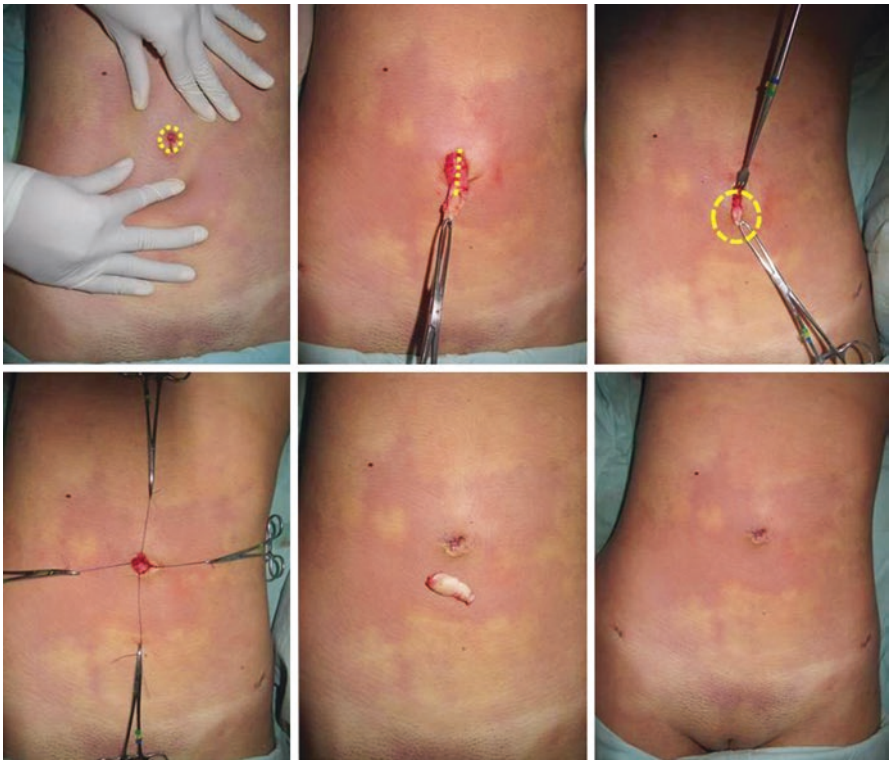

**Fig. 8** Primary umbilicoplasty during liposuction, to prevent redundant, descended and "sad" umbilicus. Top left: a long and deep navel that will lead to post-operative redundancy is detected during tumescent liposuction, circular incision is planned to create an umbilical hole. Top center: the umbilical stalk is exteriorized through the periumbilical incision. Top right: the skin of umbilical stalk walls is cut off, leaving only its bottom 1 cm in diameter, as shown in the circle of yellow lines. Bottom left: the dermis of the umbilical ring is sutured to the aponeurosis of the *linea alba*. Bottom center: resected redundant skin of the umbilical stalk. Bottom right: the primary umbilicoplasty prevented "sad" and redundant navel after liposuction

It has been recommended to locate the umbilicus at the height of a line passing between the iliac crests during aesthetic surgery of the abdomen; however, this is a skeletal reference that is not easy to palpate and measurements are difficult to duplicate between different observers, also this situation is more difficult in the supine position with the surgical table in a flexed position [18].

Other surgeons locate the navel during surgery 3–5 cm above the line passing through the easier-to-palpate anterior iliac spines.

Another clinically useful method for finding the best location for the navel in surgery is to measure 15 cm from the pubic symphysis in patients with a height of 145–178 cm [19].

**Table 1** Parnia's formula to find the ideal position for the relocated umbilicus during abdominoplasty

| $Xu = -0.98 + 0.91Xp - 0.07H$ |
|---|
| *Where: "Xu" represents the distance between the umbilicus and xiphoid, "Xp" represents the distance between xiphoid and pubic symphysis and "H" indicates the patient's height* [21] |

In descriptive studies of anthropometric proportionality, different rules can be used when there are plans to modify the position of the navel or the lower abdominal crease.

In a description of 75 nulliparous women of normal stature and weight conducted in India, the authors observed that the proportion between the distance from the xiphoid to the umbilicus, and the distance from the pubic symphysis to the navel was 1.6:1. This is similar to the ideal ratio of 1.618. They also described the ratio of the distance between the navel to anterior-superior iliac spine and the distance from one iliac spine to the other as 0.6:1, if the factors are inverted in the last case, the result is 1.66, which almost approaches the ideal proportion [20]. To relocate the umbilicus in surgery, they proposed drawing two semicircles centered on each anterior superior iliac spine with a radius of 60 % of the distance between the two spines, the intersection of these circles in the midline is the ideal position for the new umbilicus.

A similar study of 65 healthy young women in Iran had comparable findings, describing the proportionality between the xiphoid-navel and the pubic symphysis-xiphoid measurements. The proportion was 53 ± 3.9 %, or 1.88. They arrived at a formula for intra-operative application that sets out the xiphoid-navel distance that was equal to a constant number of −0.98 plus 0.91 of the umbilical-pubic bone distance, minus 0.07 of the patient's height [21] (Table 1).

When skeletal references are used (as described above) there may be discrepancies during the measurements because they have to be made by palpation, so the reference point on the surface of the skin may not be the exact site of the underlying bone. It is better to use more visible references like the lower abdominal crease. In a study carried out of photographs of models, the proportion between the distance from the xiphoid-navel center and the distance from umbilicus to the lower abdominal crease could be determined and it was quite close to the ideal ratio of 1.618. This description was supplemented with another on donor area closure of free DIEP or TRAM flaps, using the Fibonacci caliper and the ideal ratio to maintain the harmony between the xiphoid-navel and lower abdominal crease to umbilicus (X-U/U-C = 1.62) (Fig. 9) [3, 22].

Taking into account proportionality during primary abdominoplasty, it could be useful to choose a slightly higher location of the umbilicus to create an effect of slimness with the navel further from the pubic scar. This is accomplished during the plication, where the umbilical stalk is sutured in a cephalic position fixed with sutures 1–4 cm above the original position (Fig. 10) [23, 24].

Abnormal downward displacement of the umbilical position has occurred after mini-abdominoplasties with floating umbilicus or with transverse hypogastric crescent plication performed by some surgeons. This shift can be tolerated with

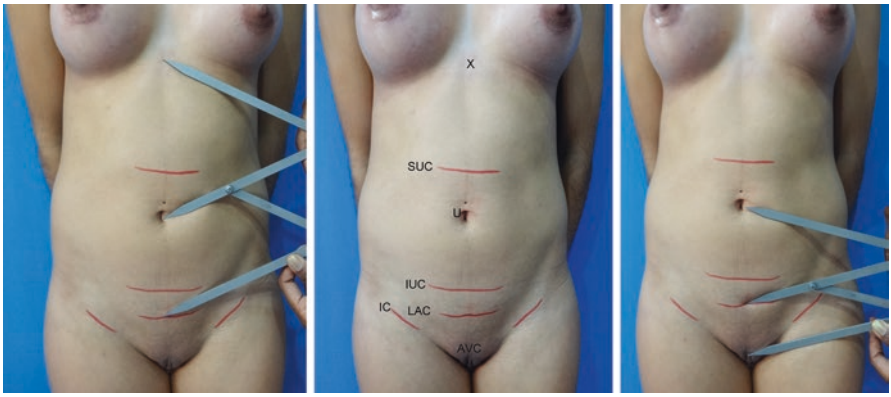


**Fig. 9** Proportionality of the umbilicus position in the normal abdomen. Center: (SUC): supraumbilical crease, (IUC): infra-umbilical crease, (LAC) lower abdominal crease, (IC): inguinal crease. The element of navel jewelry was removed and additional points in the xiphoid (X), navel (U), and anterior vulvar commissure (AVC) have been determined to measure proportionality. Left: Using a Fibonacci caliper, which constantly determines segments with a ratio 1:1.618, X-U distance is 1.62 while U-LAC distance is 1. Right: distance V (AVC-LAC) is 1, while distance H (LAC-U) is 1.62. This "normal" proportionality may vary; however, it is a good parameter for intra-operative measurements and evaluation of results

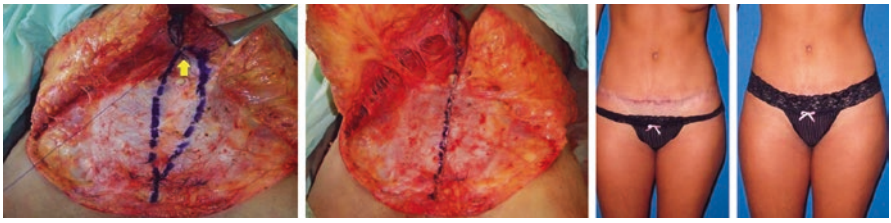

**Fig. 10** Superior displacement of the umbilicus during vertical plication is helpful in some cases to obtain better proportions in abdominoplasty [23, 24]. Left: Front view during a conventional lipo-abdominoplasty, violet-colored ellipse is the plan of vertical plication, to sew together the edge of the rectus muscles, the yellow arrow shows the planned upward displacement of the umbilical stump. Center: plication is complete, umbilical stump has been displaced 3 cm higher. Right: Slightly high but concealable transverse scar. Relatively high positioned belly button allows for a reasonable and proportional result

satisfactory results if the proportionality is maintained, which is feasible since in these surgeries is easy to descend the lower transverse scar somehow preserving the ideal ratio, while inferior traction of the flap could change navel disposition to vertical, therefore improving the result [25, 26].

In a previous description by the author, the distance H: hypogastrium from the navel to the lower abdominal crease and the distance V: veneris from this crease to the anterior vulvar commissure, was measured in 45 frontal photographs of nulliparous women without previous abdominal surgery, standing with hands behind the neck, aged between 18 and 30 years, with normal body mass index (BMI 19–25). In

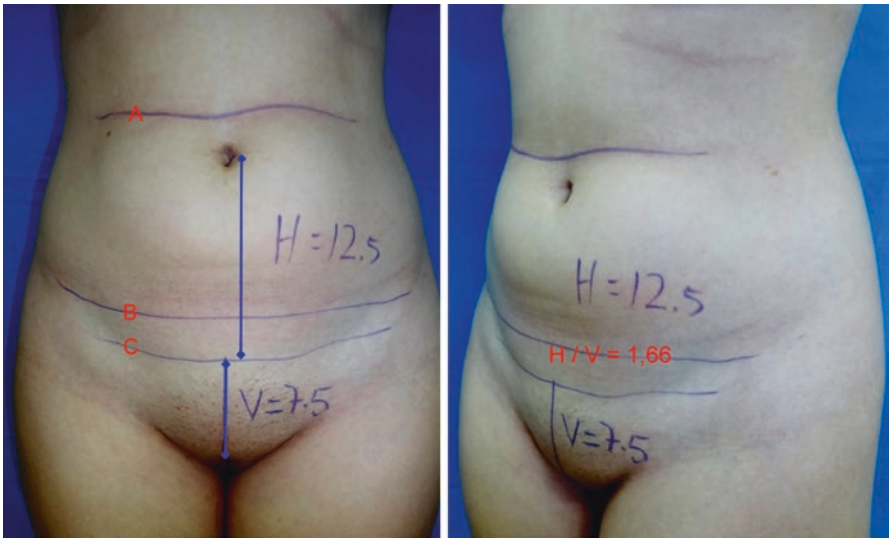


**Fig. 11** Proportionality of the navel determined by distance H and distance V. The distance from navel to the lower abdominal crease (H) maintains the ideal ratio with the distance (V) from the anterior vulvar commissure to the lower abdominal crease (H/V = 1, 66) in this 19 year-old nulliparous woman with body mass index of 23.2. A: supraumbilical crease, B: infra-umbilical crease, C: lower abdominal crease, H: distance from navel to the lower abdominal crease, V: distance from the anterior vulvar commissure to the lower abdominal crease

90 % of the group, the distance between the navel and the lower abdominal crease was between 1.5 and 2 times the distance between the anterior vulvar commissure and the lower abdominal crease. This proportion is close to the ideal ratio of 1.618 extracted from the Fibonacci sequence and described as harmonious and attractive in nature, being repeatedly seen in body proportions. This is why H/V is considered by the author to be the most important point of reference for the location of umbilici and scars during aesthetic surgery of the abdomen. The reference points are located on the skin surface, are very easy to determine, are reproducible, and are not based on palpation of deep structures [27] (Fig. 11).

To attain an inconspicuous scar and good umbilical form, the following steps are important: thinning the flap around the new navel hole by excising redundant fat, leaving a very short stem with little skin that only occupies the bottom of the new umbilicus, and a secure attachment with absorbable sutures to the wall of the abdomen accompanied by a periumbilical depression of delicate slopes [28].

## Midline Positioning of the Umbilicus

Although the umbilici are not exactly in the midline, the general perception is that it is a centralized anatomical structure that tolerates little shifting and asymmetry [29].

In a previous description by the author, measurements of the position of the umbilicus in relation to a line joining the center of the sternal notch with the anterior vulvar commissure, performed in photographs of 40 nulliparous normal women, the findings were: umbilicus is central in 45 % of the patients and lateralized to the right in another 45 % of the cases, while the left shift was only seen in 4 of 40 measurements (10 %). These findings merit further study and perhaps are because of the path of the umbilical vein to the right and to the position and effect of the falciform ligament of the liver. It is possible that variations occur in measurements if they were made with patients in supine position (Fig. 12).

The inclusion of the sternal notch or the xiphoid process in the operative field allows for the drawing of a straight line to the vulvar commissure, which in turn would serve for the intra-operative location of the new umbilical position, thus avoiding unwanted laterality and helping in secondary cases as a correction parameter. Intra-operative assessment of the midline hair orientation in the epigastrium and the *linea nigra* below could also help in the umbilicus positioning at the time with the use of a surgical marker (Fig. 13).

The lateralized navel could be avoided by using careful techniques. It can be corrected with further surgery, which consists of mobilization of the abdominal flap around the displaced umbilicus with the aid of liposuction, incision of umbilical perimeter, and positioning in the midline with dermal stitches firmly attached to the abdominal wall. Any extra periumbilical tissue should be distributed with additional liposuction or surgically excising septa or adherences until an even skin distribution is attained.

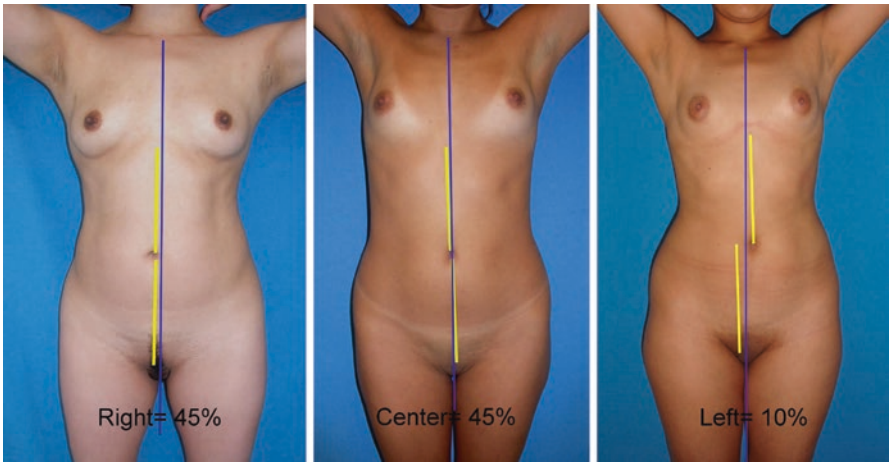


**Fig. 12** Navel position with respect to the midline [27]. In 40 pictures of normal nulliparous women, the navel was central in 45 % and lateralized to the right in another 45 % of the cases, while the left shift was determined in 4 of 40 measurements (10 %). The blue line between the sternal notch and the vulvar commissure was determined as the midline in this group of women; the yellow lines correspond to proportional measurements

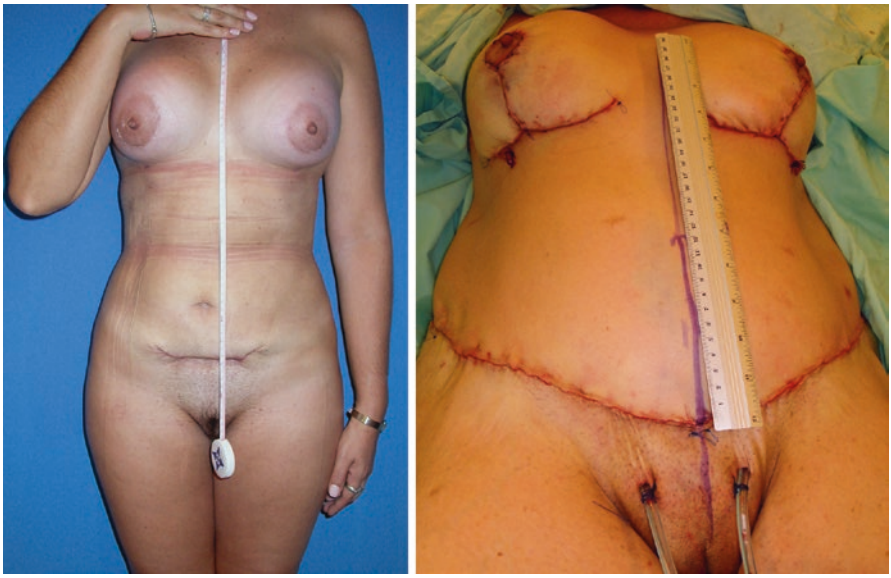

**Fig. 13** The lateralization of the navel during surgery is rare but preventable. Left: patient after mini-abdominoplasty with floating navel, complaining of the lateral shift of the umbilicus. Right: the systematic markings of the midline and the use of a sterile ruler during exteriorization of the umbilical stalk or during the neo-umbilicoplasty prevents the eccentric location of the navel

## Devices and Techniques to Locate the Umbilicus in the Same Position and Facilitate its Externalization

To facilitate exteriorization of the umbilical stump through the abdominal flap, multiple devices have been used to match the position of umbilical stem and the new omphalic opening.

The clamp to demarcate flaps (designed by Pitanguy) can be used in a conventional way to locate the position of the underlying navel on the abdominal flap. One of the jaws of the device rests in the center of the belly button and the other closes on the skin pointing to the new incision site [30]. Similarly D' Assumpção's forceps can be used as both are applied in the demarcation of the flap during rhytidectomy.

A spherical metal device similar to a perforated marble, named by its author as *Umbilocator* is sutured temporarily above the navel stump, while the upper abdominal flap is advanced and fixed temporarily to the bottom edge of the pubic incision. Through palpation, the right place to make the incision can be determined [31]. In the same way, a sterilizable cone-shaped metal device, available also as a disposable polypropylene cone, has holes on its base to be temporarily sutured to the omphalic stump being easily palpated over the skin of the advanced flap, assisting in the location of the incision [32].

Avelar makes detailed pre-operative measurements of the position of the belly button with the patient lying down, having as reference the sternal notch and taking the same estimate during the surgery maintaining in this way the omphalic position. He also uses two devices: one double hook as support to cut the original umbilicus as an equilateral triangle, and another device similar to sugar tweezers with two jaws, one resting on the omphalic stump and another that closes on the abdominal skin to locate the site of incision, the latter having a terminal in the form of a disk with a Y-shaped slit of symmetrical arms 1 cm long, allowing for the use of a surgical marker to create the incision composed of three triangles to be sutured to the triangular-shaped stump during exteriorization [33].

A simpler way is to use a hemostat attached to the umbilical stem that is palpated on the skin to determine four cardinal points to make the incision in the center of the cross-shaped delineation [34]. Similarly, we have used two Allix's clamps (16 cm long), one attached to the skin of the omphalic stump and another placed parallell on the advanced flap, to determine the position of the new incision.

## Neo-umbilicoplasty: Creation of a New Navel in Surgery

If the plication of the wall has a horizontal component or shortens the distance from navel to pubis, it could be convenient to perform umbilical amputation and reconstruction in the best possible position, according to operative intuition guided with the mentioned references of ratio H/V and xiphoid/vulva reason.

Neo-umbilicoplasty (also sometimes called omphalloneoplasty) is performed through a variety of techniques with flaps, skin grafts, and condrocutaneus grafts. The best results are those that create small umbilici, with no visible scar, having in mind the reconstruction with anthropometric proportions [35] (Fig. 14).

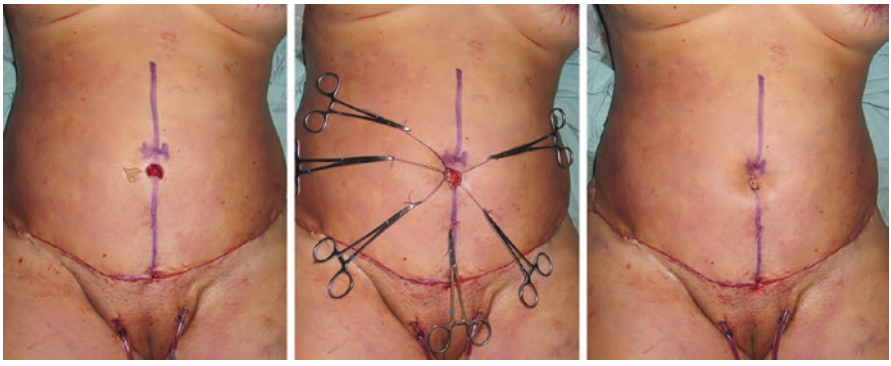

**Fig. 14** Neo-umbilicoplasty with a skin graft during TULUA abdominoplasty. Left: after selecting the new umbilical position, an inverted U-shaped incision 1, 5 cm wide is made in the midline. Center: after de-fatting around the inverted U incision, the border of the dermis is anchored with 2–0 polyglactin sutures to the aponeurosis. Right: the bottom of the umbilicus is completed with full thickness skin graft fixed with 3–0 plain catgut stitches

There are cases of reconstruction of new umbilici without skin incision, being those achieved with defatting towards the dermis, to the site of the new navel from underneath the flap and anchoring the dermis with sutures to the ideal position on the *linea alba* or the old umbilical stump, adding purse string-arranged sutures in 360° or 180° to help create an umbilical ring or inverted U hooding [36–38].

## Lower Abdominal Crease and Abdominoplasty Scar During Surgery

### Lower Abdominal Crease and *Mons Veneris*

The lower abdominal crease in the midline is located approximately 6 cm above the anterior vulvar commissure or the root of the penis, extending laterally to the mid or posterior axillary line, passing below the anterior superior iliac spines and 3 cm above the inguinal creases.

The lower abdominal transverse crease is usually present at birth and may have some variability in depth and location according to the position, gender, age, and especially weight changes. With some variability, it can be determined in most humans. It separates the skin of the abdomen from the skin of the genitals and crural area, which all have different characteristics.

When hypogastric tissues overgrow, they can hang over the lower abdominal crease, partially or completely covering the genitals and, in some cases, part of the upper thighs.

The lower abdominal crease is made up of fibrous adherences between the dermis and the deep structures. These fibrous adherences become more noticeable with progressive fat deposits and obesity.

From this fold down, the skin becomes hairier, with more exocrine appendages; a prominence that is continuous with the external genitalia forms of the *mons veneris*. In almost all cultures, the lower abdominal crease and genital area are covered by clothes.

The exaggerated prominence of the *mons veneris* and the presence of hairs above the fold are a common cause of consultations. These two residual deformities are seen with some frequency after abdominoplasty. They can be prevented with proper surgical planning and careful surgery execution.

### Lower Abdominal Crease and Transverse Scar Positioning During Abdominoplasty

It is widely known in plastic surgery that the best location for scars is on the skin folds (Pinkus lines 1927) [39]; however, the use of the lower abdominal crease to situate the incision of abdominoplasty can be a mistake as it moves upward during incision closure, leaving a prominent *mons veneris* with a high scar and hairy skin that is non-concealable with underwear or swimwear (Fig. 15).

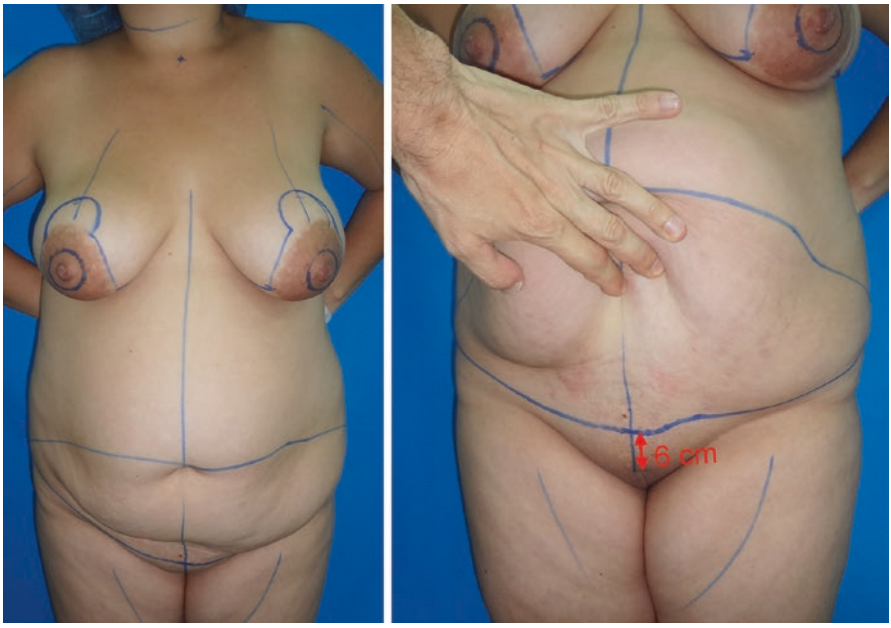


**Fig. 15** High riding scar, prevention. Although there is a natural tendency to use the lower abdominal crease for the incision site, a lower placement of the incision, 6 cm from anterior vulvar commissure is recommended. See Fig. 23

The ratio between the location of the lower abdominal fold and the navel is important in the overall appearance of the abdomen; when these proportions are surgically modified, deformities that are very difficult to correct may appear (Figs. 16 and 17).

## High Scar

With abdominoplasty being a resection procedure, some degree of migration of the pubic area is expected given the upper traction. Such situations must be taken into account during the planning. The surgeon should aim for an inferior incision. If the initial plan draws the incision on the crease, the end result will be a high, non-concealable scar. The main remedy is prevention as correction is difficult.

A high scar can cause discomfort in patients. They feel that the pubic mound is abnormally noticeable and bulky while the vulvar fold has moved up. The umbilicus seems to be very close to the scar causing dissatisfaction with results. Typically the H/V ratio approaches 1 or is higher with severe cases with a H/V ratio = 1/0.7–1/0.3 (Figs. 18, 19, and 20).

At the time of marking the location of the incision in primary or secondary cases, it is necessary to consider the patient's preference of underwear or swimwear, sun tanning marks, and previous scars. The proper execution of the technique in the primary case with special attention to pre-operative and intra-operative location of the incision and scar is recommended.

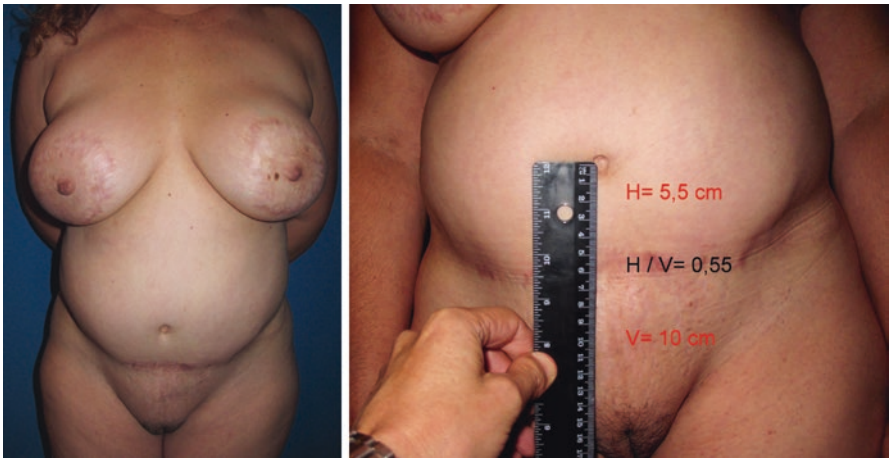


**Fig. 16** The proportionality between the position of the navel and the location of the scar are paramount in the abdominoplasty final results. Left: patient dissatisfied with her breast lift and tummy tuck surgeries, her chief complaints were the high location of the abdominal scar and very low navel. Right: H/V ratio = 0.55, pubogenital aesthetic unit with hairy skin is almost twice the ideal size


**Fig. 17** The proportionality between the position of the navel and the location of the scar are paramount in the abdominoplasty results. Left: high placed abdominoplasty scar, difficult to conceal under normal dressing. Right: the H/V ratio = 0.68 is far from the ideal ratio 1.62

**Fig. 18** The proportionality between the position of the navel and the location of the scar is paramount in the abdominoplasty outcomes. Patient dissatisfied with early abdominoplasty results, the scar is high and the navel is relatively low, transverse shape and the large size of the umbilicus were also major complaints

**Fig. 19** High riding scar correction. Left: unsatisfactory abdominoplasty results, high scar is not concealable. Center top: surgical markings to descend the scar. Center bottom: After unrestricted liposuction of the anterior abdomen and suprapubic horizontal plication of the abdominal wall, scar could be placed in a position less than 6 cm from the anterior vulvar commissure. Right: after four post-operative weeks, a satisfactory final result is anticipated with better H/V ratio, between navel and scar

**Fig. 20** Correction of a high lower abdominal scar through TULUA abdominoplasty. Left: same patient of Fig. 4. 19 year-old nulliparous woman, with a visible and difficult to hide abdominal infra-umbilical fold, due to horizontal laparotomy in neonatal period. Center: pre-operative planning of abdominoplasty with liposuction, without epigastric detachment, transverse plication and neo-umbilicoplasty (TULUA). Hypogastric conventional skin and fat resection was planned as in multiparous women. Right: results 2 years after surgery. Despite the nulliparity and relative scarcity of skin; the transverse plication and the neo-umbilicoplasty allowed an acceptable result with scar and navel in appropriate locations and proportions

### Very Low Scar Location

It is seen rarely, but may occur in patients previously operated with abdominoplasty and especially mini-abdominoplasty who have gained weight generating tissue laxity, making the scar migrate down. This appears as a true example of ptosis of the pubic mound with a descent of the vulvar commissure.

The correction is achieved with a new abdominoplasty in which the pubic tissues will be lifted again, the navel will be located or created anew in the ideal position with a skin graft as described, and the scar is located in a better position, improving the H/V ratio, appearance, and position of the genitals.

## Suggested Strategies for Suitable Location of Scar and Umbilicus During Surgery

### Pre-operative Markings

With the patient standing, the new transverse incision must never be the pre-existing lower abdominal crease. On the contrary, it is necessary to make firm upward traction of the hypogastrium with both hands to outline the midline new position of the incision, approximately 6 cm above the anterior vulvar commissure, this incision extends laterally to the mid or posterior axillary line, progressing 3 cm above the inguinal crease. The incision must be planned as long as necessary to avoid tissue redundancy, cones of rotation or dog's ears.

## Intra-operative Verification

The use of a sterile metal ruler with graduation in centimeters is recommended. Using a surgical marker, the midline is outlined on the skin and on the abdominal wall itself, in the same way, the distance V is confirmed. The outlined midline must match the subjacent *linea alba* and the external determinants of the midsagittal plane on the skin as the hair orientation and divergence at epigastrium or *linea nigra* at hypogastrium.

Similarly, measurement of the size of the umbilical ring and the omphalic shaft itself must be made. When plication is completed in the midline, the umbilicus is preserved on its pedicle leaving only a diameter of about 1 cm of skin, completely excising the umbilical side walls, ensuring that the new navel will have no cylindrical or infundibular form.

The circumcised umbilicus can be placed in the existing position or can be moved 1 or 2 cm up or down from its initial situation to adjust for the best H/V ratio. To do this, it must be anchored to the midline with 2–0 polyglactin stitches.

The incision on the abdominal skin for extracting the umbilical shaft is performed by forming an inverted U that is 1.5 cm in diameter. The skin edges of this incision will be joined firmly to the fascia of the abdominal wall with 2–0 long-lasting absorbable sutures, so the scar stays as deep as possible and is not visible.

To prevent the excessive upward displacement of the genitals and the *mons veneris*, it is important to use progressive tension sutures to adhere fat tissue to the muscular wall. In the same way, it is useful to suture the superficial fascia together in both sides of the incision and use some fixation stitches from the superficial fascia to the pubis and anterior superior iliac spines to prevent displacement of the scar.

A beveled cutting of suprapubic fat tissue and a carefully layered closure prevents depressed scars or step deformities formed by the difference in thickness between the *mons veneris* and advanced abdominal flap. It is also important to do liposuction to reduce the *mons veneris* if necessary.

When excessive tension is anticipated in the incision closure, it is preferable to close in the form of a small inverted T, which may have a vertical component of 3–5 cm instead of raising the hairy skin. This inverted-T scar is preferable to an excessively high *mons veneris*, verticalization of the vulva and the rise of public hair to a non-concealable position (Fig. 21).

## TULUA, Transverse Plication Abdominoplasty

Transverse plication abdominoplasty, without epigastric detachment of the flap, unrestricted liposuction and neo-umbilicoplasty with a skin graft (TULUA, Table 2) has been used since 2005 to achieve consistently acceptable aesthetic results. The transverse plication allows effortless sliding of the epigastric flap to perform the incision for closure under less tension, placing the transverse scar quite low, with less elevation of pubic tissues and minor verticalization of the vulvar fold [40] (Fig. 22).

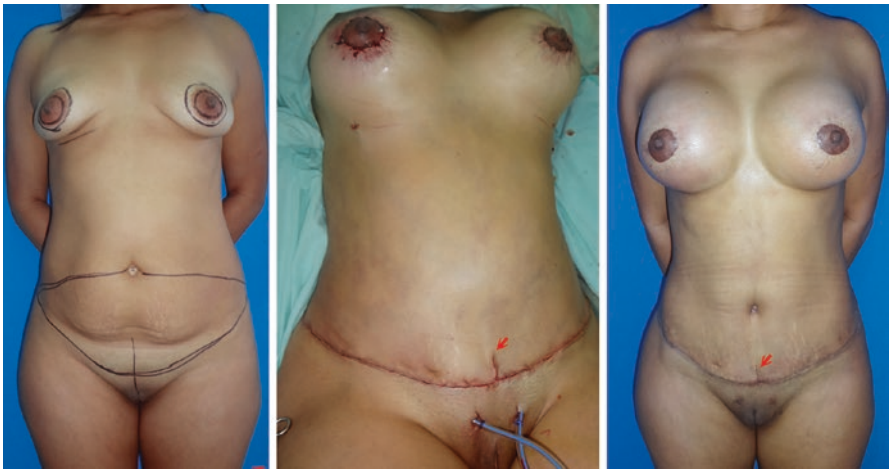

**Fig. 21** Placement of the transverse scar during TULUA abdominoplasty. Left: pre-operative design, breast lift with implants and transverse plication abdominoplasty in a 40 year-old woman, note that the incision will be located in a very low position, below the lower abdominal crease, resecting part of the *mons veneris*. Center: A small inverted T closure (red arrow) was necessary to locate the scar 6 cm from anterior vulvar commissure. Right: satisfactory result 8 weeks after surgery, with navel and scar well-proportioned in form and location, the vertical portion of the scar (red arrow) is a reasonable price to pay, to make wound closure under less tension and to locate the scar in a lower position

**Table 2** TULUA abdominoplasty modifications compared with lipoabdominoplasty and conventional abdominoplasty

| Lipoabdominoplasty and conventional abdominoplasty | Modifications in TULUA abdominoplasty | |
|---|---|---|
| Vertical plicature | **T** | **T**ransverse (plicature) |
| Wide dissection | **U** | **U**ndermining halted at umbilicus (no epigastric flap detachment) |
| Without liposuction or limited (danger zones) | **L** | **L**iposuction (without restrictions) |
| Umbilicoplasty by stump exteriorization | **U** | **U**mbilicoplasty with a skin graft |
| Abdominoplasty with not very low scar location due to flap tension | **A** | **A**bdominoplasty with low transverse scar localization |

The creation of a new umbilicus with a skin graft instead of its exteriorization has several advantages, the first being its simplicity of execution, the second the freedom to select its new position, achieving an adequate proportion and appearance of the final result and the third that the new umbilicus has acceptable aesthetic appearance with properly and almost in-depth hidden scars, since they are completely attached to the abdominal wall.

Amputation of the navel and creation of a new one as is done with the TULUA technique is useful when there are concerns about its blood perfusion, in obese patients with long and descended umbilical stumps, in patients with a history of

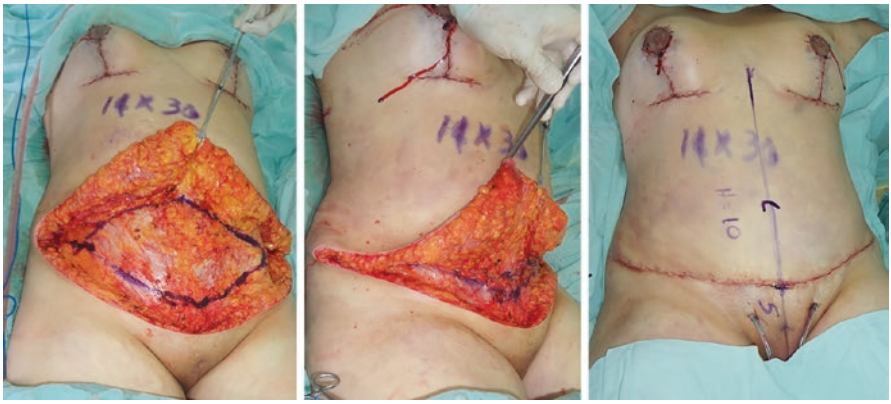


**Fig. 22** TULUA abdominoplasty. Location of scar and navel in the same patient of Fig. 15. Left: after tumescent infiltration, complete liposuction of the epigastric flap and resection of skin and fat in the lower abdomen, a horizontal plication of abdominal wall from the amputated navel to the pubis and from one iliac spine to the other is planned (14 x 36 cm). Center: oblique intra-operative view. Transverse plication was performed with 1–0 polypropylene two layered suture. Note the epigastric flap that has not been dissected off the wall, easily descends without tension to the lower edge of the incision. Right: once the surgical wound is closed, a neo-umbilicoplasty with skin grafts in the convenient position is planned

previous surgery, scarring around the umbilical stem, and the intra-operative presence of an umbilical hernia.

Amputating the umbilicus facilitates the surgical procedure and the chances of a successful outcome are maintained (Fig. 23).

TULUA abdominoplasty has proved to be useful during 11 years in primary cases and in correcting unsatisfactory results of previous abdominoplasties with high scars and misplaced low umbilici [41].

Previously published [40, 41]

## Discussion

The location of the transverse scar and the umbilicus are determinants of the final result of abdominoplasty. A variety of techniques exist for continued success.

There are several ways to determine the best position of the navel and scar, most times taking into account surrounding references such as the sternal notch or xiphoid, and abdominal landmarks as anterior iliac spines and abdominal natural creases. However, it is clear that the proportions must be maintained to achieve aesthetic results.

The location of the transverse scar must be between the limits of the abdominal and pubogenital aesthetic units, respecting shape and proportions. Excessive upward displacement of the hairy skin is not aesthetically acceptable.

**Fig. 23** TULUA abdominoplasty. Location of scar and umbilicus in the same patient of Fig. 15. Left: pre-operative, 36 year-old woman, BMI 31, epigastric redundancy without diastasis of the rectus abdomini muscles. Center: result 12 weeks after TULUA transverse abdominoplasty, with full liposuction of the flap, no epigastric flap detachment, neo-umbilicoplasty with skin graft and low scar placement. Right top: intra-operative view after breast lift and TULUA abdominoplasty, with transverse plication of the wall in the hypogastrium of 36 by 14 cm, the location of the scar was 5 cm from vulvar commissure (V = 5) and the neomphallus at 10 cm from the scar (H = 10). Right below: Results remain stable 12 weeks after surgery H/V = 2

The ideal ratio at which the X-U distance from the xiphoid to the umbilicus is equivalent to 1.618 of the distance U-C, navel to the lower abdominal crease, can be taken into account [22]; however, we prefer the intra-operative measurements of ratio H/V as previously described (Figs. 24 and 25).

The TULUA technique avoids epigastric dissection for the exteriorization of the umbilical stalk and vertical plication of the muscle wall, with mentioned advantages of vessel conservation and less dead space during closure. There is total freedom in placement of the new umbilicus and this prevents its low placement. The neo-umbilicus scar is concealed because the umbilical sidewalls are created of adjacent skin to the inverted U incision. Constricted and funicular umbilici are avoided and the results are acceptable and at least as good as in conventional abdominoplasties. Umbilical hernias can be repaired safely and there is no concern about umbilical necrosis.

## **Conclusions and Key Points** (Table 3)

The combination of low placement of the scar facilitated by the effective pulling down of the flap exerted by the horizontal plication, with a properly positioned umbilicus; ensures a harmonious result of each abdominoplasty (Fig. 26).

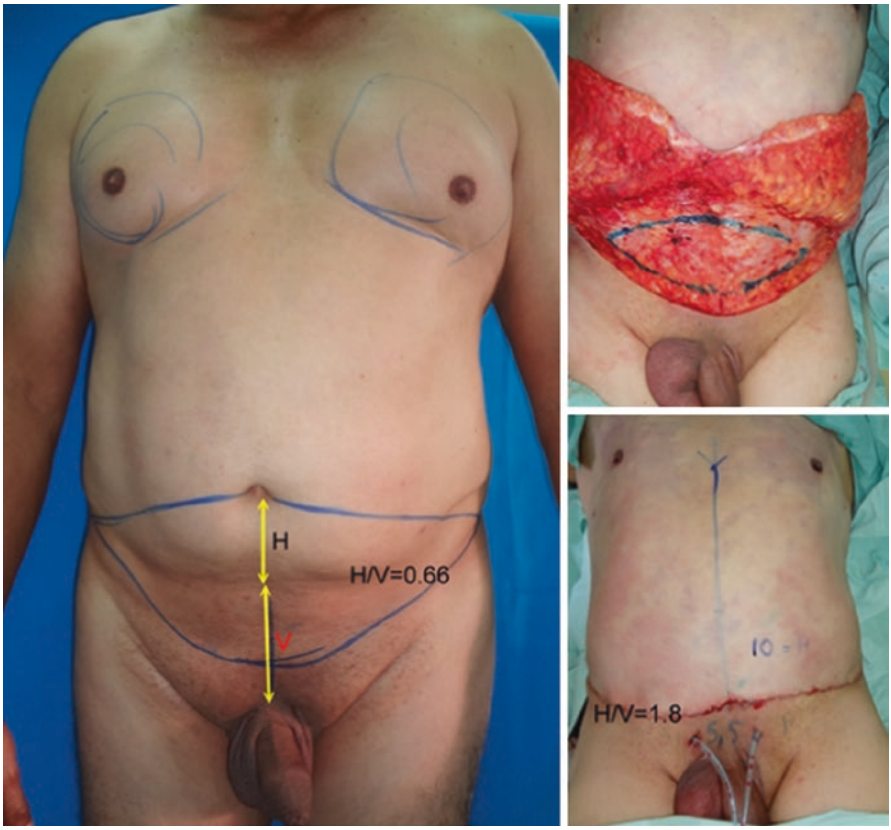


**Fig. 24** TULUA abdominoplasty in men. Left: 48 year-old man wanting abdominoplasty. Pubogenital aesthetic unit is large and is delimited by a high lower abdominal crease with a relatively low navel. The distance measured from the base of the penis to the fold is 1.5 times larger than the distance H (H/V ratio = 0.66). Right top: intra-operative view. Liposuction, without epigastric detachment, transverse plication and neo-umbilicoplasty (TULUA). Right bottom: neo-umbilicoplasty with skin graft is planned 10 cm from the incision, the H/V ratio = 1, 8 is close to the golden proportions (Fibonacci)

The position of the navel should not be a fortuitous event, instead it must be handled by the surgeon following the basic principles of human proportionality. It has been clinically useful to measure the H/V ratio; however, it does not replace clinical judgment and surgical intuition, but it does help in making intra-operative decisions.

It is estimated that the distance V is approximately 5–7 cm, and distance H 9–14 cm with H/V ratio 1.5–2 close to the ideal ratio 1.618.

The TULUA technique consistently allows for the accurate location of the transverse scar, giving good shape and position to the navel and obtaining a convenient ratio H/V.

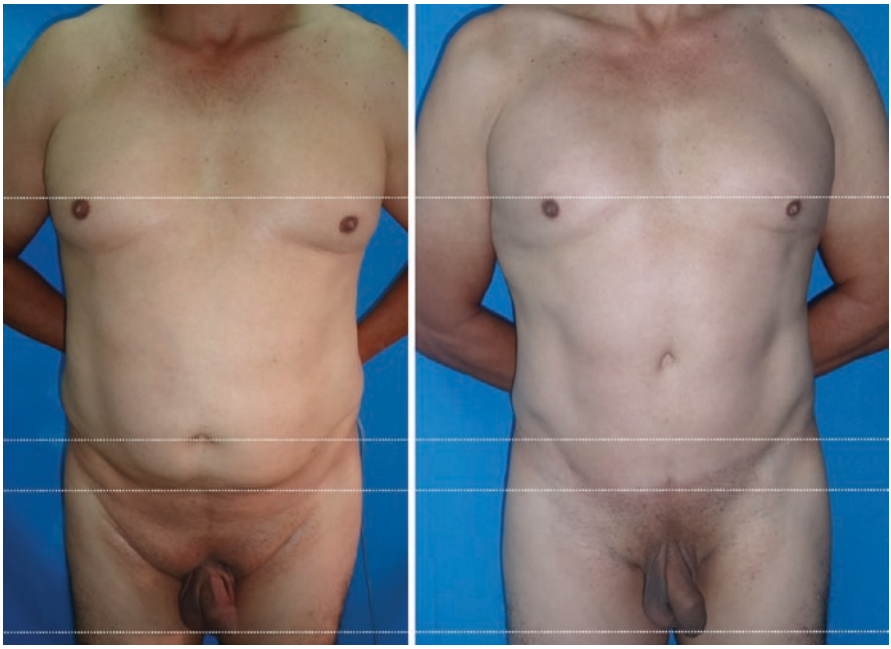

**Fig. 25** TULUA abdominoplasty in the same patient of Fig. 24. Left: before TULUA surgery. Right: 2 years post-operative result. Besides the achievements in the contour of the breasts and abdomen, navel and scar location make a difference in the result, the transverse white lines demonstrate how the neo-umbilicus was created anew in an upward position, it is of normal appearance and is well-proportioned. If the umbilicus had been left in its pedicle and exteriorized, it would not have been possible to achieve this result that approximates to the ideal proportions (1:1.618 Fibonacci)

**Table 3** Details of operative techniques for proper positioning of umbilicus and scar

| | |
|---|---|
| Surgical markings | **Not to use lower abdominal crease. Markings with upward traction, 6 cm above the anterior vulvar commissure** |
| Intra-operative measurements and confirmation | **Sterile ruler in cm. Surgical marker and ratio H/V, a Fibonacci caliper will help tracing proportionality** |
| Progressive tension sutures | **Reduces dead space, slides and fixes the flap in the lowered position** |
| Transverse plication | **It facilitates very low scar placement under less tension** |
| Wound suturing | **Plane by plane, superficial fascia repair, less tension** |
| Neo-umbilicoplasty | **Freedom of choice neo-umbilicus position, good shape** |
| Inverted T wound closure | **Preferable to a large *mons veneris* or a high scar** |

When the umbilicus is not amputated and exteriorization is decided, it may be necessary to raise the navel 1 to 3 cm above the previous position to maintain an appropriate proportion.

Resection of the original navel and creation of a new one by umbilicoplasty with a skin graft, combined with the series of modifications of TULUA abdominoplasty is strongly recommended (Fig. 27).

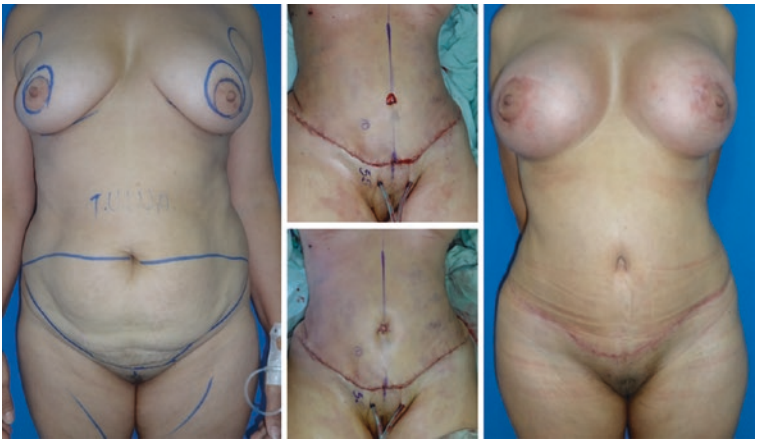

**Fig. 26** Low scar placement and navel with proportional height. Left: before abdominoplasty of horizontal plication in the hypogastrium TULUA. Top center: after complete liposuction, absence of detachment in epigastrium and transverse plication, a new navel is created, 10 cm from the incision, H/V ratio = 1.8, is close to the divine proportion. Below center: once completed the omphalloneoplasty with a 1.5 cm diameter full thickness skin graft. Right: results 6 months after surgery. The location of the scar 5.5 cm above the vulvar commissure and navel placed 10 cm from the incision, seems as a well-proportioned abdomen with satisfactory results

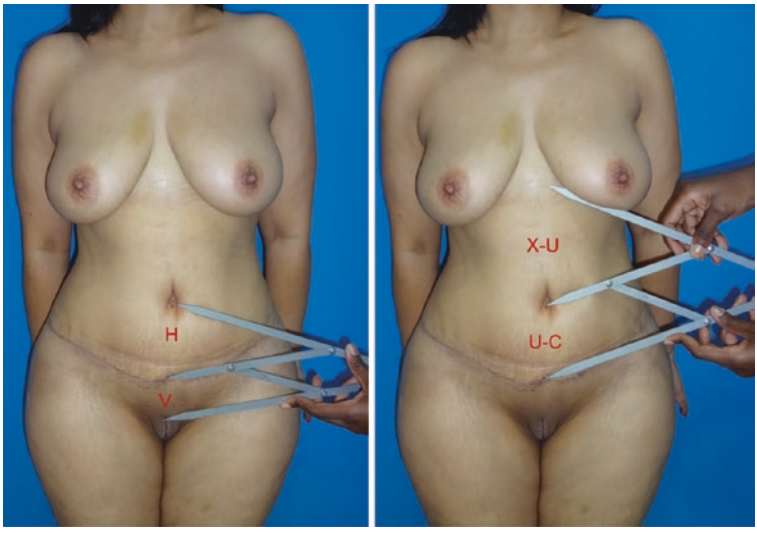


**Fig. 27** Positioning of the navel and abdominoplasty scar. Two determinants of the outcome. Left: with a Fibonacci's compass, confirmation of post-operative outcome is made 4 weeks after surgery in a 34 year-old patient with transverse TULUA abdominoplasty. Transverse plication allowed low location of the scar, the neo-umbilicoplasty with total freedom of choice for the position of the navel maintains the ideal ratio between H and V, complete liposuction molded epigastrium and waist, and the absence of excessive detachment and dead space avoided seroma, dehiscence and necrosis of the flap, facilitating closure without tension. Right: similarly, 1.618 proportionality can be demonstrated in the same patient, between the distances from the navel to xiphoid (X-U) and from the umbilicus to scar (U-C) [22]

The position of the transverse incision should not be left to chance. It should be manipulated at the planning and marking steps, placing it 6 cm above the vulvar commissure or the base of the penis. It is not recommended to use the pre-existing abdominal fold.

The best placement of the scar during surgery can be modified using resources such as transverse plication that take tissues smoothly downwards and prevents excessive tension in wound closure. Progressive tension sutures, repair of the superficial fascia, and fixation with anchor stitches are also good tips.

It is preferable to leave a small vertical component or inverted T-shape on the midline of the transverse scar than an excessively lifted *mons veneris*.

Intra-operative measurement of the placement of the scar and the umbilicus is recommended for every case, using a measurement ruler and surgical marker during surgery, facilitating proper placement of these two determinants of the final result.

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# Umbilicoplasty

Cemal Senyuva

Why is umbilicoplasty important?

- this is the only uncovered/difficult to hide scar in abdominoplasty
- the abdomen or tummy is often exposed
- the neo-umbilicus can be well designed/beautifully created.

Basic rules for umbilicoplasty:

- the neo-umbilicus should be created in the correct location
- the neo-umbilicus must be in the midline
- the distance between the pubis and neo-umbilicus should be at least 9 cm
- the neo-umbilicus should be large enough
- the neo-umbilicus should look natural.

Definite rules for umbilicoplasty:

- no stitch marks should be visible
- collapse—circular contraction should be avoided
- hypertrophic scar formation should be prevented
- the belly button dimple should be created.

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W. L. Murillo (ed.), *Omphaloplasty*, https://doi.org/10.1007/978-3-319-64313-7_6

**Fig. 1** Patient examples with "tongue and groove" type belly button

What does a lovely belly button look like?

Is it possible to classify belly button shapes?

Photographic evaluations of 100 non-abdominoplasty patients have been made and a new classification is proposed. Four types of belly button have been suggested.

Type 1: Ideal type belly button is also named the "tongue and groove type"

In this type of belly button, there is a superior hooding, superior depression and shadow, and the inferior part of the umbilicus is obscure (Fig. 1).

In the sample group of 100 patients, the incidence of Type 1 (tongue and groove type) belly buttons was 25 %.

Type 2: "T type" belly button

In this type of belly button, there is almost a horizontal hood, sharp and narrow shadows below it and two symmetrical soft tissue bulging inferiorly (Fig. 2).

In the sample group of 100 patients, the incidence of Type 2 (T type) belly buttons was 28 %.

**Fig. 2** Patient examples with "T type" belly button

Type 3: "Split type" belly button

In this type of belly button, the umbilicus is oriented in the vertical position; there is a vertical depression and shadows, simulating a split (Fig. 3).

In the sample group of 100 patients, the incidence of Type 3 (split type) belly buttons was 12 %.

Type 4: Non-aesthetic belly buttons

In this group, the different shapes of belly buttons include:

- post-partum type belly buttons: the incidence was 16 % (Fig. 4)
- herniated belly buttons: the incidence was 11 % (Fig. 5)
- round belly buttons: the incidence was 5 % (Fig. 6)
- obese type belly buttons: the incidence was 3 % (Fig. 7).

**Fig. 3** Patient examples with “split type” belly button

**Fig. 4** Post-partum type belly buttons

**Fig. 5** Herniated belly buttons

**Fig. 6** Round belly buttons

**Fig. 7** Obese type belly buttons

In the sample group of 100 patients, the first three types of belly buttons are considered to be aesthetic and good looking and their incidence is 65 %.

Tongue and groove type and split type belly buttons can be created surgically during abdominoplasty procedures. The surgical techniques are explained below.

We don't have a surgical technique to create the T type belly button, which is also considered an aesthetic umbilicus.

By creating tongue and groove type or split type belly buttons, surgeons can ensure that the neo-umbilicus will be attractive and pleasant.

## Surgical Technique for Creating the "Split Type" Belly Button

This is a simple surgical technique and is less demanding when compared to the ideal type "tongue and groove" belly button surgery.

At the end of ultrasonic or conventional liposuction and before the lower abdominal incision, the original umbilicus is held and elevated with two skin hooks. At almost 12–14 mm from the bottom of the original umbilicus' depth, a circumferential skin incision is performed with number 15 scalpel (Fig. 8).

The elevation of the abdominal flap has been performed with the aid of electrocautery. At the level of the umbilicus, scissor dissection is used to avoid thermal damage around the umbilicus' stalk edges. Flap elevation above the umbilicus is limited. A 10 cm large tunnel is created up to the level of the xiphoid process and rib cage. The narrow tunnel will be large enough for rectus fascia plication and to place and fix the umbilical stalk in its ideal location.

After rectus plication and hemostasis, wide irrigation with saline or much diluted Betadine solution is applied. A second hemostasis is made at this time.

Lower abdominal tissue is resected with the help of Lockwood instruments and markings.

The abdominal flap is approximated to the inferior skin edge over the suprapubic area with the help of two 2/0 Vicryl stitches in the midline.

**Fig. 8** Incision planning for "split type" belly button

The ideal location of the neo-umbilicus is determined at this stage. The opening should be in the midline. The level is 9 cm from the lower skin edge in most cases. This is the level of the superior iliac crest. The more superior location of the umbilicus at 1 or 1.5 cm above those given landmarks will provide a more youthful appearance of the abdomen. Vertically-oriented split-like holes measuring 11–12 mm in length and 7–8 mm in height are created by skin and deep soft tissue excision.

The sutures in the suprapubic region are released. The abdominal flap with the neo-umbilicus opening is elevated again. From underneath the abdominal flap and around the neo-umbilical opening, circular fat tissue can be excised in a moderate way to thin out the umbilical region thickness.

**Fig. 9** Umbilical stalk is prepared and fixed to the abdominal wall with two non-absorbable stitches

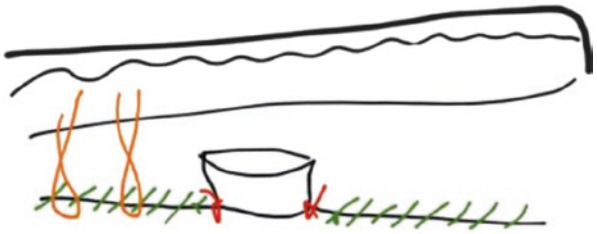

**Fig. 10** Progressive tension sutures are placed to reduce the tension on neo-umbilicus and lower incision

With two stitches of 2/0 non-absorbable suture materials, the umbilical stalk is fixed to the abdominal wall. The first stitch should be placed in the midline at the 12 o'clock position and the second stitch should be at the 6 o'clock position in the midline. Both stitches should attach to the umbilical stalk approximately 9 mm from the deepest point of the umbilical depression. By doing this, the stalk will be buried and the umbilical depression is created (Fig. 9).

One 2/0 Vicryl stitch is placed on the umbilical stalk and left 4–5 cm long in a loop fashion. This stitch will help to find the umbilical stalk later from the opening and also facilitate stitching the deep dermal layer. This stitch is taken out at the end of suturing.

Progressive tension stitches are placed separately in the midline above and below the neo-umbilicus opening. 2/0 Vicryl is used for this and the aim is to close dead space and to eliminate tension around the neo-umbilicus and at the level of lower incision (Fig. 10).

The inferior incision is closed in three layers. 2/0 or 3/0 Quill stitches are used for the deep fascia and the deep dermal layer in a running fashion. 3/0 Monocryl separate stitches are used to reinforce and to adjust the closure. The skin edges should push each other at this stage before using 3/0 or 4/0 Monocryl intradermal continuous sutures.

Finally, 2/0 Vicryl stitches are pulled from the neo-umbilicus opening and separate 4/0 monocryl stitches are placed in the deep dermal layer. Attention is given to the umbilical stalk orientation. Any distortion should be avoided in order to ensure adequate blood circulation and to have a natural result.

Vaseline gauze is loosely packed against the umbilicus to help the depression and waterproof dressing is applied. This dressing is changed the next day.

The advantage of the "split type" belly button is that is relatively simple to create this attractive/pleasant umbilicus (Figs. 11, 12, 13, 14, 15, and 16).

**Fig. 11** Patient 1. Pre-operative and post-operative views of "split type" belly button

**Fig. 12** Patient 2. Pre-operative and post-operative views of "split type" belly button

**Fig. 13** Patient 3. Pre-operative and post-operative views of "split type" belly button

The main disadvantage is that the technique is prone to collapse and scar contracture (Fig. 17). Our suggestion to avoid this is to open the neo-umbilicus hole large enough and to put separate stitches and not continuous intradermal sutures.

## Surgical Technique for Creating the "Tongue and Groove Type" Belly Button

This is a rather advanced surgical technique and more demanding when compared with the "split type" belly button surgery.

At the end of ultrasonic or conventional liposuction and before the lower abdominal incision, the original umbilicus is held and elevated with skin hooks. A

**Fig. 14** Patient 4. Pre-operative and post-operative views of “split type” belly button

**Fig. 15** Patient 5. Pre-operative and post-operative views of “split type” belly button

**Fig. 16** Patient 6. Pre-operative and post-operative views of “split type” belly button

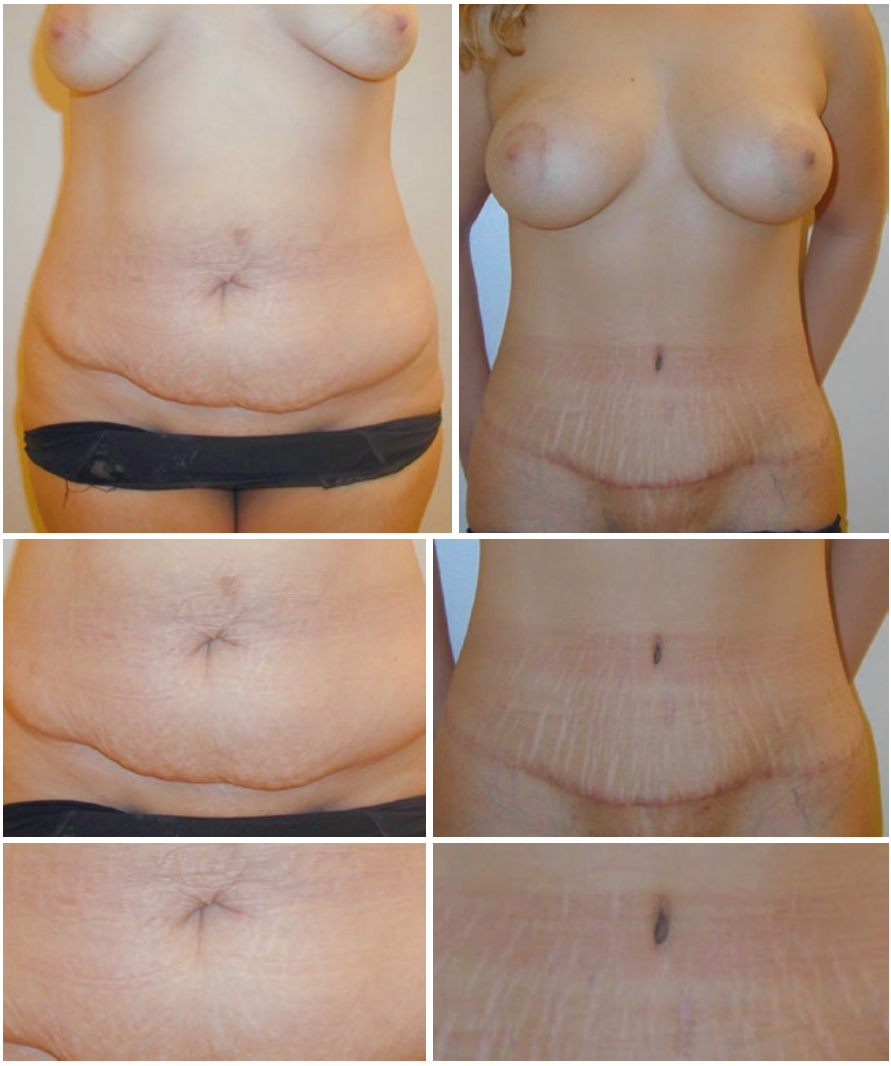

**Fig. 17** Patient 7. Pre-operative and post-operative views of "split type" belly button with contracture

triangular shape incision is made with the 15 blade scalpel around the umbilicus, almost 12–14 mm from the bottom of the original depth of the umbilicus. Each leg of the triangle is approximately 8–9 mm in length (Fig. 18).

The elevation of the abdominal flap is performed with the aid of electrocautery. At the level of umbilicus, scissor dissection is used to avoid thermal damage around the umbilicus stalk edges. The flap elevation above the umbilicus is limited. A 10 cm large tunnel is created up to the level of the xiphoid process and rib cage. The narrow tunnel will be large enough for rectus fascia plication and to place and fix the umbilical stalk in its ideal location.

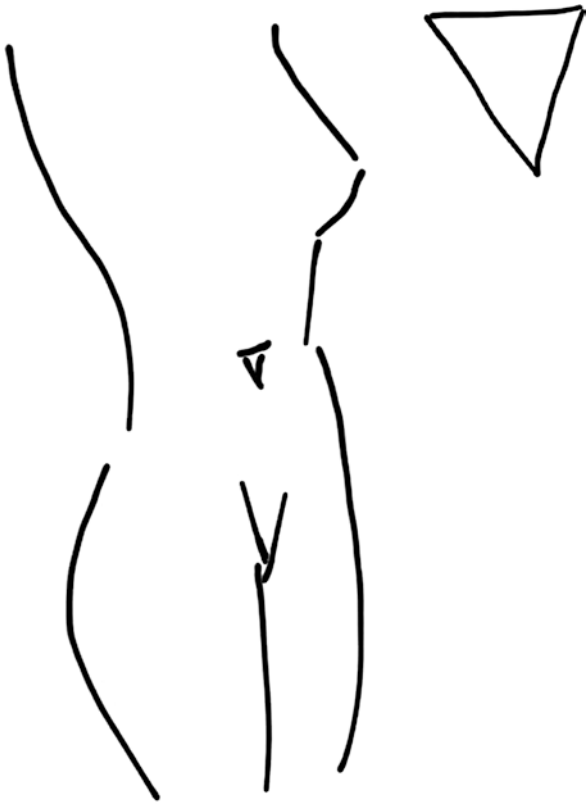

**Fig. 18** Incision planning for "split type" belly button

After rectus plication and hemostasis, multiple irrigations with saline or much diluted Betadine solution are given. A second hemostasis is made at this time.

Lower abdominal tissue is resected with the help of Lockwood instruments and markings.

The abdominal flap is approximated to the inferior skin edge over the suprapubic area with the help of two 2/0 Vicryl stitches in the midline.

The ideal location of the neo-umbilicus is determined at this stage. The opening should be in the midline. The level is 9 cm from the lower skin edge in most cases. This is the level of the superior iliac crest. The more superior location of the umbilicus at 1 or 1.5 cm above those given landmarks, will provide a more youthful appearance of the abdomen (Fig. 19).

Facing down, a bean-shaped neo-umbilicus opening is marked. The horizontal length is about 15–16 mm and vertical length is approximately 8–9 mm. This area is de-epithelialized and then divided from the middle to create two dermal flaps based inferiorly. The underlying fat and soft tissue is excised and the bean-shaped hole is made (Fig. 20).

The sutures in the suprapubic region are released. The abdominal flap with the neo-umbilicus opening is elevated again. From underneath the abdominal flap and around the neo-umbilical opening, circular fat tissue can be excised in a moderate way to thin out the umbilical region thickness.

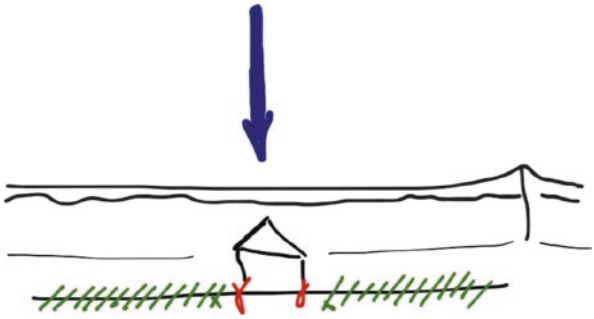

**Fig. 19** The ideal location of the neo-umbilicus should be 9 cm from the lower skin edge

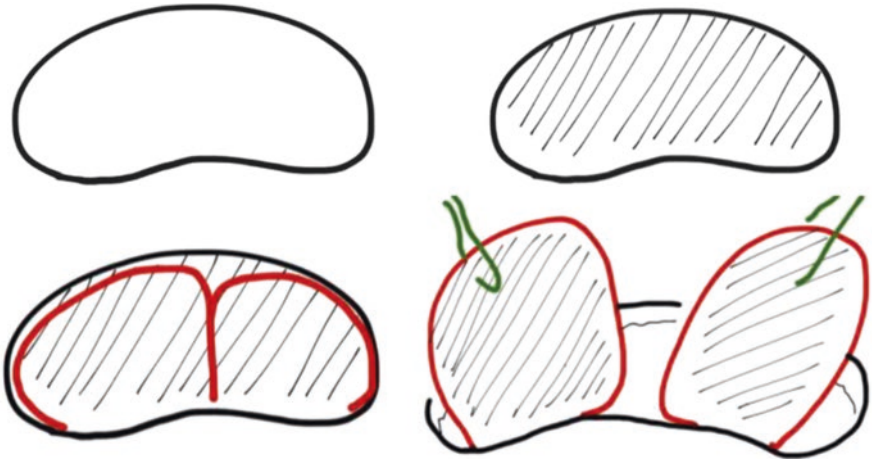

**Fig. 20** Preparation of bean-shaped de-epithelization and two dermal flaps

With two stitches of 2/0 non-absorbable suture materials, the umbilical stalk is fixed to the abdominal wall. The first stitch should be placed in the midline at the 12 o'clock position and attached to the umbilical stalk at approximately 5 mm from the deepest point of the umbilical depression. The second stitch should be at the 6 o'clock position in the midline and attached to the umbilical stalk at approximately 9 mm from the deepest point of the umbilical depression. By doing so, the stalk will be buried more at the inferior point and less at the superior point. This will help to create the superior hooding of the neo-umbilicus (Fig. 21).

One 2/0 Vicryl stitch is placed in the umbilical stalk and left quite long in a loop fashion. This stitch will help to find the umbilical stalk later from the opening and also facilitate the stitching of the deep dermal layer. This stitch will be taken out at the end of suturing.

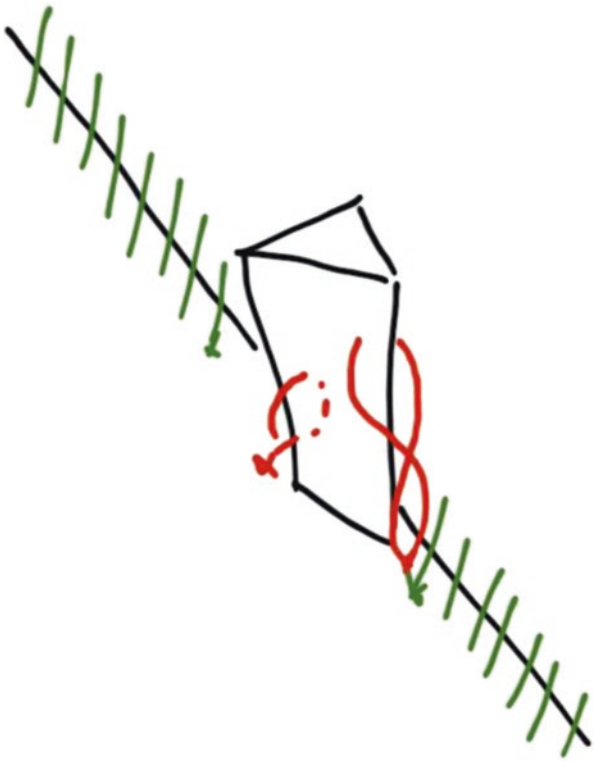

**Fig. 21** Umbilical stalk is prepared and fixed to the abdominal wall with two non-absorbable stitches

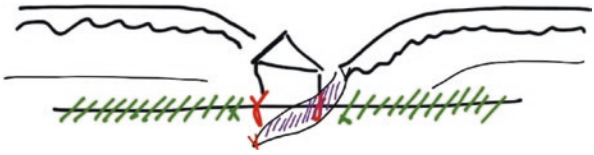

**Fig. 22** Two de-epithelized dermal flaps fixed to each side of the umbilical stalk to give the depression of the neo-umbilicus

Progressive tension stitches are placed separately using 2/0 Vicryl suture material in the midline above the umbilicus. The aim is to close dead spaces and to eliminate tension around the neo-umbilicus.

Two de-epithelized dermal flaps created from the bean-shaped opening are fixed to each side of the umbilical stalk with 2/0 Vicryl separate sutures. This will give the depression of the neo-umbilicus and help to create the shadow below the hooding (Fig. 22).

More progressive tension sutures will be placed below the neo-umbilicus opening. 2/0 Vicryl is used for this. The aim is to close dead spaces and to eliminate tension at the lower incision level.

The inferior incision is closed in three layers. 2/0 or 3/0 Quill stitches are used for the deep fascia and the deep dermal layer in a running fashion. 3/0 Monocryl separate stitches are used to reinforce and to adjust the closure. The skin edges should push each other at this stage before using 3/0 or 4/0 Monocryl intradermal continuous sutures.

Finally, the 2/0 Vicryl stitches are pulled from the neo-umbilicus opening. A wedge excision is made at the inferior edge of the umbilical stalk. This stitch will serve to accommodate the lower edge of the bean-shaped opening (Fig. 23).

Separate 4/0 monocryl stitches are placed in the deep dermal layer. The co-adaptation of the skin edges of the triangular umbilical stalk and the bean-shaped opening are made with separate, half-buried 5/0 Prolene stitches. The knot is placed inside the umbilical stalk in order to avoid any scar visibility due to the buried knots (Fig. 24).

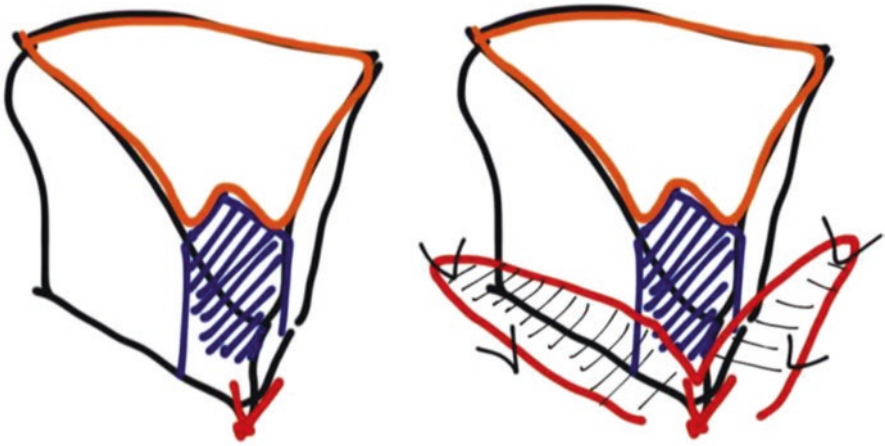

**Fig. 23** A wedge excision is made in the lower part of the umbilical stalk for accommodation of the lower edge of the bean-shaped opening

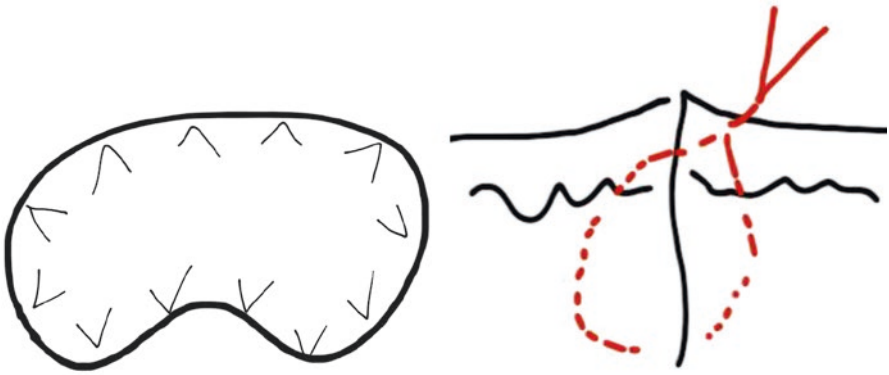

**Fig. 24** Deep dermal monocryl and half-buried prolene stitches preferred for the adaptation of the neo-umbilicus

**Fig. 25** Patient 8. Pre-operative and post-operative views of "tongue and groove type" belly button technique

The advantage of the "tongue and groove type" belly button is that it is an attractive/pleasant umbilicus. The inferior flap hides half of the scar deep in the umbilical pit. Therefore the patient can barely see it and the visibility by others will be less. The possibility of collapse and scar contracture is reduced.

The main disadvantage is that the technique is more demanding.

Patient examples for the "tongue and groove type" belly button technique are shown in Figs. 25, 26, and 27.

**Fig. 26** Patient 9. Pre-operative and post-operative views of "tongue and groove type" belly button technique

**Fig. 27** Patient 10. Pre-operative and post-operative views of "tongue and groove type" belly button technique

## Conclusion

As a conclusion, the aesthetic characteristics of the belly button can be determined by a plastic surgeon. A new classification of the umbilicus is suggested. The "tongue and groove type", "T type", and "split type" belly buttons are considered to be the aesthetically pleasing belly button types. Round belly buttons are unaesthetic and should be avoided.

# Neo-Omphaloplasty in Dermolipectomies: Personal Technique

Freddy Rodriguez García

## Generalities

The umbilicus (from Latin *umbilicus* and Greek *ómphalos*) is the scar left after the umbilical cord separates from the newborn baby. The umbilical cord that remains after delivery falls off between 1 and 2 weeks after birth, resulting in the umbilicus (Fig. 1).

Umbilicus is also the name of the umbilical region, that is, the zone of the abdomen that surrounds the umbilicus, and it is featured in the *International Anatomical Terminology* of 1997, paragraph A01.2.04.005, and under the Latin names *umbilicus* and *regio umbilicalis* [1].

**Fig. 1** Characteristics of a normal umbilicus

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W. L. Murillo (ed.), *Omphaloplasty*, https://doi.org/10.1007/978-3-319-64313-7_7

**Fig. 2** Initial marking of the navel to be disinserted, in an oval shape with 1.5 cm vertical length and 1 cm horizontal width

**Fig. 3** Disinsertion of the umbilicus with the indicated shape and dimensions

The umbilical scar is elliptical or round and presents in its central portion some mamelons, with the central point being the trace of the scar of the umbilical cord. Surrounding the mamelons, we find a circular depression called the umbilical groove. And in the upper part, a little bit deeper, is the skin ridge that limits it [2] (Fig. 2).

In young and thin women, the umbilicus tends to have a more oval and vertical shape. Less fat generally exists in the periumbilical zone, which gives it a depressed aspect. In obese people, the umbilicus becomes more elongated and deep because of the accumulation of periumbilical fat (Figs. 3 and 4).

From a cultural point of view, clothing that exposes the umbilicus is more fashionable in the present day, especially for young women. The exposure of a naked umbilicus used to be taboo in Western society because the umbilicus was considered an erotic visual stimulus. Today, the umbilicus is given a purely aesthetic function and it is even decorated with piercings.

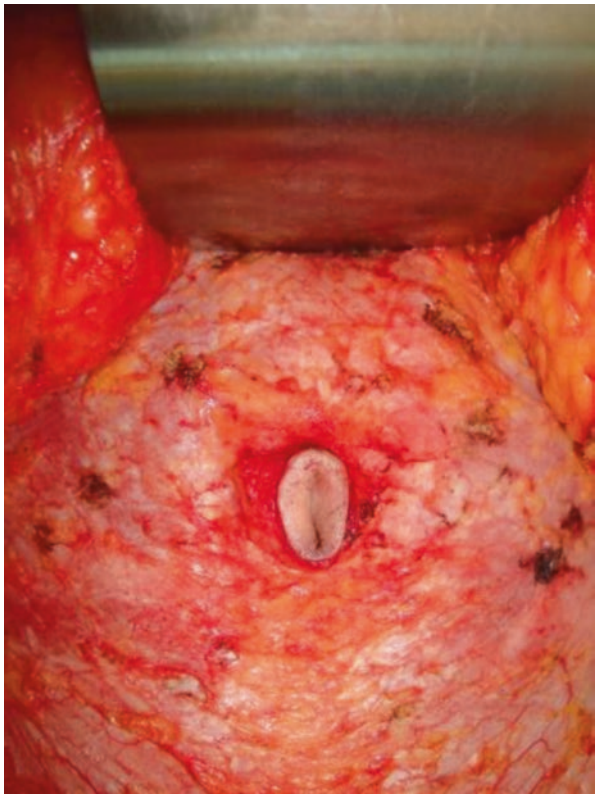


**Fig. 4** Disinserted umbilicus with the indicated shape and dimensions, over the fascia and abdominal rectus

The umbilicus is the only scar considered normal in the body structure, present since the first days of life. It is also considered a key component of abdominal beauty; therefore, prime factors in obtaining a good aesthetic result include positioning, depth, shape, and scarring of the neo-omphaloplasty during a dermolipectomy, as described by Murillo W.L. [3] (Fig. 5).

## Historical Review

During the beginning of dermolipectomy in France in the nineteenth century, it was quite common to resect the umbilicus together with the excess of cutaneous-adipose flap elevated during the dissection (Jolly, Peters, Kelly, and others), as mentioned by Sinder [4] and Hakme [5], in their publications on abdominoplasty. Very little or almost no attention was given to this scar structure of the abdomen.

Later, at the beginning of the twentieth century, some surgeons trying to maintain that component of abdominal beauty went on to preserve the navel, keeping it in its original position. The first to develop this technique was Frist in 1921, who using circular incisions was able to transpose [4]. Flesch, Thebesius, and Weisheimer, in 1931, left a triangle of distal base skin in the navel, as Sinder [4] describes it. Then

**Fig. 5** Plication of the fascia of the rectum and fixation by four cardinal points, from the stem or umbilical pedicle to the plicated fascia, at a depth greater than the thickness of the adipose-cutaneous flap, to obtain the natural depressed appearance of the navel

Andrews in 1956 presented some reconstruction work, Vernon in 1957 returned to using circular incisions, presenting many cases of stenosis, and Pitanguy in 1967 disclosed the new technique neo-omphaloplasty, with a curved incision of cranial concavity, well reported by Tavares et al. [6].

In 1976, Avelar [7] published the three-pointed star technique, trying to avoid scar retractions, drying the umbilicus in a triangular shape and the abdominal flap in a Y shape.

The difficulties because of hernias, eventrations, or amputations due to previous surgeries gave rise to the emergence of many new omphaloplasty techniques. Baroudi and Carvalho [8] in 1981 and Franco [9, 10] in 1985 and 1999 also published new neo-omphaloplasty techniques. Matsuo [11] in 1990 used a graft composed of conchal cartilage to reconstruct the navel. In 2008, Barreto et al. [12] published the neoumbilicoplasty technique—technique of three sutures; in 2014, Murillo W.L. [3] published his original omphaloplasty technique—back to the natural process.

## Anatomical Considerations

As anatomically described by Moore [13] in his book *Anatomy with Clinical Orientation*: "umbilicus is an obvious feature of the anterolateral wall of the abdomen, and is the reference point of the Transumbilical Plane. It is typically located at the level of the intervertebral disc between the L3–L4 vertebrae. Its position varies with the amount of fat in the subcutaneous tissue [13]."

The umbilicus presents a central mamelon, an umbilical groove that surrounds it and uppermost a skin ridge that limits it. All the layers of the anterolateral wall of the abdomen merge in the umbilicus.

The main blood vessels (arteries and veins) of the anterolateral wall of the abdomen are [13]:

- the upper epigastric vessels and the branches of the musculofrenic vessels
- the lower epigastric vessels and deep iliac circumflex vessels
- the superficial iliac circumflex vessels and the superficial epigastric vessels
- the posterior intercostal vessels of the 11th intercostal space and anterior vessels of the subcostal vessels.

Of these related vessels, the upper epigastric vessels, besides irrigating the abdominal rectus and the superficial and deep abdominal wall of the epigastrium, irrigate the superior umbilical region. The inferior epigastric vessels also irrigate the rectus abdominis and the deep abdominal wall of the pubic and lower umbilical regions. These two groups of vessels are anastomosed in the periumbilical region, in a rich well-known arterial network.

The skin and muscles of the anterolateral wall of the abdomen are innervated mainly by the following nerves [13]:

- thoracoabdominal nerve
- thoracic lateral cutaneous branches
- subcostal nerve
- iliohypogastric and ilioinguinal nerves.

The anterior abdominal cutaneous branches of the thoracoabdominal nerves T7–T9 innervate the supraumbilical skin. T10 innervates periumbilical skin. T11 besides the cutaneous branches of the subcostal (T12), iliohypogastric and ilioinguinal nerves (L1) innervates infraumbilical skin [13].

## Surgical Technique

There is currently no ideal technique for neo-omphaloplasty or neo-umbilicoplasty that offers aesthetically satisfactory results regarding the shape of the umbilicus, its positioning, depth, and scarring. This is the main reason why today's surgeons continue to search for new techniques to give the abdomen that natural beauty that comes with a natural umbilicus, especially during youth.

Any alteration or complication of neo-omphaloplasty in terms of shape, position, depth, and scarring, might jeopardize the results of a dermolipectomy or of an abdominal reconstruction.

The loss or deformity of the umbilicus might result in psychological disorders for many patients, especially younger patients [3]. Nevertheless, surgeons are most concerned about the scars since a hypertrophic, keloid, or contractile scar in an umbilicus might produce umbilical stenosis. Other techniques have been developed to try counteract this complication [14, 15].

In 2009, Rosique et al [16] published a comparative study among omphaloplasty techniques, dividing the patients into two groups: one with circular techniques (vertical oval, enlarged "U", and horizontal oval) and the other with non-circular techniques ("Y", inverted "V", and "inverted triangle"). The study concluded that there was a greater percentage of hypertrophy and stenosis in the circular techniques and greater satisfaction of the patient and surgeon in the non-circular techniques. However, each surgeon generally uses the technique taught during his/her training, or the one that provides better results in his/her hands regardless of whether it is circular or non-circular.

Neo-omphaloplasty techniques generally follow the same steps as in a dermolipectomy. The only thing that varies is the form of the disinsertion of the umbilicus from the elevated cutaneous adipose flap and the shape of the incision in the skin of the advanced flap.

We start the abdominoplasty procedure with previous infiltration of the area, suprapubic incision of the flap, and liposuction of the flanks, waist and supraumbilical midline, elevation of the adipose cutaneous flap to the umbilical area, disinsertion of the umbilical scar of the flap to allow its dissection to the xiphoids. Rigorous hemostasis is done, marking and plication of the fascia of the rectus abdominis muscles (when necessary), suprapubic advancement of the elevated flap and resection of the excess of the flap. Central suprapubic sutures of the flap to position are performed and the neo-omphaloplasty is initiated (Figs. 6 and 7).

In the development of my personal neo-omphaloplasty technique, I try to recreate the shape, position, depth, and aesthetic scarring of the umbilicus. The internal

**Fig. 6** Preliminary fixation of the flap in the midline suprapubic, to locate the neo-navel in the most natural position possible. Maneuver performed with marking clamp, with the digital tip and reconfirmed with the transfixion of the flap to the umbilical mamelon with hypodermic needle

**Fig. 7** Marking with methylene-blue at the located point of the flap, with a circular design of 1.2 cm in diameter

steps of the technique are similar to those used by most surgeons. The only variables are in the design of the disinsertion of the umbilicus of the elevated flap and of the incision in the skin of the flap that is already adorned, accommodated, and sutured partially in the suprapubic incision (Figs. 8 and 9).

The fundamental principle on which this personal technique is based is to avoid the tension or the deformity that might present between the orifice or fabricated incision in the skin of the cutaneous adipose advanced flap and the previously disinserted umbilical scar during the elevation of the flap. For this, we take into account the podalic direction of the traction force of the flap, when sutured to the initial suprapubic incision. This force of traction allows for an incision in the skin of the flap of a totally circular type, with a 1 cm diameter, to become an oval vertical incision of 1.5 cm long that matches exactly the size and the manner in which the disinsertion of the umbilicus was previously made. In this way we can obtain a new umbilicus with the desired shape and size, with the usual position, the depth that we estimate and above all, with an external scar with no tension, of good quality and of good aesthetic aspect. This scar might evolve poorly because of genetically-determined scar alterations related to the patient but this is not related to the technique per se (Figs. 10 and 11).

I will briefly describe the steps taken in this personal neo-omphaloplasty technique, starting at the moment when the flap has been advanced, positioned, resected and fixed to the central part of the suprapubic.

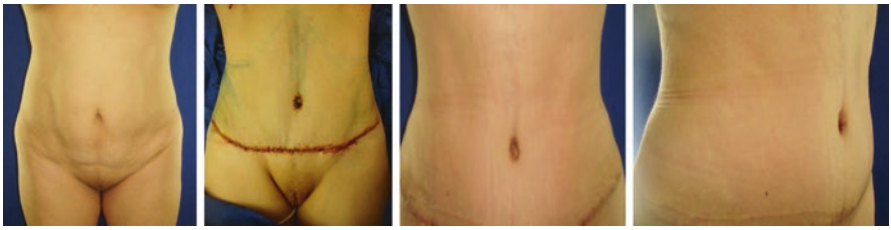
**Fig. 8** Incision and automatic transformation of the circular shape of the anterior marking, to vertical oval with dimensions very similar to those used in the navel detachment. Cutaneous resection and subsequent vertical and peripheral lipectomy are continued with scissors from the new umbilical area, and median supraumbilical liposuction with cannula

**Fig. 9** Total transformation of the circular design (1.2 cm diameter) of the skin flap by a vertical oval design of 1.5 × 1 cm wide, coinciding with the dimensions used to disinsert the navel, during the elevation of the skin-adipose flap. This favors suturing and healing

**Fig. 10** Exteriorization and suturing of the navel to the dermis of the cutaneous adipose flap, with 4/0 nylon "U" stitches. These are fine stitches as there is no tension at the edges of the suture. The suprapubic suture ends at this point

**Fig. 11** Final aspect of the dermolipectomy with neo-omphaloplasty using my personal technique

Case 1



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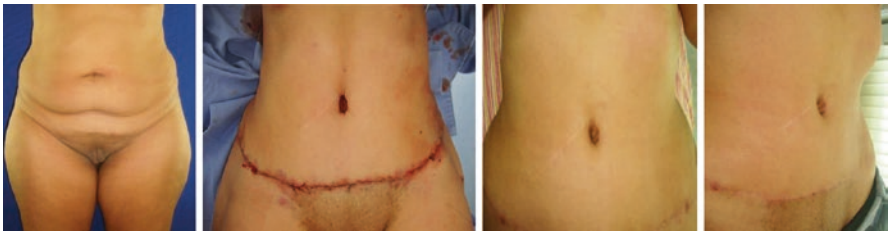
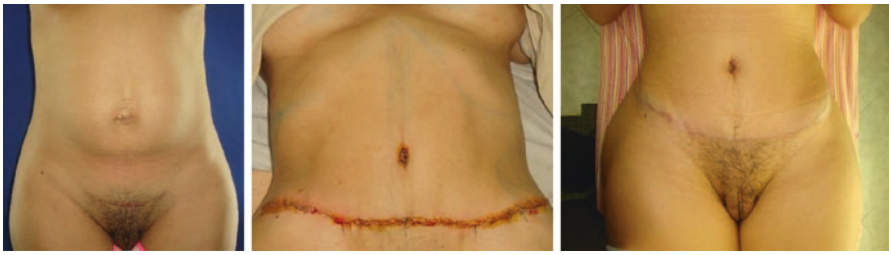


Case 3

Case 4

Case 5



Case 6

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# Emulation of a Newborn's Umbilical Scar

William L. Murillo

## Introduction

The umbilicus is a point of attraction on the otherwise unremarkable abdomen. It may be the only scar everyone wants to have and be proud of; in fact, many cultures consider the navel to be sexually appealing [1]. The umbilicus is even a metaphoric symbol of personal independence (i.e., to have one's umbilical cord cut off). Therefore, in modern abdominoplasty, surgeons are required to pay more attention to the aesthetic aspects of the umbilicus.

The umbilicus is a dimpled mark bounded by natural skin and located in the midline of the abdomen, on the same plane as the superior iliac crests [2]. Diverse techniques have been published in the medical literature in an effort to recreate a natural-looking belly button. However, many of these creative approaches have achieved flawed results. Some procedures try to hide the ensuing scar [3, 4]; however, hypertrophic scars, stenosis [5], widening, or a perceptible tone difference between the abdominal flap and the umbilical skin may occur. Scarless techniques [6, 7] may result in unnatural skin tone continuity or a loss of depth in the long term, with a flattened and bizarre appearance at the umbilical location.

As I tried to find a solution to these problematic outcomes after abdominoplasty, I was attracted to a course of action based on umbilicus healing in the newborn. During the first week after birth, a baby's umbilicus mummifies and usually falls off

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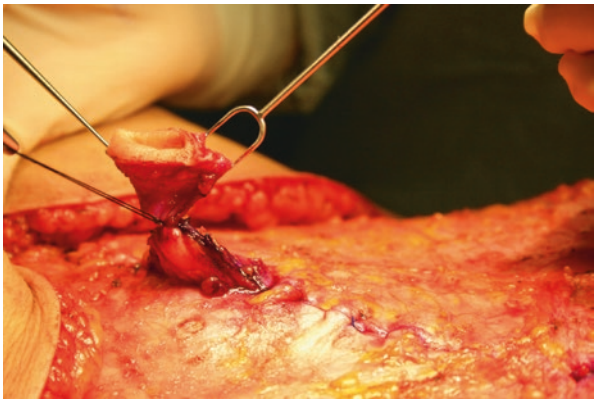
between the 7th and 10th days, leaving behind an open wound. By the end of the second week, the navel wound is healed while it retracts and contracts. The technique presented in this chapter is used in a tummy tuck as a biomimic of the normal process of umbilicus scar formation. This neo-omphaloplasty technique is called EMCUBE, a spanish acronym for "baby's umbilical scar emulation" (and also a reference to an incubator device).

## Technique

All ordinary markings for abdominoplasty are drawn with the patient in a standing position. The incision and undermining for abdominoplasty is performed along with plication of the rectus muscle sheath in a manner similar to a four-leaf clover (Fig. 1). The raised abdominal flap is temporarily fixed to the suprapubic area, and the new navel position is determined [8–10]. Normally, I perform this through a cutaneous projection of a finger placed on top of the umbilical stalk. At this point, a 2-cm-long incision is made in the abdominal skin, along with resection of a cylinder of the underlying fat tissue. A defatted area around the incision helps to form a dimpled spot [11].

Next, the umbilical stalk is tied at approximately 0.5 cm above its implantation with a 2–0 silk suture. The distal portion containing the skin is ablated (Figs. 2 and 3).

**Fig. 1** A four-leaf-clover sheath plication allows for an increase in the umbilical depth



**Figs. 2 and 3** At the marked point, the umbilical stalk is tied around and the distal portion is ablated

Using a 2–0 silk or Monosyn® suture, the four cardinal points of the umbilical stalk are sutured subdermally to the abdominal flap as follows:

– At the superior and inferior border, the skin is sutured only to the umbilical stalk beneath its tie (Fig. 4a, b).
– Lateral borders of the incision are also attached to the umbilical stalk and the aponeurosis [12] (Fig. 5a–e).

Sometimes, patients do not need a complete sheath plication. In those cases, the navel's depth can be improved by vertically plicating the periumbilical fascia [13].

Ointment-impregnated gauze is used for the dressing and is left untouched for 2 days. After that, the preference is to leave the umbilicus open.

Postoperative management is very simple, but keeping the umbilical stalk dry and disinfected is critical in the approximately 5 weeks healing process. Therefore, daily cleansing is carried out only with 90% alcohol.

By the end of the second or third postoperative week, the stalk above the loop suture mummifies and falls off (Fig. 6a, b). As with a newborn's umbilicus, this

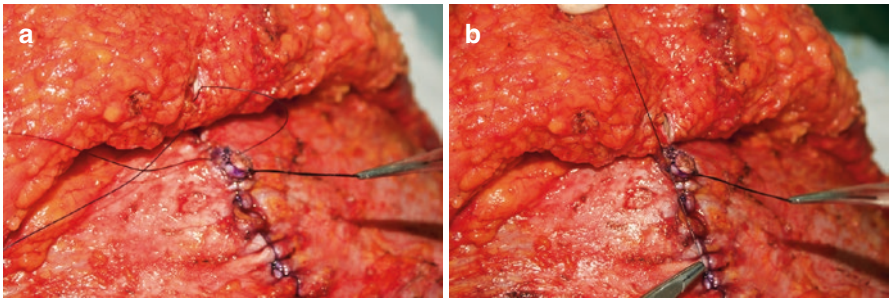



**Fig. 4** (**a**, **b**) The cranial part of the stalk is fixed to the superior angle of the neoumbilical incision at the cutaneous flap

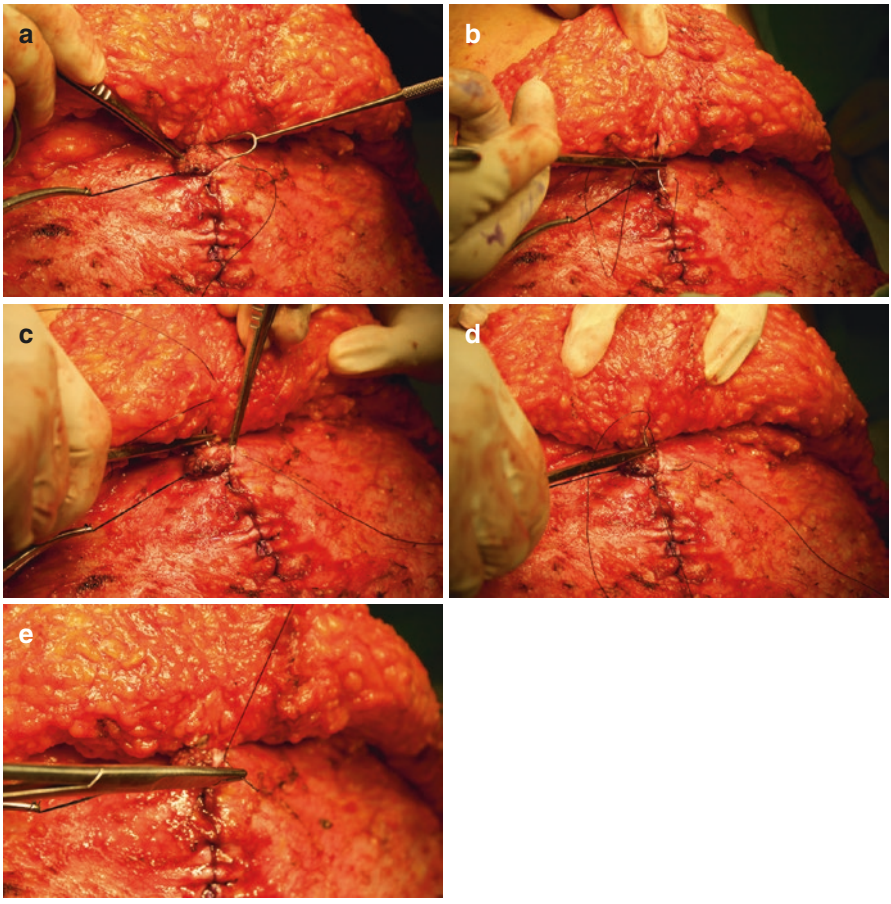



**Fig. 5** (**a–e**) Sequence of the neo-omphaloplasty technique, showing the lateral fixation of the stalk

**Fig. 6** An open wound of the neo-umbilicus is shown after the stalk has fallen off

begins the process of healing (Fig. 7). The remaining stalk suffers retraction and some degree of contraction. Consequently, the healed navel has a completely natural appearance, which in many cases is almost indistinguishable from a nonoperated navel (Fig. 8)

## Materials and Methods

From June 2008 until January 2016, I performed 237 cases of abdominoplasty with neo-omphaloplasty in my private practice. Patients' ages ranged from 19 to 63 years of age. The aim of this study was to track the umbilical evolution for at least for 1 year postoperatively.

The process started with a single vertical incision on the abdominal flap, suturing its borders to the umbilical stalk. Although a good navel depth was achieved, the resulting scar contraction at the central portion had a narrowed appearance. Thus, the procedure was revised attach the skin, umbilical stalk, and rectus abdominis fascia together as described in the previous section. This improved the central core, with retraction that provided a natural aspect to the umbilicus.

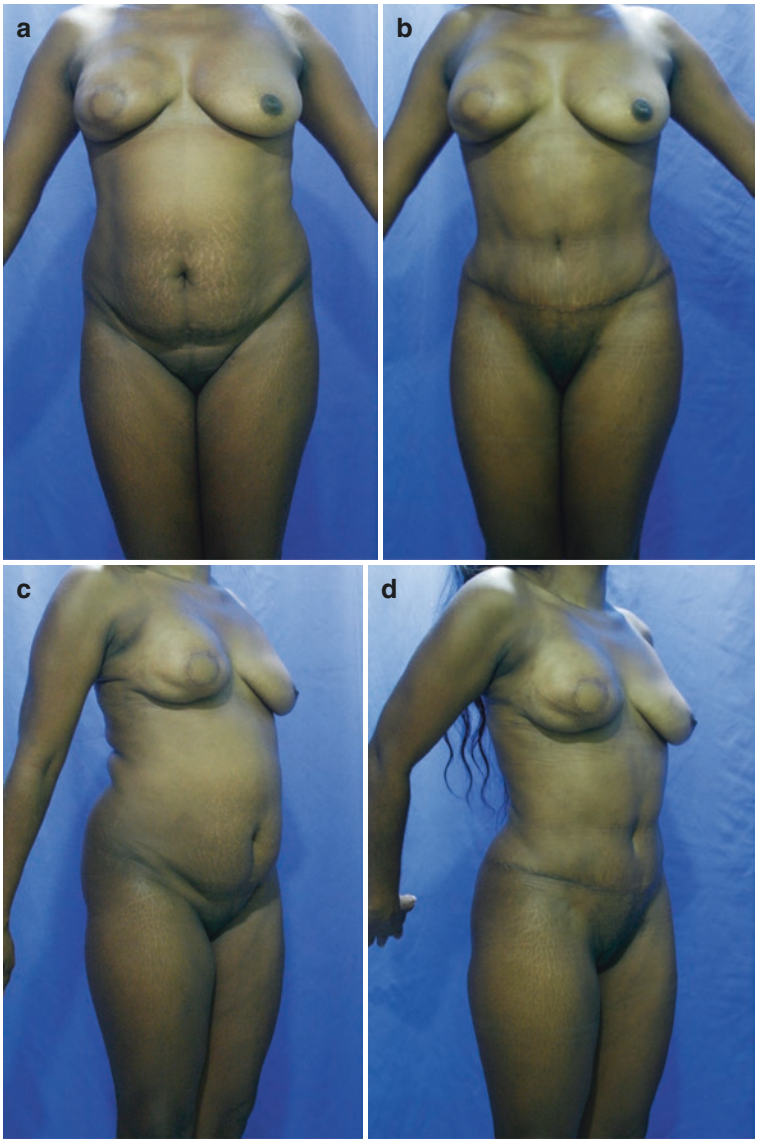
**Fig. 7** Umbilical healing process

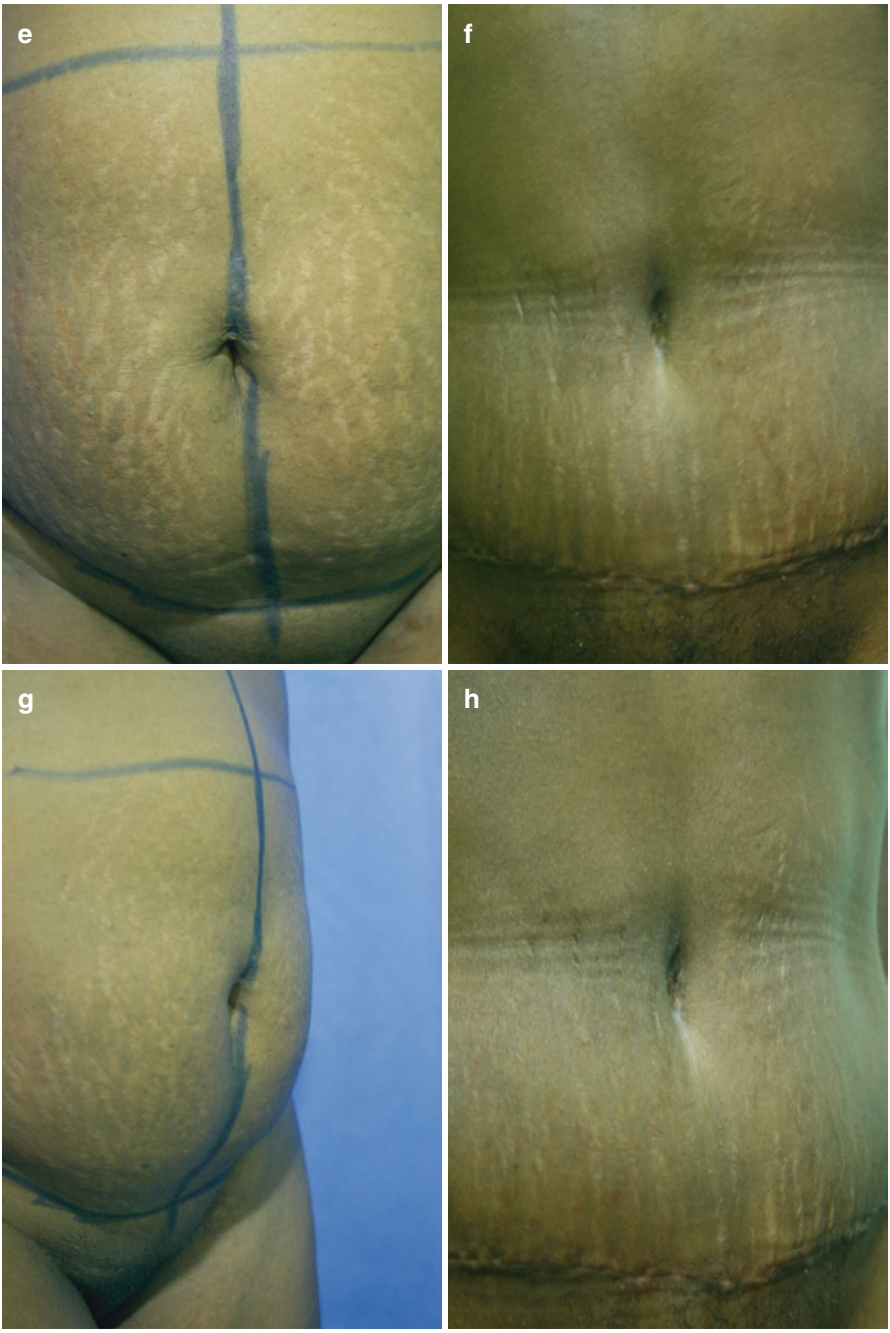
**Fig. 8** Long-term results of the umbilicus

## Results

Using this technique, the umbilicus could be reproduced without the well-known issues associated with abdominoplasties, such as a noticeable scar, widening, stenosis, or mismatched skin tone. In general, patients were very pleased with the outcomes, especially when they had the opportunity to compare their postoperative navel with that of a friend who also got a tummy tuck with another umbilical technique. Patients were extremely impressed with the superior quality of their results and expressed great satisfaction with the method (Cases 1–6).

Case 1. 46-year-old female patient at before surgery, 1 year postoperative and 2 months after lower scar revision

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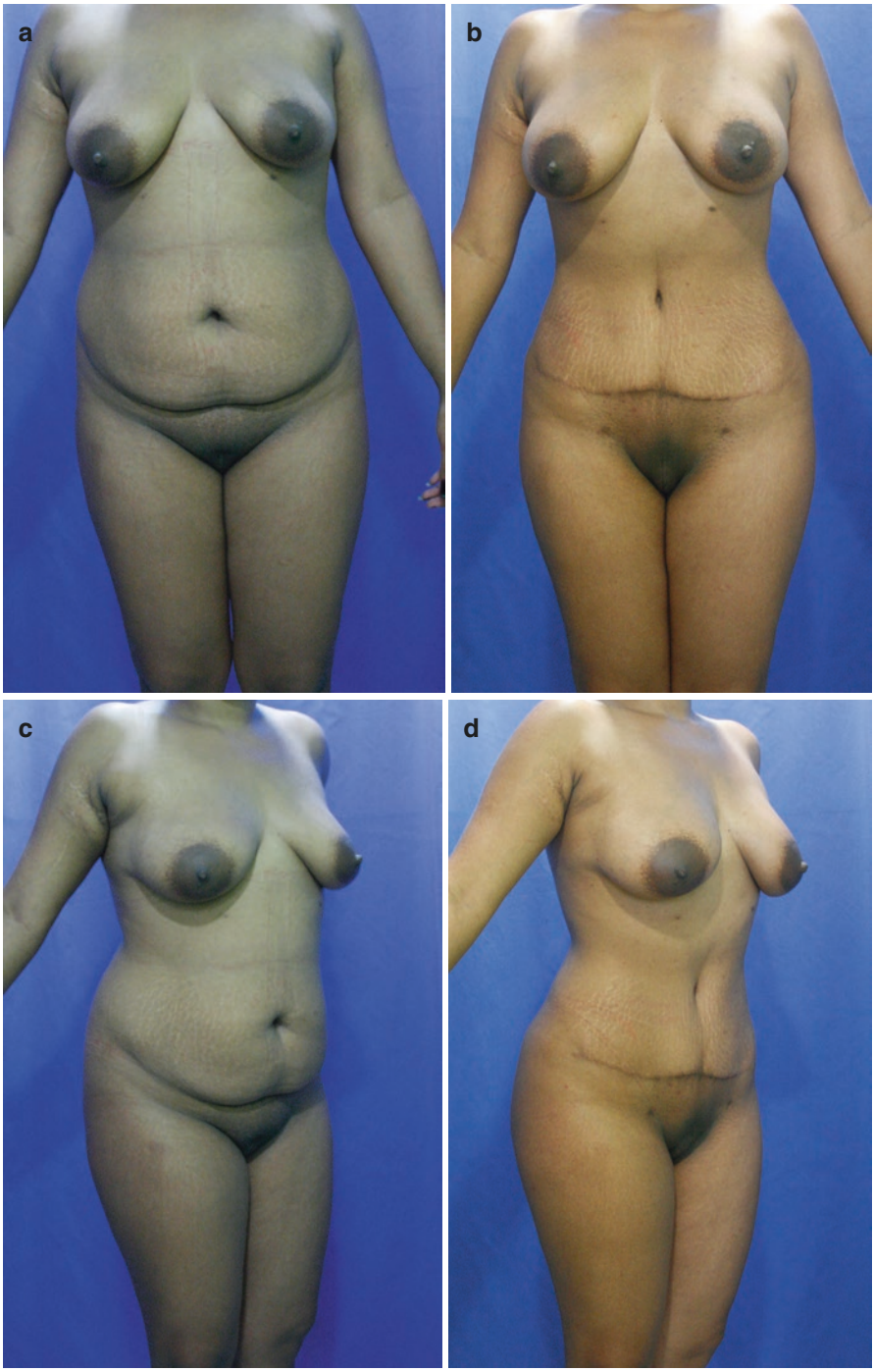
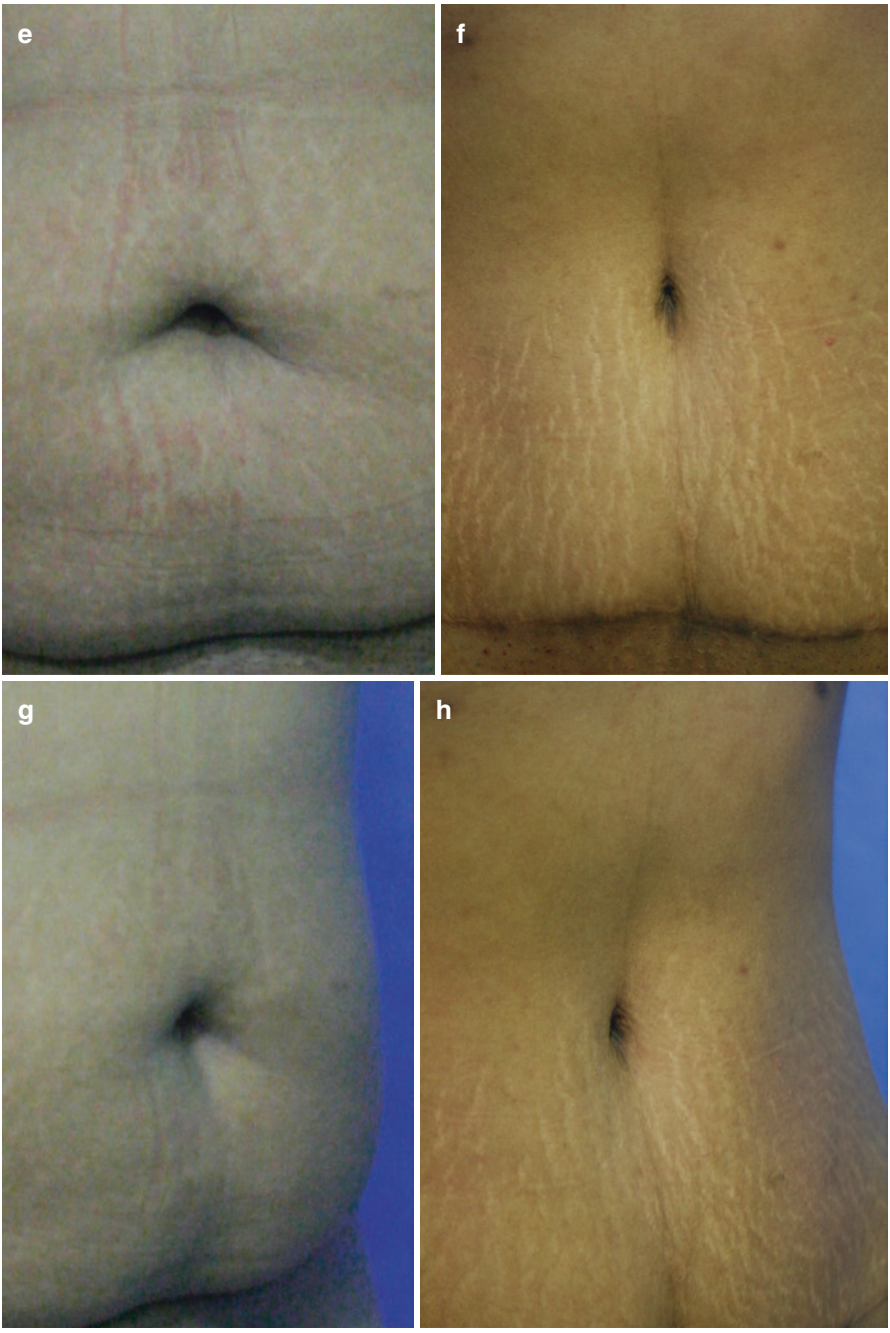
Case 2. A 26-year-old female patient at before and 9 months postoperative.

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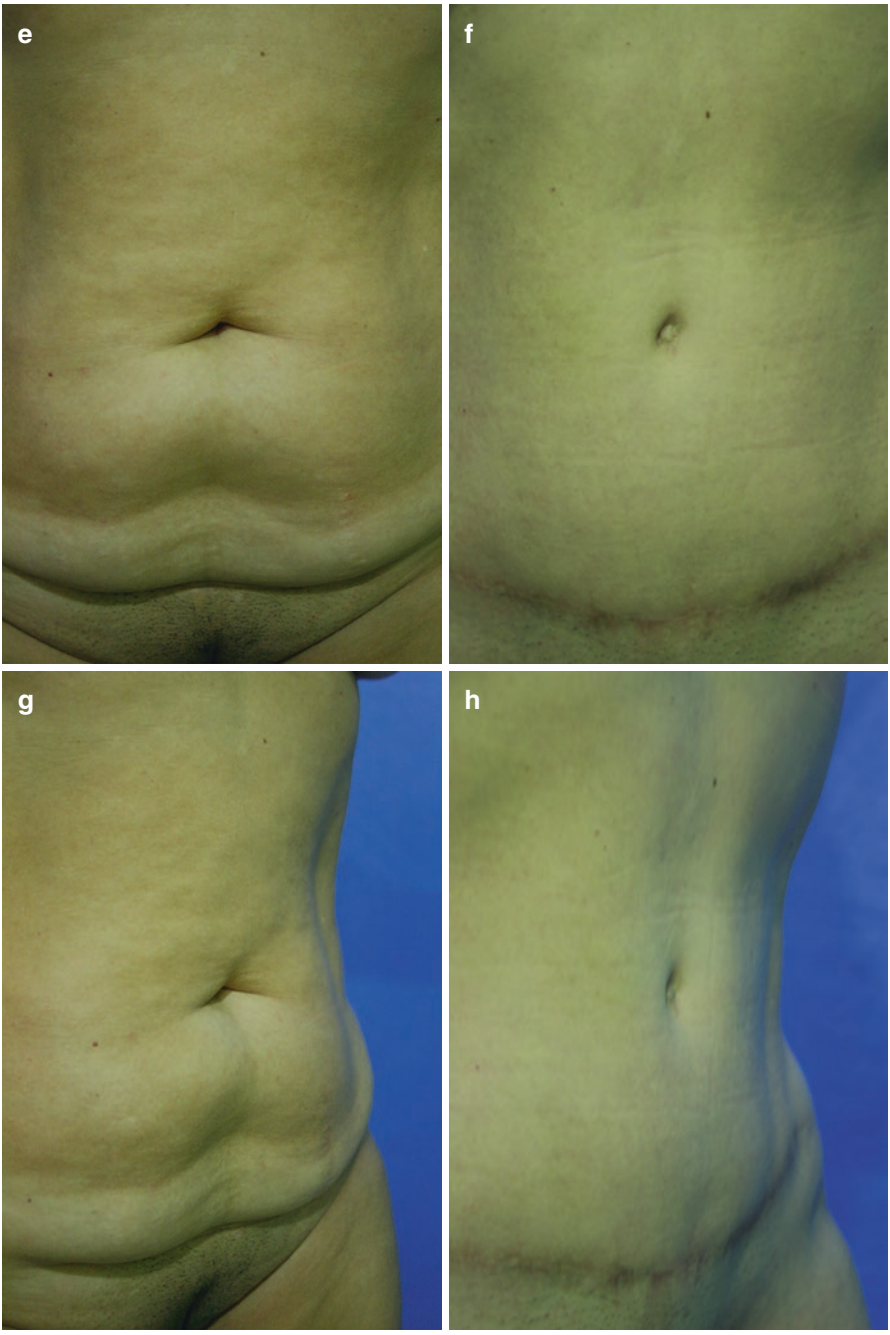
Case 3. A 54-year-old female patient at before and 2 years postoperative.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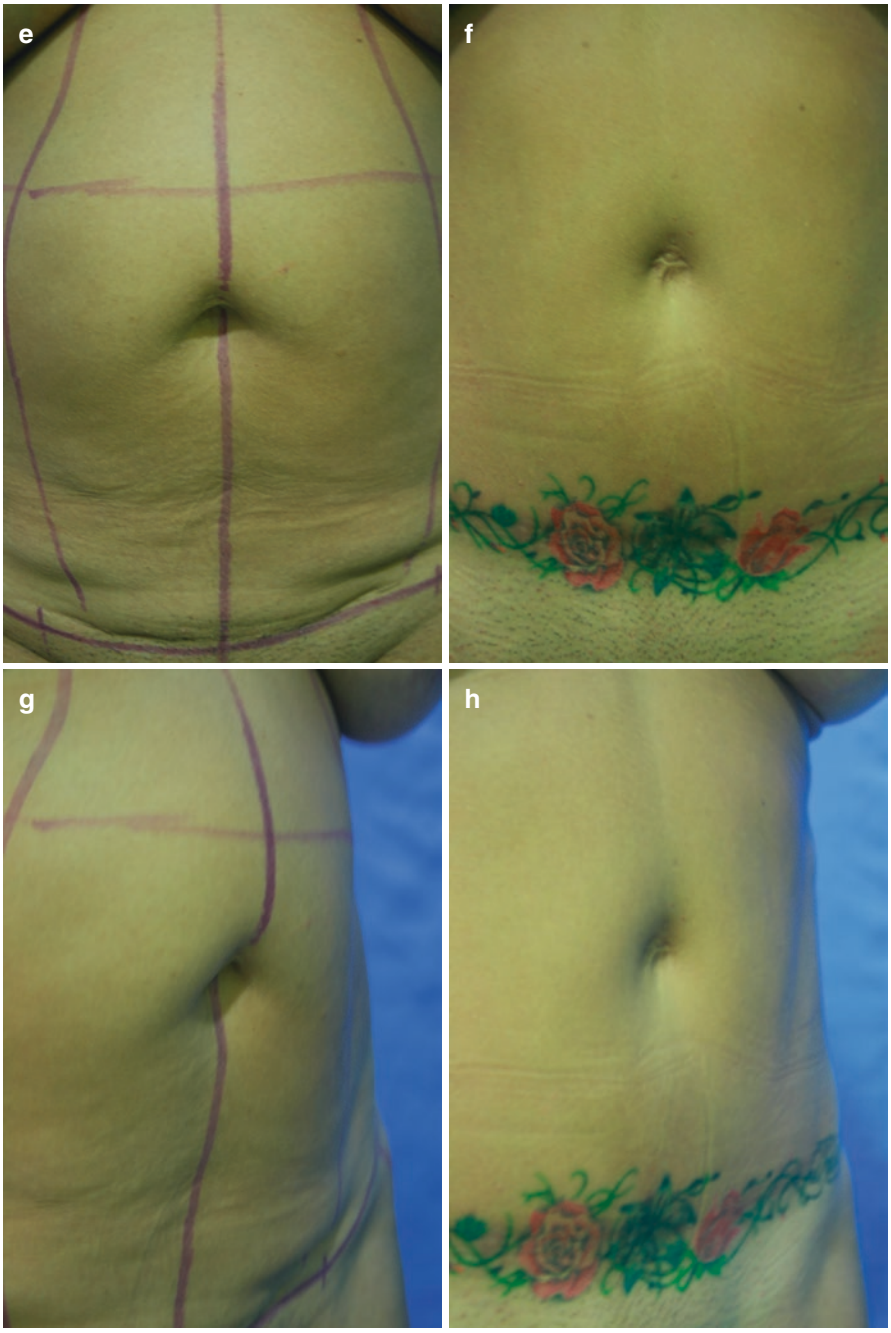
Case 4. A 45-year-old female patient at 1.5 years postoperative.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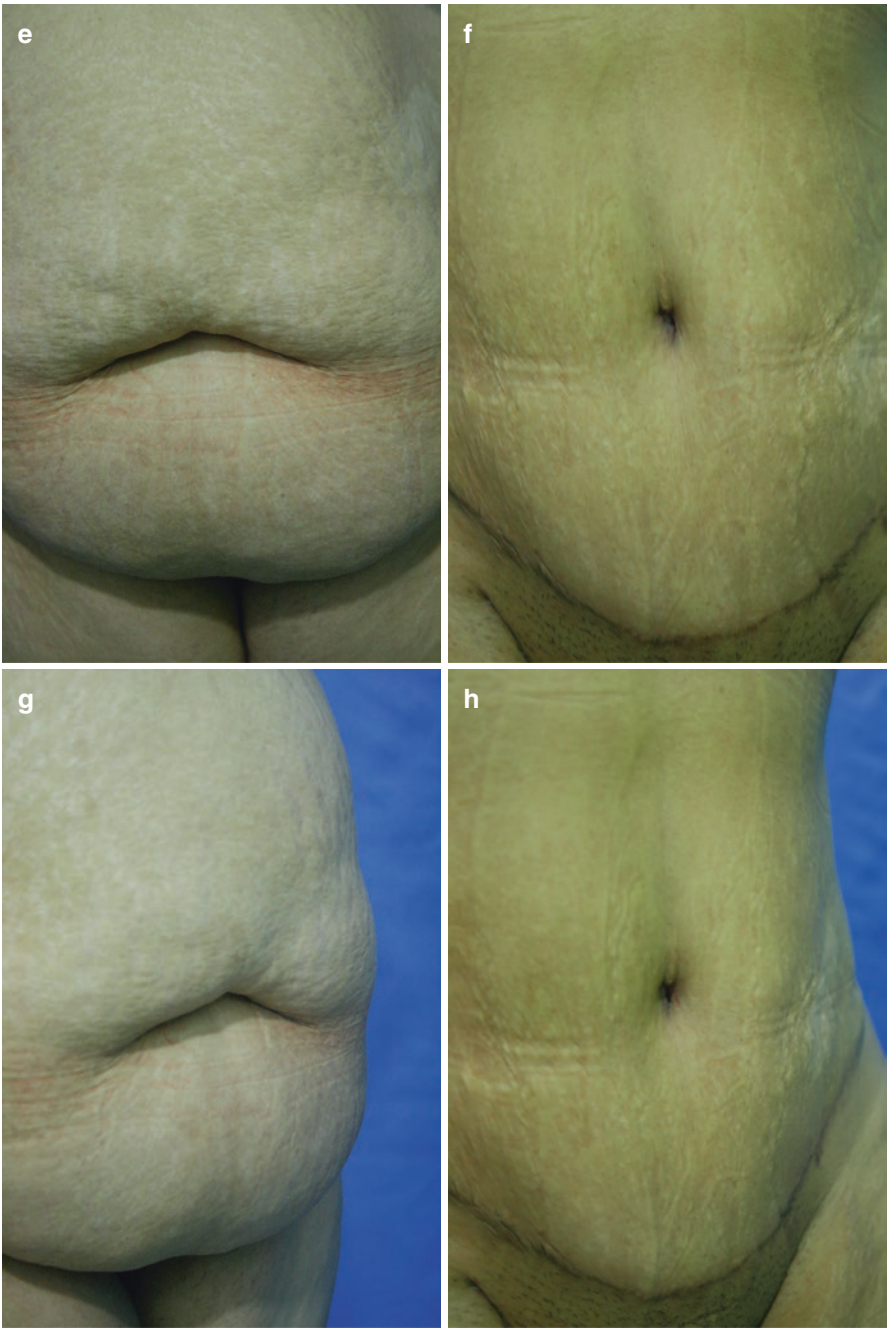
Case 5. A 38-year-old female patient at before and 5 months after abdominoplasty and 2 weeks after a secondary reduction mastoplasty.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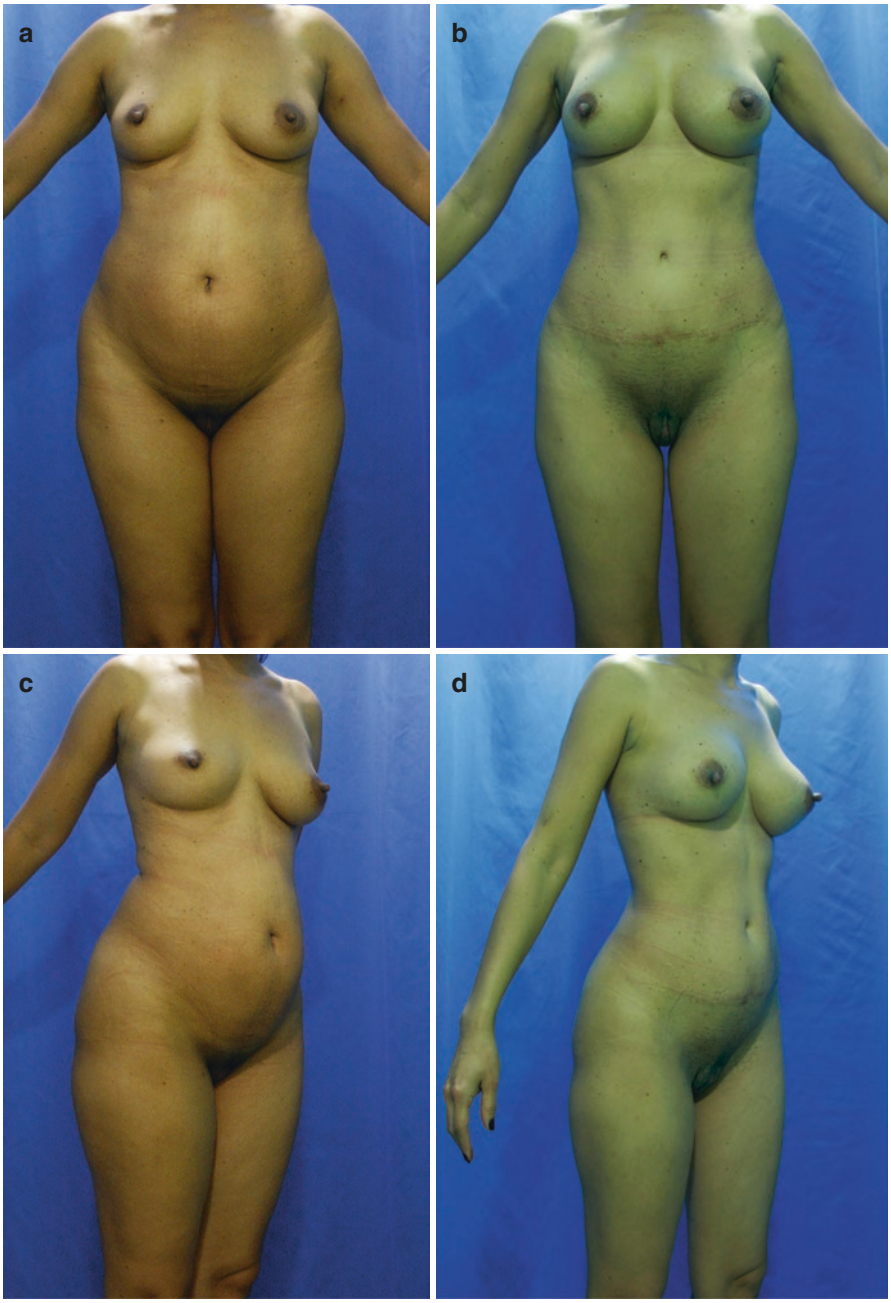
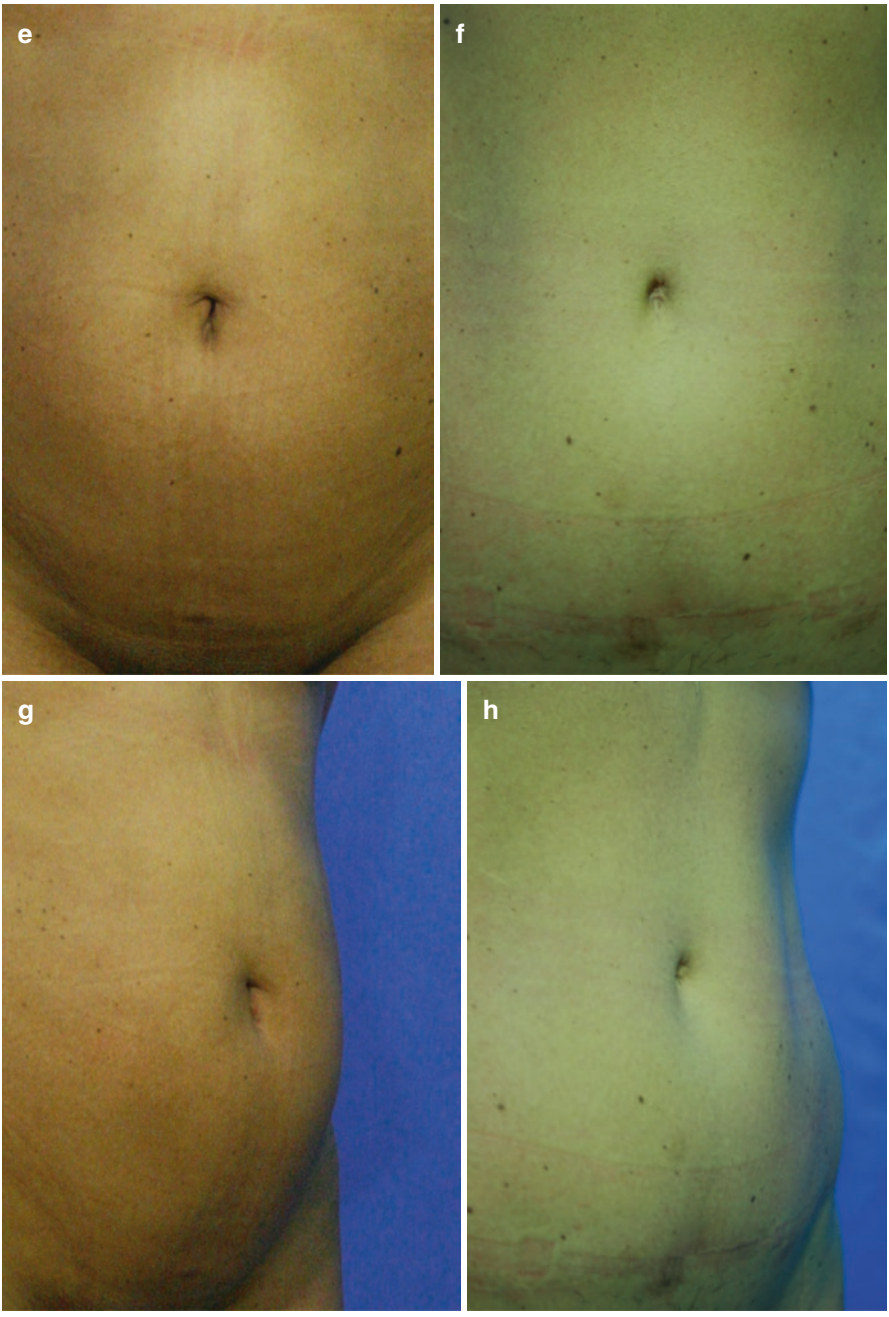
Case 6. A 47-year-old female patient at before and 4 years postoperative.

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## Complications

One major complication occurred, which was not related directly to the umbilicus but to the abdominoplasty. Classical triangular abdominal skin necrosis occurred, with its base at the lower incision and its apex at the umbilical point. Reconstruction of the abdominal wall was performed with advanced local flaps. In the beginning of the healing process, the umbilical depth appeared to be lost. However, in the long run, it resulted with reasonably good aspect (Fig. 9a, b).

A few minor issues (not complications) were related to delayed falling-off or delayed healing of the umbilical stalk up to two months. Patients expressed worries about (what they considered to be) the yellowish, undesirable appearance of their navel. However, once patients received an explanation about the process, they were appeased.

## Discussion

Aspects such as positioning, shape, depth, and scar are all involved in aesthetic omphaloplasty. However is the scar which usually receives surgeon's full attention. This is the reason why the vast majority of described techniques in omphaloplasty attempt to conceal or avoid a periumbilical scar, which is viewed as an undesirable

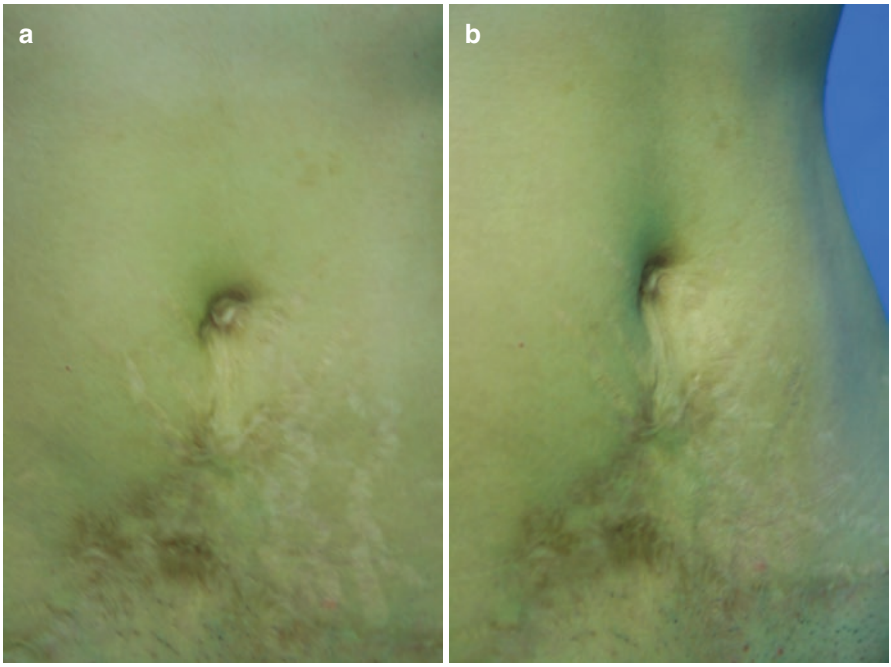


**Fig. 9** (**a** and **b**) This patient experienced triangular necrosis from the navel (apex) to the lower abdominal incision (base), however ended up with reasonably good umbilical outcomes 8 years after the procedure

outcome of the procedure. Some authors try to hide the scar by anchoring the umbilical skin to the rectus fascia. Their variation is on the abdominal flap. For example, Massiha et al. [3] used a single Y incision to achieve a natural appearance, whereas Lee and Mustoe [4] used a vertical incision on the abdominal flap to ensure a youthful-looking umbilicus.

Lim and Tan [14] used a method in which two small triangles of skin were removed along with a large cylinder of fat underneath. The skin flaps were then sutured to the underlying deep fascia to create a vertical slit appearance for the umbilicus. Rozen and Redett [15] depithelialized the skin in the neoumbilical position and incised it in the midline. This resulted in two dermal flaps that were sutured down to the abdominal fascia, creating a periumbilical concavity for an inconspicuous scar through a tension-free closure.

In their scarless technique, Schoeller et al. [6] lifted the abdominal flap. A round area of approximately 6–7 cm in diameter was defatted from underneath at the new navel site. Next, a purse-string suture was stitched to the dermis at the peripheral margin of the defatted circle from the inner side of the lifted abdominal flap. The suture was then tightened until the circle diameter shrunk from the initial 6–7 cm to 2 cm, imitating the umbilical crater. The preserved, original umbilicus skin was then depithelialized, maintaining the cone shape into which the skin crater created by the purse string was sutured. Mazzocchi et al. [13] made a double-opposing Y incision on the abdominal flap and sutured its borders to a designed elliptical umbilical skin island, which was previously attached to the abdominal rectus fascia.

In cases of absence or necrosis of the navel, Baroudi [16] performed a transverse incision on the abdominal flap. He defatted the area around the incision and stitched its edges to the fascia, leaving an open area to be healed by second intention. At first glance, Baroudi's procedure may appear to be the same as the one described in this chapter. However, it varies in a number of aspects. For example, I preserve part of the stalk, which generally allowed umbilical indentations to form. I also leave the stalk to heal along with the abdominal skin flap and preserving the umbilical sensation.

The method presented in this chapter aims to achieve a natural appearance of the navel by reproducing its normal process, with good positioning, shape, depth, and minimal scarring. A lack of the typical umbilicus issues associated with abdominoplasty is of paramount significance to the patient's self-esteem.

## Conclusions

The umbilicus, as the central aesthetic attraction in the abdomen, has gained special attention in the process of cosmetic or reconstructive abdominoplasty. As stated by Park et al. [17], navel loss or deformity may be a source of psychological distress for many patients. In my experience, this statement is true, especially for younger patients.

A youthful and appealing umbilicus has been described as small, vertically oriented, and deep with superior hooding [4, 18, 19]. All these aspects are related to wound contraction, growth process, periumbilical fat deposits, and gravity. That said, a variety of navel shapes can be found in the general population.

Biomimicking the natural umbilical scar formation allows for the innate development of these desirable characteristics. In my experience, this technique offers significant improvements over past procedures. The natural-looking characteristics achieved with this method may help to change the way this important component of abdominoplasty is treated in the future.

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# Creation of the Umbilical Region During Full Abdominoplasty: New Concepts and Techniques

Juarez M. Avelar

## Introduction

The umbilicus is a natural scar located in the center of the abdominal wall as a result of the formation of necrotic tissue when the cut umbilical cord falls off a few days after birth of a newborn. The necrosis produces intussusceptions of the skin, creating a suitable depression with varied aesthetic outcomes. To reproduce this anatomical region is a constant challenge to surgeons.

Plastic surgeons should be very concerned about the umbilicus because it is an important aesthetical reference on the abdominal wall and to create it during an operation it is matter of art and hand ability.

Two groups of surgeries are performed on the umbilicus: (a) during treatment of local pathologies; (b) during full abdominoplasty.

## During Treatment of Local Pathologies

Several abnormalities can occur in the umbilical region: redundancy of skin, hernia, unaesthetic scars secondary to previous surgeries, diastasis of the rectus abdominalis, ectopic location of the umbilicus, flat surface caused by anatomical alterations, and several others that damage the aesthetical references of the umbilicus. All these deformities require an adequate approach to repair the anatomy as well as the aesthetic appearance in order to reinstate the harmony of the abdominal wall. The surgical treatment described herein can be used to adequately repair these abnormalities.

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## During Full Abdominoplasty

When Kelly [1] published the first aesthetic procedure on the abdomen, he resected a segment of excess panniculus to improve the body contour; this was the beginning of the history of abdominoplasty. The expression "abdominal lipectomy" is credited to him. His procedure used to be the base principle of several techniques published during a long period of panniculus resection without transposition of the umbilicus. However, Vernon [2] was the first author to describe upward umbilical transposition during abdominal lipectomy, and this allowed surgeons to extend the operation on the superior segment of the abdomen, which improved body contouring. In his original publication, he described performing a circular incision around the umbilicus in order to separate it from the abdominal panniculus wall. Consequently, the cutaneous surface of the umbilicus was in a circle shape. Afterwards, traction of the abdominal flap is made downwards for resection of the excess panniculus. For reimplantation of the umbilicus on the abdominal flap, another circular incision on the skin was made and a tube of subcutaneous fat tissue was resected in order to accommodate the umbilicus to be sutured (Fig. 1).Creation of a new umbilical region during full abdominoplasty is an expected procedure, since all panniculus below the umbilicus is resected and transposition is a matter of operatory procedure. Therefore Vernon's description opened a new era in abdominoplasty. Since then, other authors

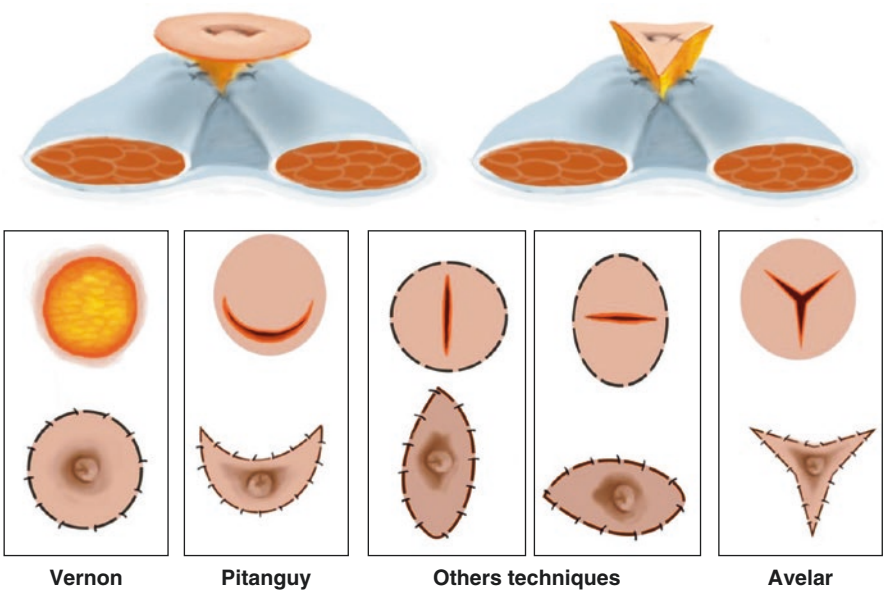


**Fig. 1** Other cutaneous incisions used in umbilicoplasty and their implantation on the abdominal flap. Top: The circular incision used in other techniques and triangular one in my technique for umbilicoplasty; Middle: Different cutaneous incisions on the abdominal flap and my triangular one; Bottom: Different shapes of the surgical wound after implantation of the umbilicus according to each technique

have published procedures with vertical or horizontal incisions and also a semicircular incision by Pitanguy [3], resulting always in a circular scar around the transposed umbilicus (Fig. 1). Even when outstanding surgeons perform the operation, the final results have not been satisfactory in most patients.

In a remarkable survey done by Grazer and Goldwyn [4], regarding 10,540 abdominoplasties performed by plastic surgeons from the USA and other countries, they found that umbilical scar contractures occurred in 45 % of the surgeries. In that survey, 2 % of the surgeons believed that some sort of retraction or contraction of the umbilical scar always occurred after abdominoplasty when transposition is done.

Since I started my practice in 1974, I gave special attention to creating a natural umbilical region during abdominoplasty in an attempt to solve some severe problems in the umbilicus associated with abdominoplasty. In my original publications [5–8], there are descriptions of an approach that proposed a new possibility, avoiding problems regarding scar retraction and even contraction (Fig. 1).

According to my approach, some surgical principles represent significant differences in comparison to the others: (a) the cutaneous incisions on the umbilicus are done following the skin direction lines from the outside to the inside; (b) the final scars make an atypical zplasty, which results in an aesthetically pleasing umbilicus as well as no scar retraction and contraction; (c) the skin of the abdominal wall is pushed to depth in order to be sutured to the umbilicus, instead of pulling the umbilicus to the outside as is described in other techniques; (d) the final appearance is a natural deep cavity in the new umbilical region; (e) the final scars rest smoothly on the interior side of the umbilical cavity; (f) the scars follow the direction lines of the umbilical region, which radiate from the outside to the inside (Fig. 1).Over the years, the basic principles of the method have remained the same, but according to my observations, some technical details have been revised to improve the aesthetic results [9, 10] when full lipoabdominoplasty is performed [11–13].

## Technique

The procedure must be performed in all full abdominoplasties since it is mandatory to perform transposition of the umbilicus.

The technique is performed in two steps:

(a) Surgical demarcations
(b) The operation

### Surgical Demarcations

Before surgery, meticulous demarcation is a mandatory step to create a new umbilical region during full abdominoplasties since the umbilicus must be transposed perioperatively. When one performs full abdominolipoplasty or full lipoabdominoplasty, creation of a new umbilical region is also an expected stage in order to rebuild the

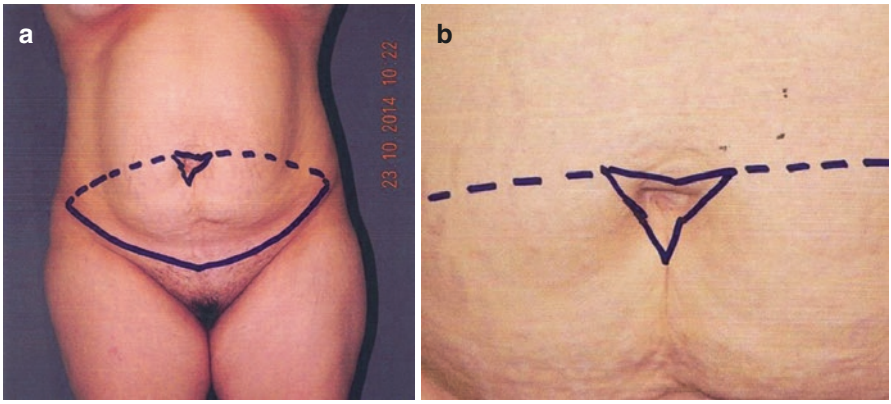


**Fig. 2** Surgical demarcations for full abdominoplasty before operation. Photograph (**a**) panoramic view of the infra-umbilical area to be resected during surgery. Photograph (**b**) close up of the umbilical region showing the triangular incisions around the navel

abdominal wall. Demarcations is a fundamental step and must follow surgical planning before plastic surgery. Regarding full abdominolipoplasty or lipoabdominoplasty, both steps are essential prior to the operation and must be done with the patient in a standing and lying down position. My preference is to demarcate all reference points on the day before surgery with the patient standing up and lying down in front of mirrors in order to follow my drawings. The demarcations on the umbilical region are done according to my approach published in 1976 and presented at the Brazilian Congress of Plastic Surgery and French Congress of Aesthetic Surgery (Fig. 1) [5, 6]. First a circle of about 2 cm in diameter must be drawn around the umbilicus to delimit the umbilical area on the surface of the abdominal wall. After drawing the circle around the umbilicus, a star-shaped incision with 3 triangular flaps is also demarcated. One flap must be directed downwards and other flaps are directed obliquely upwards to the right and to the left (Figs. 1 and 2).

In patients that have experienced massive weight loss or when there is excessive cutaneous flaccidity, the umbilical area shows some downwards inclination.

The skin area of the abdomen to be resected is also demarcated before the operation. My preference is to follow Callia's [14] and Sinder's [15] techniques to achieve the final scar as low as possible (Fig. 2).

## The Operation

The operation is made up of four steps:

(a) incisions on the umbilicus
(b) transposition of the umbilicus
(c) suture of the umbilicus
(d) dressing.

Full lipoabdominoplasty is a type of abdominoplasty without undermining the panniculus in combination with liposuction technique, which must be performed at a hospital under epidural or general anesthesia. Local infiltration with a special solution is done prior to liposuction and skin resection, which are both fundamental procedures during the operation. A special solution is prepared: 1,000 mL of sorum and 2 mg of epinefrine (1/1,000), which makes the dilution 2/1,000,000. With this volume, it is possible to infiltrate the entire abdominal wall and lateral sides of the torso. The infiltration is done on two levels: (a) on a deep plane below the fascia superficialis on the area where skin resection will not be performed; (b) full-thickness of the panniculus where skin resection will be done.

## Incision on the Umbilicus

The operation starts on the umbilical region where cutaneous incisions are done following the star-shaped drawing inside the umbilicus according to my demarcations. Initially, two horizontal incisions are done on the right and left side of the umbilicus according to Sinder's technique (Fig. 3a). Afterwards, subcutaneous dissection is performed with scissors (Fig. 3b) in order to prepare a tunnel to introduce my new surgical instrument (Avelar's Umbilicus Marker), which is a double half-circle with two-in-one type, to be articulated around the umbilical pedicle (Fig. 3e). Using this double half-circle instrument, the surgeon's assistant pulls the umbilical area upward (Fig. 3c). This maneuver is useful to elevate the cutaneous surface of

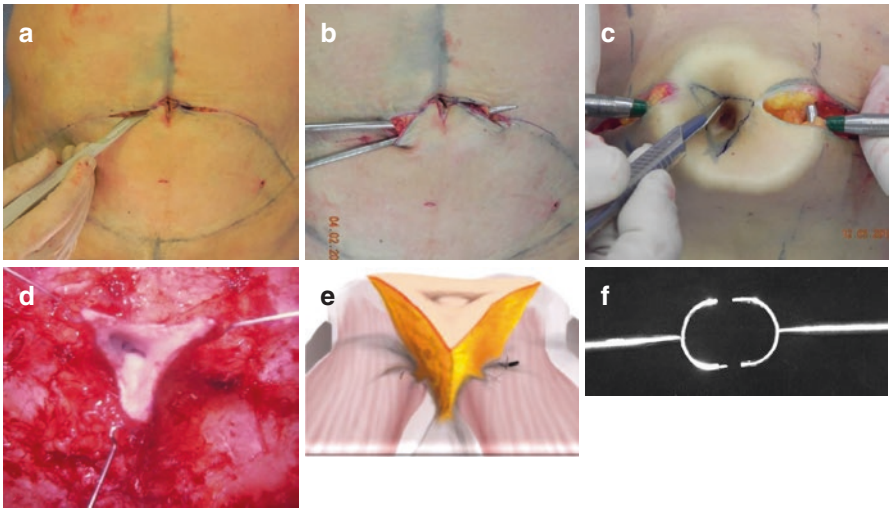


**Fig. 3** Creation of the umbilicus during full abdominolipoplasty. Photograph (**a**) shows horizontal cutaneous incisions on each side of the umbilicus; (**b**) with scissors, subcutaneous undermining is done all around the umbilicus; (**c**) using my double half-circular instrument, the umbilical area is pulled upwards to facilitate triangular cutaneous incisions inside the umbilical cavity with one flap directed downwards and the others directed obliquely upwards to the right and left; (**d**) photograph in close up showing the triangular surface of the umbilicus after incisions; (**e**) drawing shows the triangular surface of the umbilicus; (**f**) photograph of my double half-circular instrument

the umbilical region from the abdominal cavity to avoid any accidental perforation of the internal abdominal organs. Unfortunately, this kind of complication has happened during surgery even when it is performed by well-qualified plastic surgeons.

After cutaneous incisions are made inside the umbilicus with scissors, the pedicle is dissected downwards until the aponeurosis of the musculo-aponeurotic wall is reached in order to isolate the umbilicus (Fig. 3d). At the end of this stage, the cutaneous surface of the umbilicus is free, showing its triangular shape (Fig. 4a–c).

Afterwards, liposuction is performed on the deep layer of the panniculus, which is below the fascia superficialis, on the superior segment of the abdomen up to the rib costal rim preserving the perforator vessels. According to Sinder's technique, the superior flap is then pulled downwards in order to evaluate if it reaches the inferior border of the previous demarcations (Figs. 5 and 6a, b). At this time, the operating table is in a flexed position. Once the evaluation is made, the surgical table is returned to the horizontal position and liposuction is done on the full thickness of the panniculus on infra-umbilical segment preserving the perforator vessels and

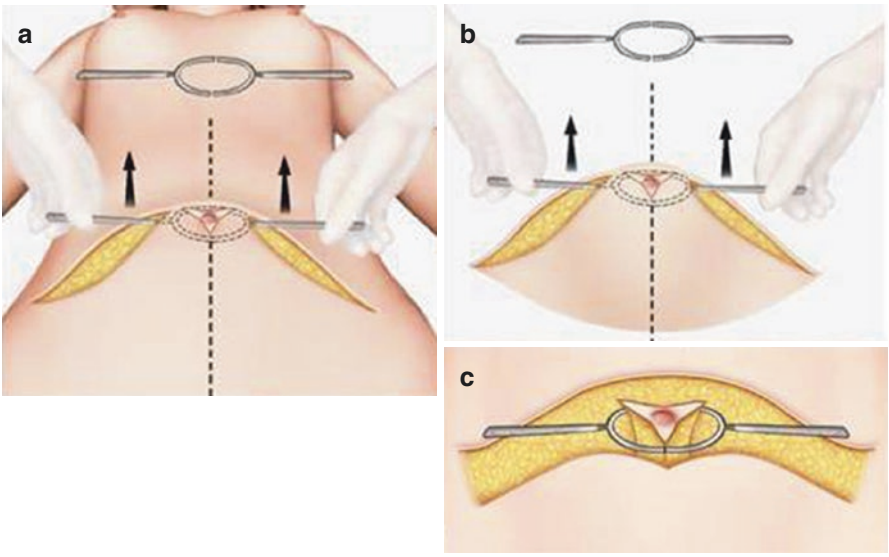


**Fig. 4** Sequential drawings showing the incisions on umbilical region during full abdominoplasty according to Avelar's technique. Drawing (**a**) the umbilical region is pulled upwards by the double half-circle instrument; (**b**) close up of the umbilical region after cutaneous incisions; (**c**) panoramic view showing the application of the double half-circle instrument

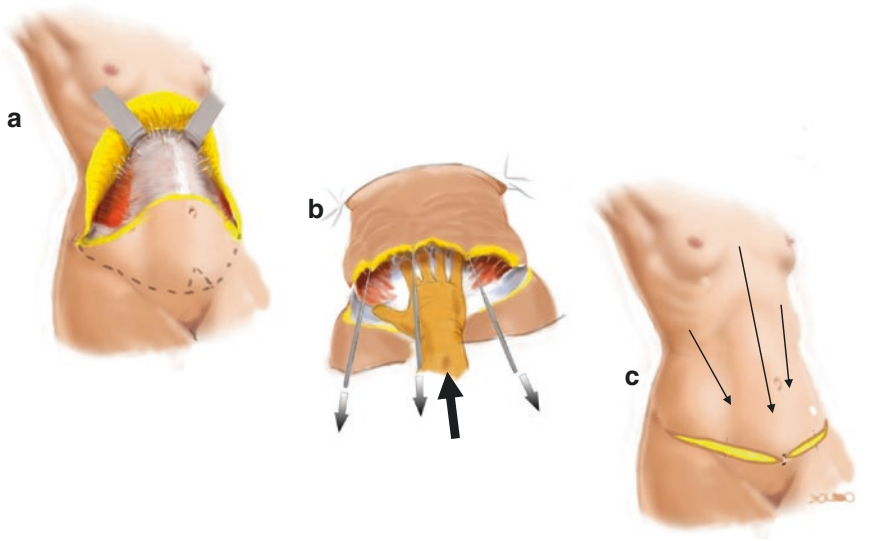


**Fig. 5** Sequential drawings showing the Sinder's technique during full abdominoplasty. (**a**) the panniculus is incised on superior line after liposuction of the upper abdominal wall; (**b**) the inferior segment of the abdomen is pulled upwards in order to be sure that the superior flap can reach the inferior line previously demarcated; (**c**) the superior abdominal is pulled downwards as indicated by arrows

connective tissue. Afterwards, skin resection of the abdominal wall following the demarcated area is a mandatory procedure. My operation is done according to Sinder's technique through which the upper incision of the area of skin to be resected begins at the junction of the curved line on both sides of the umbilicus, with a slight curvature downwards following the demarcation [15, 16]. The subcutaneous tissue is held so that the knife does not damage the subdermal layer underneath, and consequently there is no bleeding.

When patients present with diastesis of the muscular rectus, it is a good indication for reinforcement of the musculo-aponeurotic structures and this is the appropriate time to do it (Fig. 6c, d). The procedure regarding its plication is done on the midline with non-absorbable material with isolated stitches from 5 cm below the xhyphoid process to the umbilical pedicle. Below the umbilicus, the aponeurosis is reinforced on the midline until the pubis.

Demarcation of the new umbilical area is an important and difficult step of the operation and it is done using a device I created (Avelar's Umbilicus Marker) (Fig. 7a, b). It is placed on the connective tissue and perforator vessels remain after liposuction procedure (Fig. 7c, d).

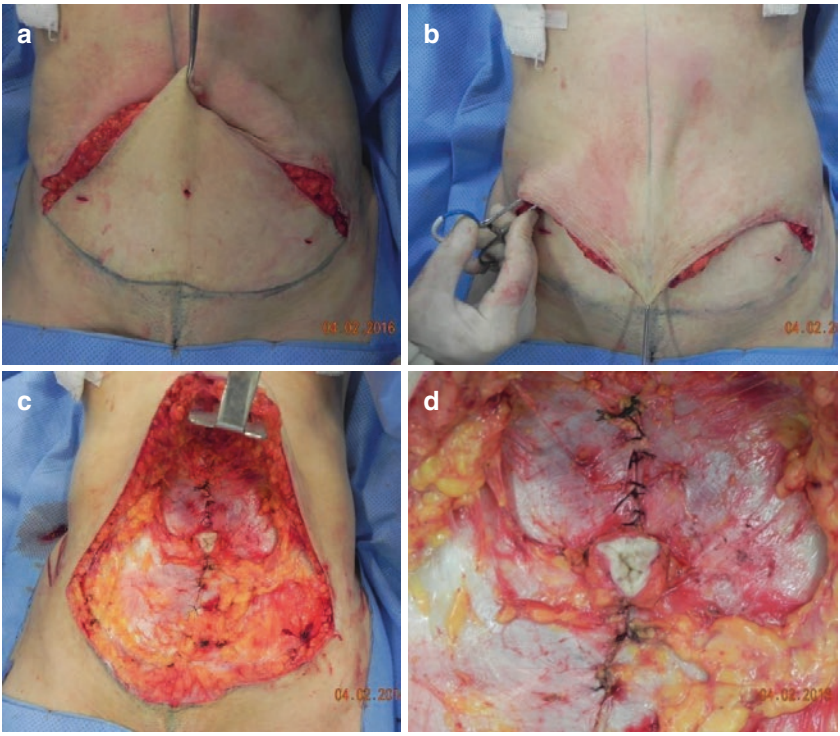


**Fig. 6** Photographs during surgery showing Sinder's technique. (**a**) the infra-umbilical segment is pulled upwards; (**b**) the superior abdominal flap is pulled downward to evaluate before resection the inferior one; (**c**) panoramic view of the abdomen after resection of the inferior segment; (**d**) photograph in close up showing the triangular umbilicus after plication of the abdominal aponeurotic wall

## Transposition of the Umbilicus

Once again, the surgical table is placed in the flexed position in order to facilitate the traction of the abdominal flap, which is pulled downwards. A temporary stitch is made on the midline to suture the inferior border of the upper panniculus to the border of the remaining panniculus in the supra-pubic region. Then, the surgical table is returned to the horizontal position in order to demarcate the new umbilical area and with my marks at the point corresponding to its projection on the cutaneous abdominal surface. The midline of the abdominal wall must be drawn before the operation in order to give the correct orientation to demarcate the new umbilicus on the abdomen. To determine the new location, my surgical instrument (Fig. 7e) allows for the achievement of the exact position of the new umbilicus and simultaneously where the final scar will be, since the instrument is a marker as well as a ruler. This instrument also protects the aponeurotic wall underneath and avoids any damage to the intra-abdominal organs since it lies smoothly on the aponeurotic wall. According to my previous publications [9, 10] on late follow-up, the umbilicus

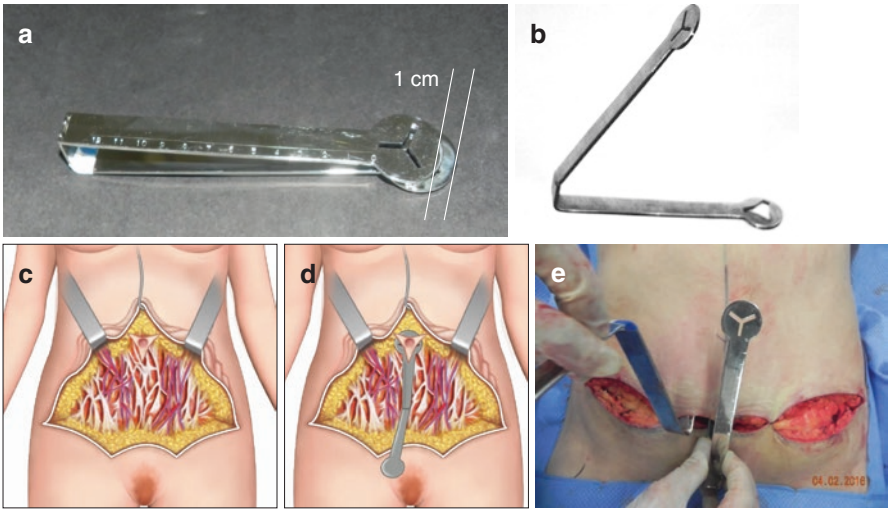


**Fig. 7** Demarcation of the new umbilical region during operation. (**a** and **b**) photographs of the Avelar's Umbilicus Marker show that the superior segment is 1 cm shorter than the inferior one. It is articulated in order to place the lower segment on the umbilicus and the other one lies on the abdominal flap; (**c**) drawing shows full thickness of the raw area with preservation of the perforator vessels and the connective tissue. One can see the umbilicus with a star-shaped surface; (**d**) diagram showing the lower segment of the umbilicus marker is placed on the umbilicus. The upper segment will determine the new umbilicus region; (**e**) the abdominal flap is already pulled and temporary stitches are done and one segment of my umbilicus marker is placed on the umbilicus and the other segment lies on the flap where the new area is drawn


**Fig. 8** Sequential per-operative photographs showing demarcation of the new umbilical region. (**a**) the superior segment of the Avelar's Umbilicus Marker is placed on the abdominal flap; (**b**) three cutaneous incisions were done following the demarcation on midline; (**c**) panoramic view of the abdomen after demarcation of the new umbilical region. The surgical wound will be sutured by isolated stitched in three layers

is pulled upward by the upper abdominal segment. For this reason, the final position of the umbilicus is marked at least 1 cm lower than its projection on the abdominal flap (Fig. 7a, b).

Avelar's Umbilicus Marker has two segments, similar to forceps, with the upper one 1 cm shorter than the inferior one in order to mark the exact projection of the umbilicus post-operatively (Fig. 8a–c). Usually, it is placed approximately 7–9 cm

above the supra-pubic incision. It is common for some patients to experience elongation of that distance from 2 to 4 cm or more 1 year after the operation.

### Suture of the Umbilicus

The umbilicus is then sutured with individual stitches of absorbable material 5.0. Following my technique, the tips of the three cutaneous flaps of the umbilicus are sutured between each small triangular skin flap created on the future umbilical region on the abdominal flap. The tips of the skin flaps of the abdominal wall are sutured between the cutaneous flaps of the umbilicus. Therefore, the final scar around the umbilicus will be a "broken" line like an atypical multiple Zplasty instead of being a circular one (Fig. 1) [5, 6, 8]. The final scar has a triangular shape, which is very important to avoid scar retraction and even contracture.

### Dressing

Dry gauze is placed inside the umbilical cavity and more gauze over it to apply light pressure over the umbilical area. This keeps the flaps in position and prevents scar tissue contracture. The final scar has a triangular shape, which is also very important to achieve good aesthetic results without any scar tissue contracture or even retraction (Figs. 9, 10 and 11). The dressing is removed 5–6 days after surgery

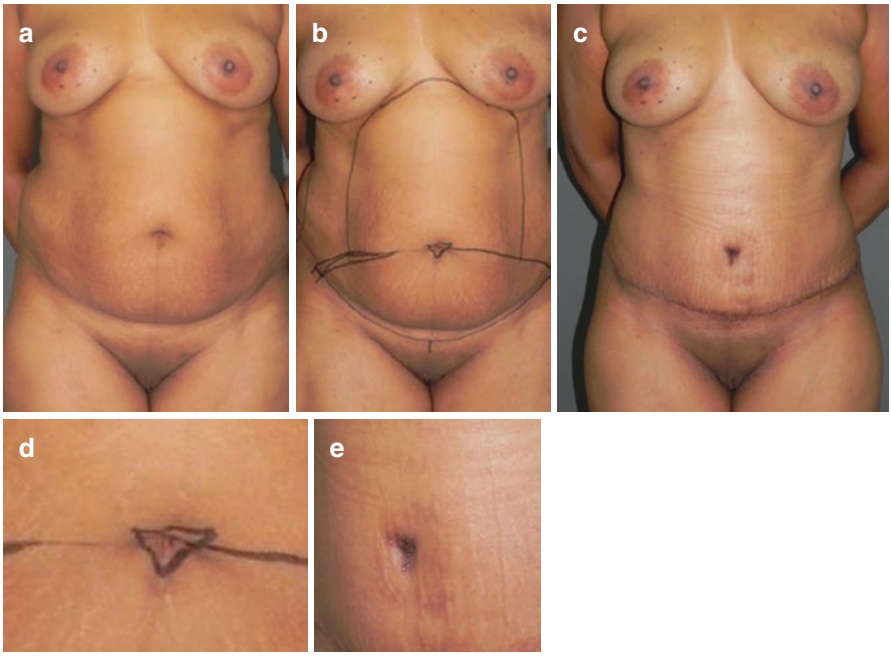


**Fig. 9** Surgical result of the technique. (**a**) pre-operative photograph of the abdomen; (**b**) surgical demarcations were done before operation; (**c**) same patient 3 months after surgery; (**d**) photograph showing in detail the triangular incisions of the technique; (**e**) same patient 3 months after full abdominoplasty showing the final aspect of the umbilicus

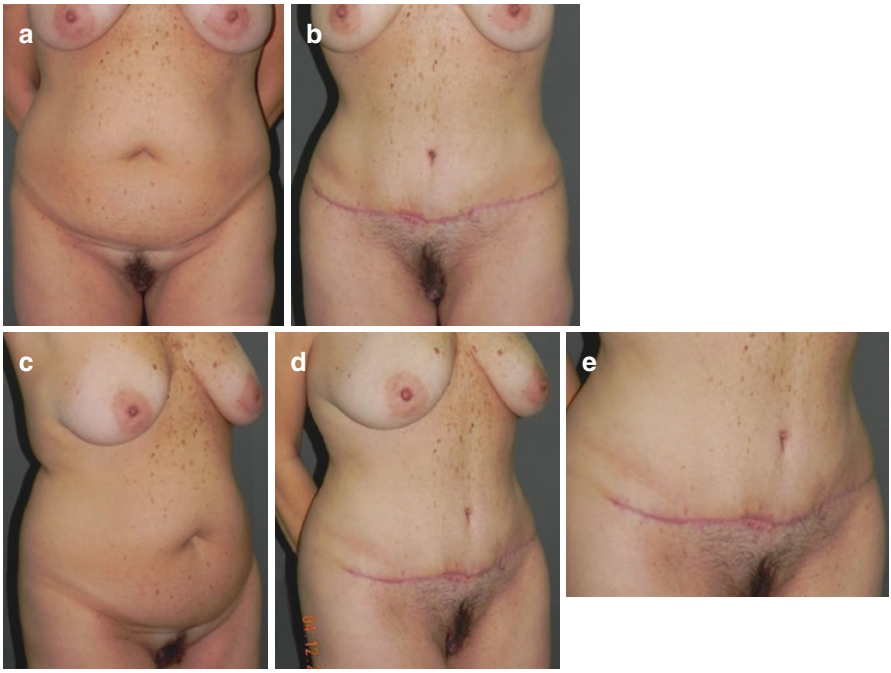


**Fig. 10** Surgical result after full abdominoplasty. (**a**) pre-operative photograph of the abdomen; (**b**) same patient 6 months after surgery; (**c**) oblique view of the same patient before operation; (**d**) surgical result of the full abdominoplasty; (**e**) shows the final aesthetic aspect of the new umbilicus

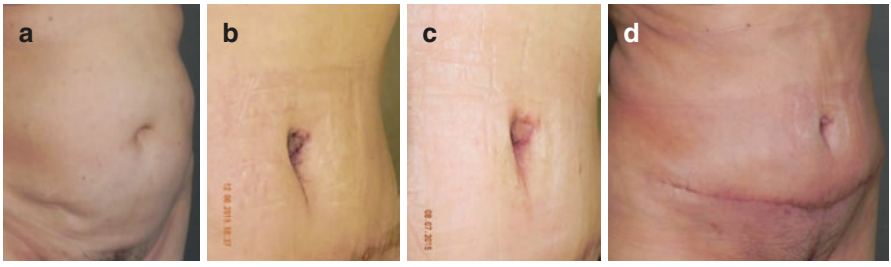


**Fig. 11** Surgical result of the technique. Photograph (**a**) pre-operative oblique view of a 65 year old female patient; (**b**) photograph in close showing the aesthetic aspect of the umbilical region 1 month after surgery; (**c**) same patient 3 months after operation; (**d**) final result 8 months after full abdominoplasty

when another dressing with dry gauze is placed inside the umbilicus and this is changed every 10 days for at least 2 months. The final result of the umbilical region after abdominolipoplasty is a smooth scar around the umbilicus in harmony with the abdominal wall [9].

## Complications

Since Vernon [2] introduced transposition of the umbilicus during abdominoplasty, this procedure became a mandatory step in all full abdominoplasties, even full lipoabdominoplasties. Therefore, Vernon's technique can be considered one of the most important contributions in this field. Nevertheless, it also brought many problems to patients and surgeons due to undesirable circumstances after operations, as reported by Grazer and Goldwyn [4] in a survey in which they found very high incidence of abnormal scars around the umbilicus with retraction and contraction. Those complications motivated me to create my technique to solve some of them. When my procedure is properly performed, the final result avoids a circular scar around the umbilicus. As the skin around the inner aspect of the umbilicus is the result of intussusceptions of the umbilical cord, the direction of the lines is from the outside to the inside. Therefore, when one performs an incision on the skin, it should always be done following that direction in order to avoid adverse scar tissue. If a circular incision is performed around the umbilicus, it will work in the opposite direction of the skin. In almost 40 years of employing my method on my patients, it is very seldom to see such adverse scars after the surgery. I've had to make a scar revision on one patient since she presented very bad scarring in the supra-pubic region. I have repaired and reconstructed the umbilicus in several patients secondarily to abdominoplasty. In other methods described in medical literature, the final result is a tendency to present circular scars that may retract or undergo contraction (Fig. 1).

## Discussion

Vernon's technique is a remarkable scientific development in abdominoplasty. Since then, many authors have presented other procedures with vertical or horizontal incisions and also a semicircular incision [17], which all result in a circular scar around the transposed umbilicus. Even when outstanding surgeons perform the operation, the final results have not been satisfactory in most patients. One of the most important surgical principles of my technique is to push the skin of the abdominal wall towards the deep structures of the musculo-aponeurosis (Figs. 9, 10, and 11). As a consequence of this new concept, the three small skin flaps created on the abdominal wall allow for suitable movement of the umbilicus already sutured close to the aponeurotic structures during the reinforcement procedure. Thus, the triangular flaps are sutured alternatively between the three triangular flaps created on the cutaneous surface of the umbilicus. Due to such movement of the skin flaps, a natural and smooth depression is created around the new umbilicus (Fig. 11b, c) [18, 19]. In other methods described in medical literature, the umbilicus is pulled from the depth to the surface of the abdominal wall, leaving a circular scar that may cause retraction and frequently contraction according to Grazer and Goldwyn's survey [4].

There are techniques for creating four or five cutaneous flaps on the umbilicus. No matter how many flaps are created on the umbilical surface as well as on the

cutaneous covering of the abdominal panniculus, the main surgical principle is to avoid creating circular scars. In order to develop my method, I analyzed geometric figures and found that the most "opposite" shape to the circle is a triangle. In using any other figure with a greater number of cutaneous flaps, there is a tendency to approximate to a circle. There are techniques for creating four flaps on the umbilicus. For this situation, four small cutaneous flaps must be created on the abdominal wall and the final scar will be a square star-shaped figure with four tips with four small scars around the umbilicus. Such a procedure is not a new one, since the basic principles are based on my method described in 1976 [5, 6].

In 1976, my technique was a new technique since, before my publication, there were no descriptions regarding these fundamental principles.

Finally, I'd like to emphasize that cutaneous incisions on the umbilicus must always be done following the direction lines of the skin that are from the outside to the inside. If a circular incision is performed around the umbilicus, the final scar may damage the aesthetic aspect of the umbilicus.

**Conclusion**

Creating the new umbilical region during full lipoabdominoplasty is an expected procedure that is a constant challenge, since it is located in the geometric central area of the abdomen and scars around the umbilicus will always remain. Using my technique, it is possible to achieve good aesthetic results, avoiding scar retraction and contraction, which are both unfavorable post-operative results. According to previous evaluation, planning, and demarcation, the whole area of cutaneous covering of the infra-umbilical region is always resected. Cutaneous incisions on the umbilicus are done prior to skin resection [20, 21]. When lower and upper abdominolipoplasty are performed, the umbilicus is not transplanted because the skin resection is limited to the supra-pubic area and sub-mammary folds.

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# The "Y-T" Navel Technique

Belman Galvis Maldonado

## Introduction

Obtaining a natural looking navel with a non-visible scar is one of the great challenges for plastic surgeons performing abdominoplasties. In fact, more than 50% of the patients operated on are unsatisfied with the quality of their navel as assessed by several studies [2–4]. An altered, stenosed, irregular, or visible operation scar on the navel can cause serious psychological disorders that affect the patient's self-esteem [1, 2]. Therefore, multiple techniques have been proposed to obtain the ideal navel.

The existence of many techniques indicates the great anatomical complexity of reconstructing the navel and the absence of a universally accepted procedure [2–4].

In general, the techniques are divided into two groups: those of circular tendency and the non-circular ones. The first group has been the traditional method for many years, with easier execution but a greater degree of dissatisfaction in patients.

In the past three decades, the non-circular techniques have become more popular. The well-known techniques include the triangular techniques, stars of four peaks, V-Y and double Y in opposite [2, 4–11, 14]. But the important thing is not only the form of the technique but also the fixation of the navel to the aponeurosis of the rectus muscles [4, 8, 11–14].

The objective of this chapter is to show our personal technique, which has been developed and tested in our professional practice for more than 20 years. The technique is easy to understand and practice, and there is a high possibility of obtaining a natural-looking navel. Normally, this technique results in no visible scars—a result that is maintained over time.

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## Historical Review

The navel itself is nothing more than a remainder scar of the umbilical cord, which in adults has no physiological function [5, 6]. But from aesthetic, psychological, cultural, and historical points of view, it is very important. In ancient Chinese culture, the study of the navel constituted a whole science that is "omphalomancy"[1]. The navel has been given a large and varied connotation depending on each diverse culture. But it was the Chinese who established some correlations between the shape of the navel and human behavior.

"Know yourself," repeated Buddha, looking at the center of the abdomen, where he saw reflected some mysteries of the character and temperament. In Buddhism, navels are classified as: large, small, round, almond-shaped, deep, Venusian, lotus flower etc. and according to these, behaviors are classified as more or less sensitive, passionate, willful, or extroverted.

The "chi nei tsang" millennial technique of abdominal massage revolves around the navel, in order to facilitate the "chi" fluid to balance the energies and restore the emotional state, improving physical and mental state. The "chi" is the vital energy that circulates in a balanced way through the meridians of the human body, where the navel is the center of that universe energy.

For the Taoist science, the navel has importance because it is the starting point of a fertilized ovum, where cells were duplicated, differentiating until giving new life following a strict order governed by the "chi" or vital energy.

In the Western world, the navel has nowadays a great importance for its aesthetic and sensual appeal [3]. However, for many years, showing the navel was considered to be taboo because it was considered an erotic visual stimulus, such as it was stated in the modesty code of Hollywood (1922) in which actresses were forbidden to show the navel in front of cameras.

A two-piece bathing suit that left the navel uncovered was proposed in France in 1946, initially with the name of "atom". Later, it was called "bikini" in honor of a small atoll in the Marshall Islands called Bikini, where the USA government was performing some atomic testing.

For years, the bikini was considered indecent and vulgar, but Brigitte Bardot revolutionized it when she wore one in the 1956 film "And God Created Woman". The bikini became more popular in the 1960s with the appearance in bikinis of the actresses in James Bond movies.

Showing the navel quickly became popular in most of the world, highlighting its sensual appeal on the female figure [3]. Today it is displayed even more and often adorned with piercings, jewelry, or tattoos.

[1] According to the Oxford dictionary, omphalomancy is a form of divination through which one can know how many children a woman is going to have, counting the number of knots of her first baby's umbilical cord. Also, an individual fate or personality can be determined by the shape or size of the navel (editor's note).

## Belly Button

The navel is a circular or slightly oval depression of 1.5–2 cm diameter, with an approximate depth of 1 cm, which varies depending on the thickness of the fat layer of the abdomen [8]. It is fixed to the deep plane in its upper half, presenting slight folds in its bottom. The navel usually has a small fold on the horizontal skin on the upper pole as a cap [5, 6]. The navel is part of "the scenery" of the abdomen, having a moderate groove up to the upper abdomen and to the sides and below, in the hypogastrium, a slight relief that softly reduces as it approaches the pubis [1].

The navel is located in the midline of the abdomen, which corresponds to the Alba line. Its central location in the human body has been described since antiquity. In 1490, Leonardo da Vinci improved the design of the famous "Vitruvian Man" where the navel corresponds to the center of the circle with the man standing up with his arms and legs spread open.

Anatomically, the navel is centered at the upper border of the line joining iliac crests, corresponding to the junction of the L3 and L4 vertebrae. This reference is usually used to ensure its ideal position, even if there is any anatomical variation of the body structure.

Since the use of the abdominal lipectomy technique in 1967 by Dr Ivo Pitanguy [10], there have been millions of people who have undergone this type of surgery all over the world, seeking to recover their youthful bodies and improve their self-esteem. Nevertheless, the navel has become the "Achilles heel" of this procedure, because in many cases its final shape has a bizarre appearance, with visible scars that reveal surgical history.

## Surgical Technique

Initially the abdomen is marked, defining the midline, with special emphasis at the approximate site where the neo-navel will be located.

The abdominoplasty begins with the traditional dissection of the abdominal flap until it reaches the navel. The umbilical stem is released circularly with a 2 cm diameter. This preserves good circulation to the navel base. The dissection of the abdominal flap is terminated surpassing the costal margin, until the insertion of the xiphoid and proceeds to make the plication of the abdominal wall with continuous suture with Vicryl 1–0. At that point, the surgeon can decide to modify the position of the navel up or downward, if necessary.

Afterwards, a "T" design on the umbilical cutaneous island is carried out (Fig. 1). Each arm of the "T" has 6 mm in length and 4 mm width. The vertical body of the "T" has a total length of 7 mm and 4 mm width (Fig. 2). This design guarantees the bottom umbilical folds and its slight vertical oval shape.

The "T" residual navel is attached to the aponeurosis in continuity with the plication of the wall, in the upper central part of the "T" and in the lower end of the umbilical stem, always at the subdermal level, so that the bottom of the navel will always remain fixed to the aponeurosis and the lower body of the "T" stay slightly free (Fig. 3).

**Fig. 1** Initial marking of the residual navel in "T". The arms of the "T" have 4 mm in width and 6–7 mm in length

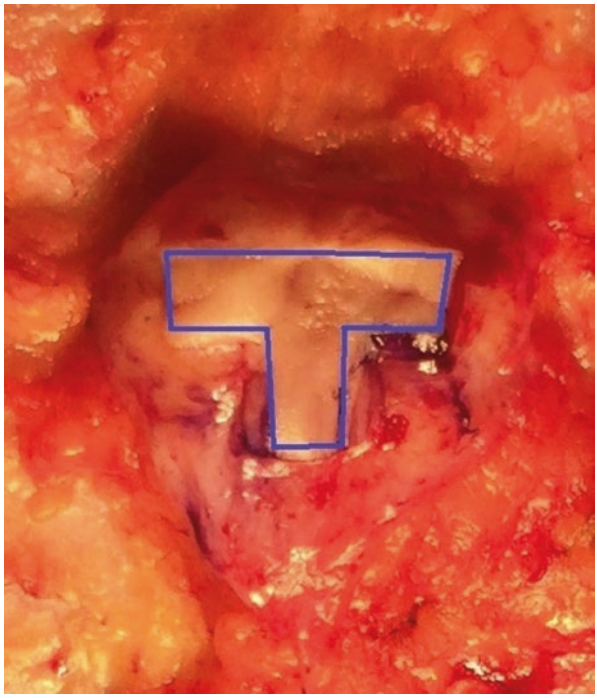

**Fig. 2** Residual navel in "T" attached to its pedicle

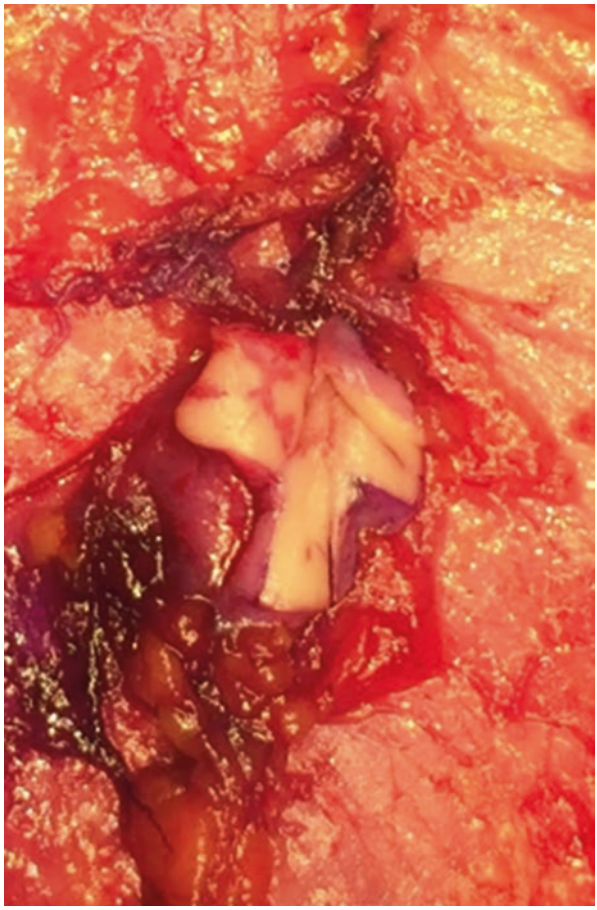

**Fig. 3** Residual navel in "T" fixed to the aponeurosis holding the subdermal at the upper and lower mid-point, at the moment of the abdominal wall plication

Then the body is flexed to make an angle of approximately 140°. The skin flap is moderately stretched and the projection of the neo-navel at the midline level is marked on the cutaneous flap as a "Y" design, with arms of 6 mm in length forming a superior angle of 90° (Fig. 4). Depending on the fat layer thickness of the flap, the length of the "Y" can be increased by 1 or 2 mm. Incision is performed according to the markings, initially with an N°11 blade. The incision to the deep plane is finished with scissors and a cone of adipose is resected, having a "protective" surgical pad under the flap. Additionally, at each extreme of the "Y", a 4 mm transverse perpendicular incision is made, giving to each arm of the "Y" a "T" shape. This detail is the key to give a higher projection to the three small flaps of the "Y" and therefore more depth to the neo-navel. At the same time, it serves as a base for suturing the arms of the residual "T". The thinning of the edges is perfected up to 2 cm on the periphery of the flap.

Using the double access to our advantage, we proceed by fixing the neo-navel from the inside with 2–0 Nylon, joining the upper central point of the flap of the "Y"

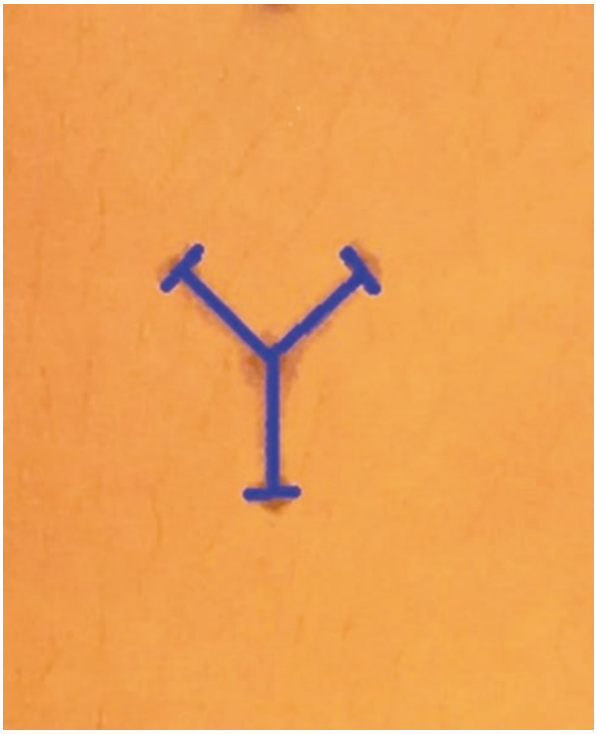

**Fig. 4** Marking the "Y" neo- navel. In the abdominal flap the arms have a length of 6–7 mm and in the extreme, a cut of 4 mm

with the upper center point of the "T", thus fixing it to the aponeurosis, this being the main fixation point of the neo-navel. Then we stitch a single point with Nylon 3–0 to the ends of the arms of the "T", working from underneath the abdominal flap (Fig. 5).

Following up, we perform the fixation of the internal angles of the residual "T" from the inside with 2–0 Nylon, at first to the aponeurosis and second to the skin at the central point of the lateral flaps of the "Y" from the outside. These two key points in deep and superior fixation of the neo-navel help to reduce tension on other points of the suture (Fig. 6).

Finally, the lower vertical end of the "T" is fixed and complementary stitches are placed side by side on the arms of the "Y" with Nylon 3–0. This is not because tension is required, but instead because the residual navel tissue is very resistant (Fig. 7).

Abdominoplasty is completed, resecting the excess of the flap and anchoring it without tension using intradermal resorbable sutures.

The final navel treatment is performed with Terramycin topical cream and abundant sterile gauze in a ball shape to prevent maceration of the periumbilical skin.

Dressings are replaced at 7 and 12 post-operative days (or earlier if there is any humidity), with Isodine, topical Terramycin and sterile gauze.

The navel points are removed on days 12 and 15 post-operative, beginning with the most peripheral points. Some may remain until day 20, if necessary, due to delays in the healing process (Fig. 8).

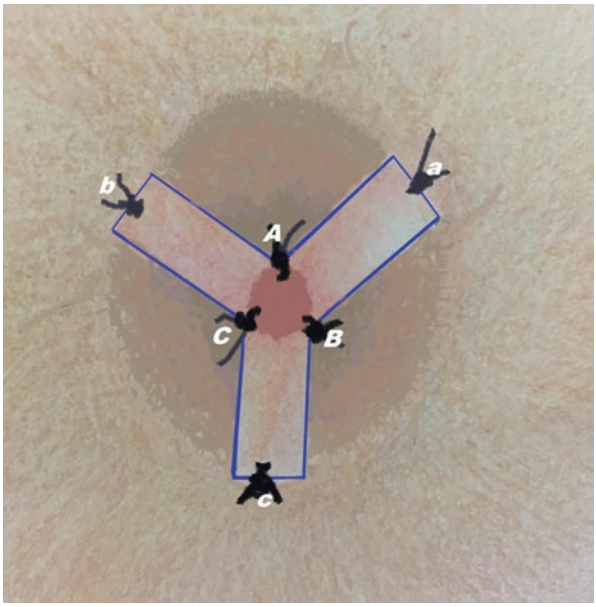


**Fig. 5** Schematic design of the neo-navel. Points A, B and C fix the ¨Y¨ flaps to the aponeurosis together with the corresponding "T". Points a, b and c join the arms of the "T" to the extreme of "Y"

**Fig. 6** Neo-navel finished

**Fig. 7** End of surgery. Navel fixed at the bottom, with a gradual and natural fall

**Fig. 8** Fifteen days post-operation. All stitches have been removed

We continue using gauze in the navel until the 6th week post-operative with a protection table on the abdomen until it is considered that the skin of the abdominal flap is adhered to the deep plane.

## Results

A natural navel, gradually depressed to the deep plane, round or slightly oval with a small upper cap is the result observed over the last 20 years (1995–2015) and in more than 2,500 patients on whom we have practiced the technique (Fig. 9).

Post-operative results were classified as excellent in 52 % of cases, very good in 28 %, good in 15 % and 5 % were between regular and bad due to hyperchromia and hypertrophic scars, which were successfully treated with subdermal triamcinolone, and cases of keloid scars that were treated with keloid resection followed by keloid preventive radiotherapy.

With our technique, navel stenosis is avoided and the results are consistent.

The final result is a completely natural navel, with no visible marks of surgery, which allows you to reveal your navel without revealing that you have a surgical procedure.

## Discussion

There is a great variety of techniques for reconstructing the navel in abdominoplasty.

The techniques grouped as circular (including ovals) present higher probabilities of stenosis as observed and confirmed by several comparative studies. Besides having a more obvious scar, the degree of non-conformity is above 50 % of patients [1, 2, 7].

**Fig. 9** Six months post-operation. The appearance is natural without visible umbilical scar

Techniques grouped as non-circular (inverted V, Y, double opposite "Y", triangular or star) are less prone stenosis thanks to the angulation of the suture line and this allows for better covering of the scar. This is why the degree of satisfaction is higher in more than 50 % of patients [2, 4, 8, 9].

The way in which the navel is fixed to the aponeurosis is what finally defines the shape and depth of it. Most of the techniques anchor the residual navel to the aponeurosis and then suture it to the abdominal skin. This is the reason why the tension is transmitted to the scar, harming the final quality of the navel.

The proposed technique (Y-T) takes into consideration the normal anatomy of the juvenile navel and tries to avoid factors that are recognized as harmful when they negatively affect the final result of the navel.

The Y-T technique, unlike the circular techniques, has the advantage to prevent umbilical stenosis, thanks to the angulation of the healing line. Additionally, the three small flaps of the "Y" are fixed to the aponeurosis, distributing the force and eliminating the tension in the line of the umbilical suture, guaranteeing a good quality scar, hidden in the bottom of the navel.

The Y-T design allows for a small excess of skin on the upper flap, which forms the cap of the navel. Additionally, the "T" of the residual umbilicus forces the fixation of the neo-navel to the aponeurosis occupying the upper part, which is normal [1, 2, 8, 11].

The final objective is always to obtain natural, attractive and aesthetically beautiful navels.

## Conclusions

From an aesthetic, cultural, and symbolic point of view, the navel is the most visible and most important anatomical component of the abdominal wall. For these reasons, surgical reconstruction should be optimal.

The technique described herein is safe, easy to understand and practice, is flexible in its design, and can be adapted to all types of abdomen (even in cases of post-bariatric surgery or previous surgeries with medium scars). With the versatility of this technique, you can create any size of navel, providing a natural appearance, with a gentle deepening to the bottom of the navel, without visible scars and a small fold or top cap, which is preserved over time.

The ideal technique for navel reconstruction has three basic components:

1. Avoid wasting the skin of the abdominal flap when designing the navel. This is the reason why circular or triangular techniques, which eliminate an island of skin, should not be practiced. To give depth to the navel, you need enough skin.
2. Peripherally thin the edges of the abdominal flap around the neo-navel.
3. The edge of the abdominal skin corresponding to the neo-navel should be fixed at at least three points to the muscular aponeurosis. In the present work, this corresponds to the three small flaps of the "Y".

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# Umbilicoplasty with Minimum Stump

William Fernández

Abdominoplasty is a type of cosmetic surgery used for corporal contouring, which aims to treat patients with flaccid or excess abdominal skin. It is applied to the area between the subpectoral region, down to the inguinal and pubic regions. Laterally it also includes the flanks. Abdominoplasty seeks to achieve smoother skin on the abdomen and a greater tonicity of the anterior abdominal wall.

Navel surgery is an important aspect within abdominoplasty. The natural female navel is three-dimensional and hard to re-create. This vestige of the umbilical cord is essential to the natural aspect. Great effort has been invested in the development of plastic surgery to re-create this emblematic component in the appearance of the abdomen.

The most popular modern techniques for umbilicoplasty are split into two major groups. One is the transposition of a stump of the original navel, composed of a dermal tissue stem that supports a cutaneous island. In some cases, a remnant of adipose tissue is left at the perimeter of the navel. This cutaneous island is sutured into a new opening created on the stretched flap. The incision for the new opening has been the focus in this procedure, with multiple designs to re-create the most natural navel shape [1–4].

The other group is that of neo-umbilicoplasty. This type of surgery can rely solely on the vestiges of the dermal umbilical stem without its skin, or it can make use of an anchor of the abdominal skin to the muscular fascia, along with various other strategies, and this gives the sensation of an infundibular structure. Skin grafts and scarring by second intention with neo-epithelialization are also used [9, 10, 20, 21].

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This chapter discusses the conventional technique of umbilicoplasty within the procedure of abdominoplasty in women. It emphasizes the achievement of a scar in the innermost part of the navel and that the union between the remaining stump of skin and the original navel creates the smallest scar posible. In this chapter, the presented technique has been called umbilicoplasty with mínimum stump.

## Considerations for Re-creating the Belly Button

### Pre-operative and Trans-operative

The position of the navel is in the midline, so it is necessary to have several strategies to ensure this location when recreating this structure.

The patient should be laid in the supine position with a slight flexion of the trunk, so that the midline is well-centered. It is important to correct the "tent" effect by stretching the flap and flexing the trunk, which can be achieved by placing anchor points of the flap onto the fascia on the midline above the point chosen to recreate the navel. You should only mark and strike when all these factors have been taken into account.

It is recommended that the navel remains at the same height as the patient had it originally, unless it did not exist or had been modified by previous surgery. In general, the considered parameter for its location is 3 cm above the horizontal line marking the union of the anterior superior iliac spines.

The design for the new opening that will receive the navel stem has had many variants in time, ranging from a circular shape, to a spindle, to an oval with a vertical major axis, to a "V", a "V enclosing a Y", half circle designs, and rotated flaps that give the impression of a small cap. Each surgeon perfects the design according to their preference in technique and to their observation and monitoring of the results.

It is also very common to use a resection of adipose tissue so that the peripheral area of the navel (approximately 2 cm diameter) is thinned cylindrically or

**Fig. 1** Resection of the adipose tissue around the opening made to recreate the navel

infundibularly (inverted cone). The preservation of the venous and arterial subdermal plexuses must be taken into account during this maneuver (Fig. 1).

In some cases, there are scars from old laparotomies through the midline. In these cases as well as in patients who have previously undergone liposuction of the abdomen, greater caution is advised when defining the final thickness of the flap, when resecting the infundibular adipose tissue mentioned in the previous paragraph, and with the tension to which the flap is subjected to when stretched.

In these cases, and when transverse dermolipectomy is combined with vertical resection (such as when there is a horizontal excess or when there are old scars in the midline), it is necessary to take the same precaution, due to the alteration in the vascular networks that normally compensate for arterial and venous flows on either side of the midline.

The presence of other old scars—traumatic or surgical—should be motive for pre-operative analysis and planning, looking to predict the impact on the circulation of the flap and the aesthetic effects of the retractions during the stretching of the flap. The resection or dermolipectomy technique should preserve the cutaneous island based on the umbilical stalk, initially protecting it with a layer of adipose tissue. In the first instance, the island should measure 2 cm in diameter. Later, during plication of the fascia, we proceed to reduce it, which will be accompanied by the resection of the adipose tissue surrounding this umbilical stem (Figs. 2 and 3a, b). The objective is to have created a new island of skin with an oval or fusiform shape, having the larger diameter in the vertical plane.

It is recommended to perform the vertical plication of the fascia over the midline, both above and below the umbilical stalk, leaving enough space through which the navel can be exteriorized. For this plication, we use a one caliber suture string (Figs. 4a–c). This will allow greater stability when the umbilical stalk is fixed onto the new opening in the flap. The umbilical stem receives nourishment mainly from the dermal plexus, through arteries that pass underneath the surface of the layers of

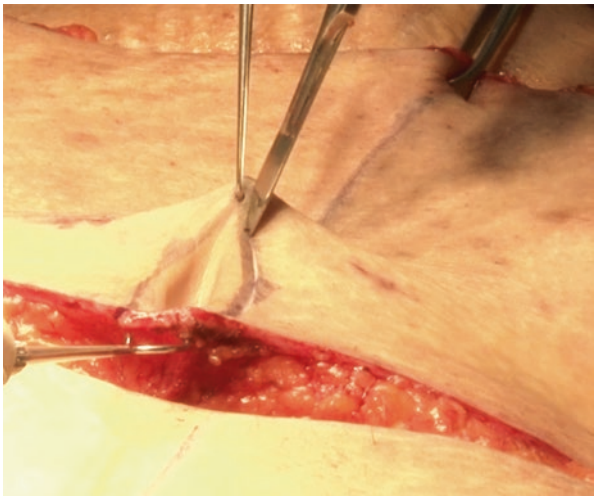


**Fig. 2** Initial preservation of the navel, during dermolipectomy, leaving an island of skin and a portion of adipose tissue around it

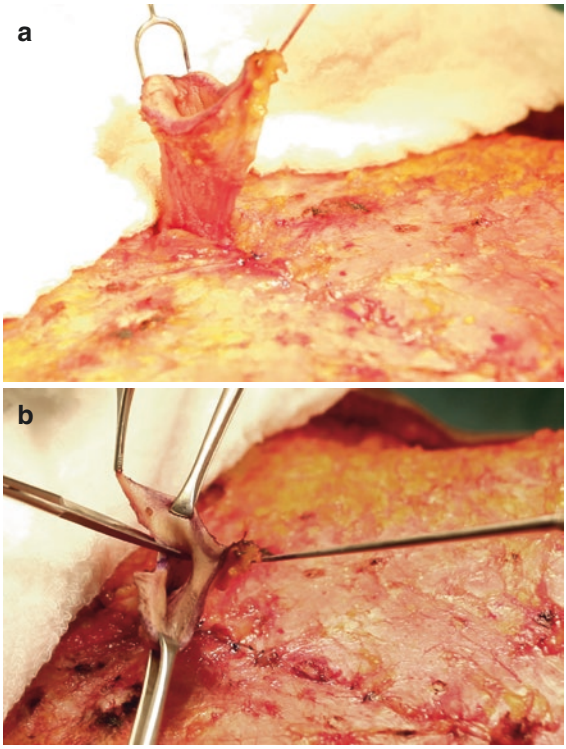



**Fig. 3** (**a**) Adipose tissue resection around the umbilical stem. (**b**) Reducing the size of the skin island, before attaching it to the fascia

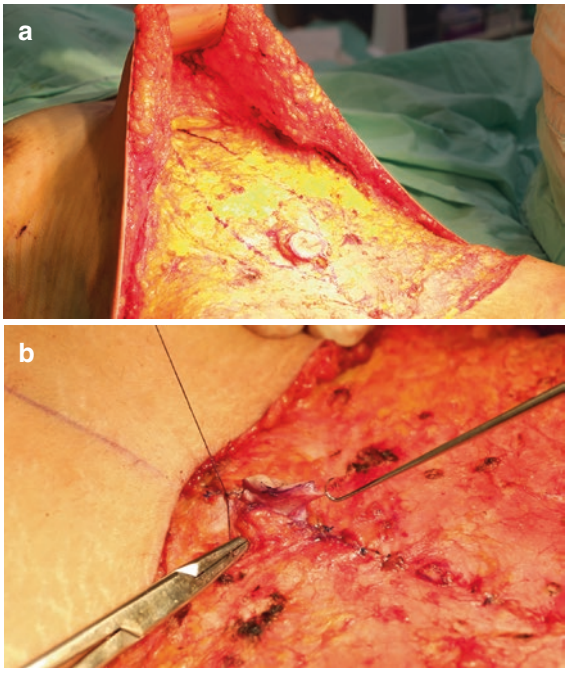
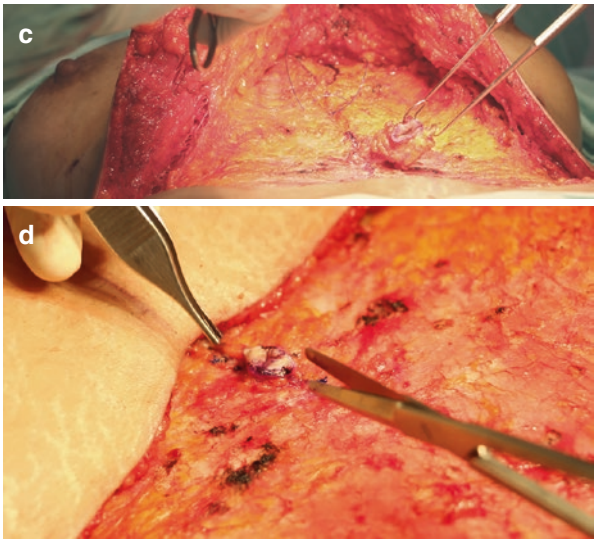



**Fig. 4** (**a**) Plication of the fascia below the navel. (**b**) Plication of the fascia above the navel. (**c**) Fixation of the umbilical stump to the fascia, with 4 stitches. (**d**) Once again cut the excess of the original navel, to obtain a minimum stump

**Fig. 4** (continued)




the abdominal, muscular, and facial walls as well as the parietal peritoneum. For this reason, the hemostasis must be very selective and precise.

When placing the plication stitches of the fascia near the navel, avoid constricting the umbilical stalk, but also be aware that the exit space for the stem mustn't be too wide as this could lead to tissue herniation. Another important precaution is to prevent any torsion of the umbilical stalk and to maintain its perpendicular orientation. It may be helpful to mark the top, bottom, and sides to guide orientation.

At this point, it is advised to correct any umbilical hernias present with the appropriate technique, without compromising the circulation that runs through the navel stem. It is frequent to find this situation, as most hernias are detected in the preoperative evaluation, while others will be revealed during the operation.

## Technique for Recreating the Belly Button

It is suggested that the point selected for the new navel corresponds to the umbilical stalk after having stretched the flap and adhered it to the muscular plane throughout its path to the navel. Because the little size of the remaining stalk skin, in this chapter the technique is called umbilicoplasty with minimum stump. It is important that the surgeon had a good check, using guide lines as suggested by many authors [2–5, 7, 8], or navel marking pliers (e.g., Pitanguy or Tchalekian) [11, 12] (Figs. 5–17).

The design of the neo-aperture is left up to the surgeon's choice. The opening made in the flap should be an oval shape or fusiform, with the larger vertical diameter between 12 and 14 mm. The infundibular resection of the adipose tissue around

**Fig. 5** Marking of the skin location where the navel will emerge through the stretched flap

**Fig. 6** Design of the new opening for the navel (recommended to be vertical and fusiform)

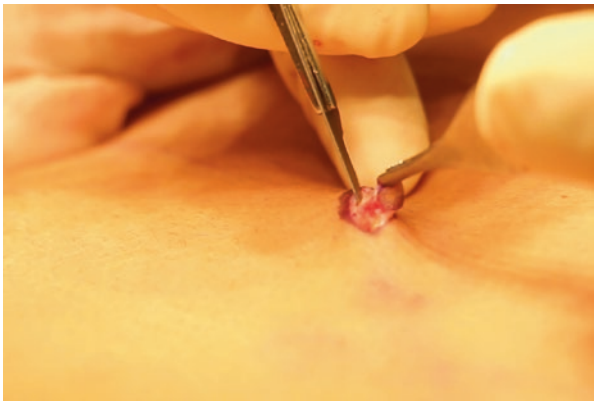


**Fig. 7** Removal of the skin and placement of adipose tissue around the opening periphery

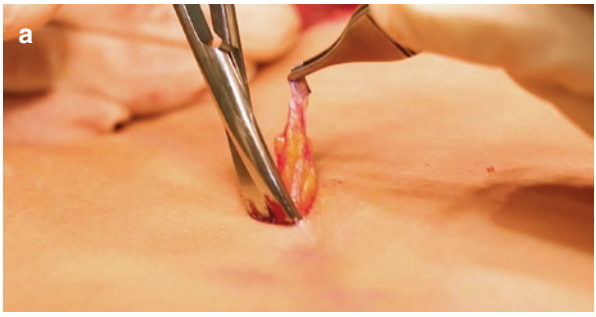



**Fig. 8** Adipose tissue resection to create the inverted cone shape, and a special care to preserve superficial vascular plexuses. (**a**) Resection from the outer side. (**b**) Resection completed from the inner side of the abdominal flap

**Fig. 8** (continued)

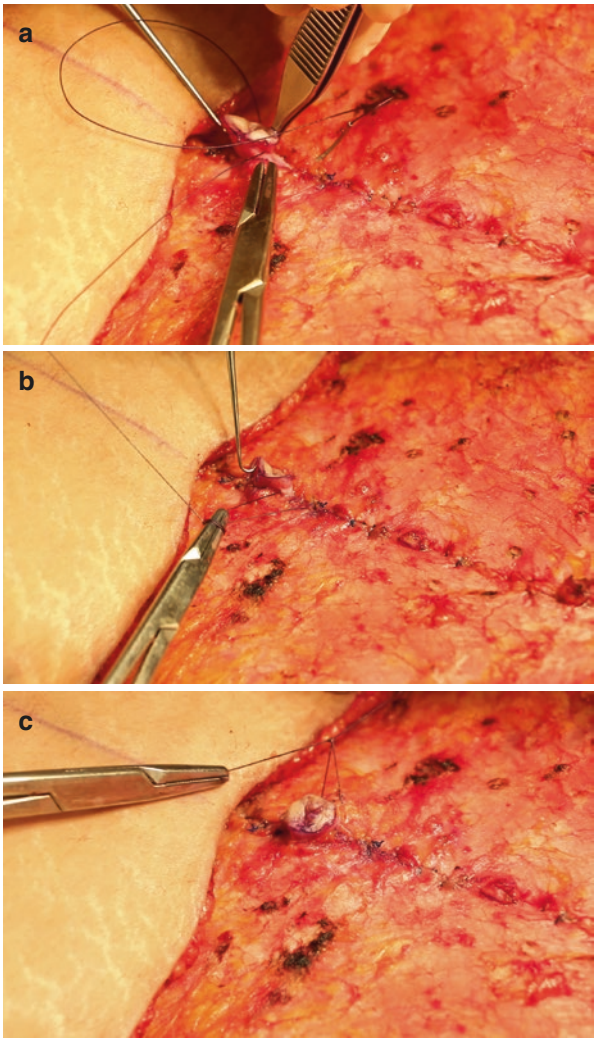




**Fig. 9** Stitches to pin up the umbilical stalk to the plicated fascia. (**a**) At the 12 o'clock position. (**b**) At the 6 o'clock position. (**c**) In the right side at the 3 o'clock position. (**d**) Left side at the 9 o'clock position

**Fig. 9** (continued)

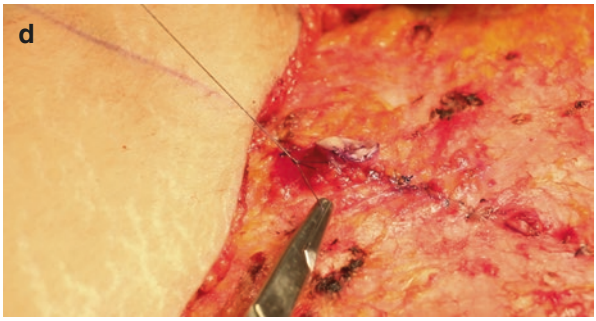



**Fig. 10** Anchor stitches from the inner side of the flap, to the muscle fascia, just in the middle line

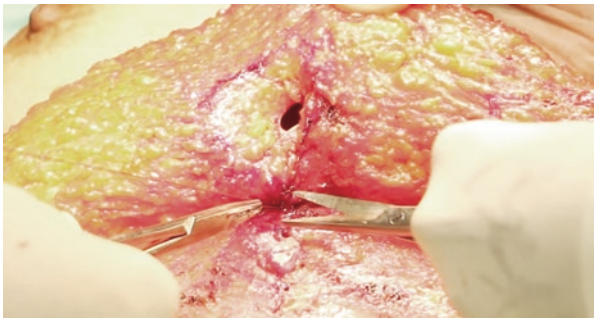


**Fig. 11** Anchor point of the subdermis of the flap opening to the fascia at the 12 o'clock position

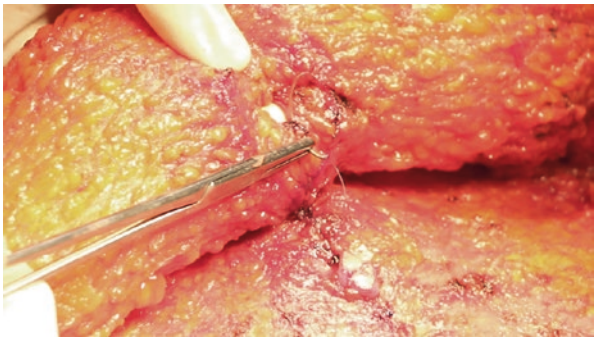


**Fig. 12** Anchor point of the subdermis of the flap opening to the fascia at the 6 o'clock position

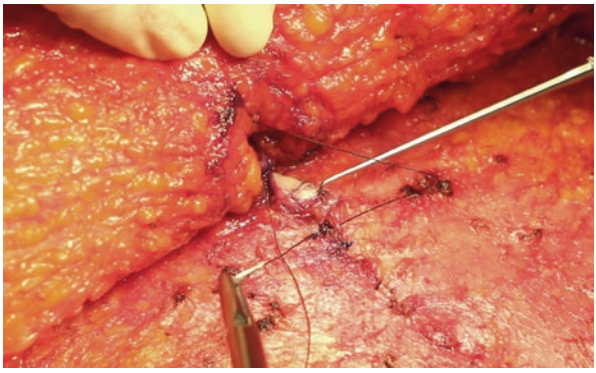


**Fig. 13** External appearance of the anchor stitches in the upper and the lower points of the navel, looking as two little pits in the skin (At the 12 o'clock and 6 o'clock)

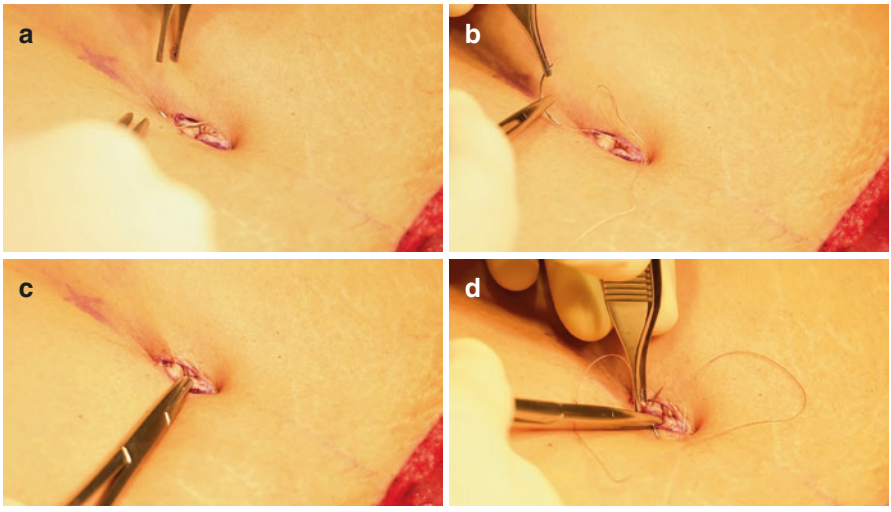



**Fig. 14** Stitches from the skin around the new opening for externalize the umbilicus stalk, just to the skin of the island of this minimun stump. (**a**) Stitch at the 12 o'clock position. (**b**) Stitch at the 6 o'clock position. (**c**) Left side, a stitch at the 2 o'clock and other at the 4 o'clock position. (**d**) Right side, a stitch at the 8 o'clock and other at the 10 o'clock position

**Fig. 15** Final appearance of the skin of the sutures navel; there are six stitches from the skin that surround the navel to the skin of the umbilicus stalk

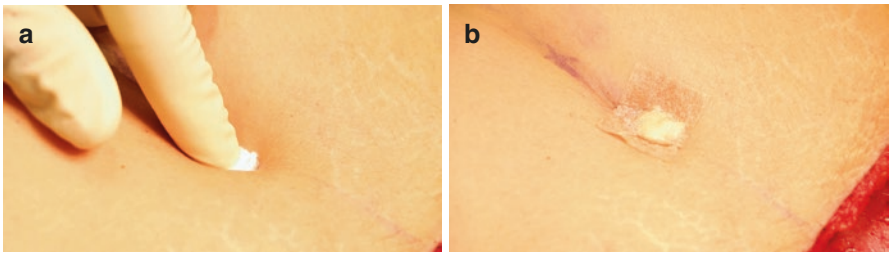



**Fig. 16** Cure with gauze swab. (**a**) Rolled gauze is lying covering the wound of the navel. (**b**) Dressing is fixed with a tap

**Fig. 17** Pitanguy and Tchalekian pliers

the incision (on the deep part of the flap) should be perfected, making a very selective and precise hemostasis that avoids any large alteration of the cutaneous circulation (Figs. 6, 7, and 8).

The fixation of the new umbilicus comprises of two components: first the umbilical stalk is fixed to the fascia. Second, after stretching the flap, the neo-aperture is also fixed to the fascia around the umbilical stem.

In the first component, the umbilical stalk is fixed with stitches to the dermis closest to the skin island and anchored to the muscular fascia. This anchorage is made on the area where the fascia was not plicated, that is, in the original emergence site of the umbilical stem. Four points are proposed. The points are made with absorbent material of thick gauge of 3–0 or 2–0 and from the four main points, as if it were a clock, at the 12 o'clock and 6 o'clock positions first and then at the 3 o'clock and 9 o'clock positions, passing through the subdermis around the island of skin. It is recommended to leave more tension on the vertical axis, shaping the island as an oval or fusiform with longer vertical length. It is seen that when the umbilical stalk is fixed to the fascia, it is protected from additional tensions that may compromise its circulation (Fig. 9a–d).

Once this fixation has been made, the oval shape of the skin island is retouched if necessary, cutting its edges millimetrically, leaving an oval or fusiform remnant with diameters between 8 to 12 mm in vertical direction and 4 to 6 mm in horizontal direction. The goal is to leave an island of skin smaller than 1 cm in its overall diameter and the edge of the island of skin anchored to the level of the fascia (Fig. 4b).

After fixing the island of skin of the navel to the muscular fascia, we proceed to the advancement of the flap, which already has the new opening created, through which we will exteriorize the navel. During the advance, it is recommended to place points to anchor the deep part of the flap to the fascia, between the xiphoid processes and the new navel, as suggested by a few authors [6, 12] (Fig. 10).

At this point, the neo-aperture is fixed from its inner side, i.e., from the dermis, to the muscular fascia at the periphery of the umbilical stalk that was already fixed from the previous step. This fixation of the openings is made using sutures of absorbable material of caliber 2–0 or 3–0, stitching at the corresponding 12 o'clock and 6 o'clock positions (Figs. 11, 12, and 13).

Up to this point, no stitches have been placed on the skin. Having verified that there is an adequate position and infundibular formation, we continue by suturing the skin, which should be free of any dramatic tension.

The skin stitches are suggested to be made in a horizontal "U" shape, beginning and ending on the island of skin of the umbilical stem and passing through the dermis of the oval created for the new navel. It is advised to use non-absorbable 5–0 caliber material, ideally colorless, which should be removed after approximately 15–20 days. We recommend placing 6 stitches, one higher, one lower and two on each side (Figs. 14, 15, and 16).

At this point, the navel surgery has been completed and the infra-umbilical advancement and surplus skin-adipose resection, i.e., the final part of the abdominoplasty, is continued.

## Important Considerations for Abdominal and Umbilical Surgery

There is great variation in the shape of the female abdomen. All of its assets result in variability and different dimensions e.g., the bone contour given by the anterior and lower costal region, the furthest terminal point of the sternum, its xiphoid process, the anterior and superior iliac spines, the iliac crests, and the pubic bone.

The muscular-fascial wall is a very dynamic structure, and it plays a great role in most of the human body's daily functions, such as containing the abdominal cavity, serving as a barrier and protector, sustaining different positions, intervening in continuous functions such as breathing, and in maintaining a good balance of the gravity axis.

The shape of the fascial muscle component and its bony insertions determine the enhancement of both the supra-umbilical and infra-umbilical portions. It is aesthetically acceptable to make an apparent flattening of this relief and, if possible, a funnel-shaped invagination at the umbilical level.

The tegumentary and subcutaneous structures have the capacity to expand rapidly and also gradually. They play a very important role in adaptability to size increases, such as those during feeding, digestion, and longer processes such as pregnancy.

The two most important components for a pleasant navel shape are first, to have an adequate tension of the tegumentary and subcutaneous tissues, and second to minimize the thickness of the latter. If possible, the lines formed by the union of the

two straight muscles in the middle and their lateral edges should be apparent through this layer, as well as the transversal tendinous intersections, that enhance the squared shape of the groups of the Rectus Abdominis Muscle. Regarding the umbilicus, all within its periphery should be highlighted and an oval aspect of vertical predominance and an adequate sinking in the bipedestal and supine position is preferred.

The intra-abdominal content and the degree of pressure it exerts on the anterior and lateral wall of the abdomen can also influence the achievement of a more pleasant concave tending form.

It is important to be aware of the quality and strength of the patient's tegumentary tissues. This will determine the tonicity scope achievable by the plications of the fascia as well as the degree of depression in which the navel may remain, when seeking to create a pleasant sunken shape.

As with the planning of any cosmetic or reconstructive surgery, it is very important to explain all the variables that are known about a particular case to the patient, such as the location of scars, the varied range of healing processes, and the final appearance of the result. It is a great challenge for the plastic surgeon to obtain a satisfactory and safe result with a low rate of aesthetic non-conformities using a more generic technique such as this one that is applicable to most cases.

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# Umbilicoplasty Without Scars: My Personal Experience

Harold Villalobos Cárdenas

## Introduction

In the process of performing a tummy tuck, the final appearance of the belly button is very important. Several umbilicoplasty techniques aim to produce natural results but most of them leave obvious scars on this important anatomical structure.

Another aspect that concerns surgeons and patients subjected to tummy tucks is the difficult healing process of this structure. Frequently, this process is slow and complicated.

Because of these characteristics, I have used different surgical techniques in my professional practice to try and achieve the best aesthetic result for my patients and their quick recovery. I have found a technique that doesn't leave any external scar in the umbilical area and leaves the patient and doctor free of any concern about the wound healing process, with a natural result in the umbilical area. This technique has been a point of great satisfaction in my practice.

## History

Gaudet and Morestin [1, 2] were the first to preserve the belly button for improved aesthetic purposes. Incisions in the skin of the abdominal wall flap at the point of the neo-umbilicus had variable shapes including round, vertical linear, U-shaped, V-shaped, and inverted U- or inverted V-shaped.

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Treatment of the umbilicus with neo-umbilicoplasty or deleting the umbilicus was devised when a large umbilical hernia was present and the original umbilicus could not be preserved.

## Anatomy

All placental mammals have a navel. The umbilicus (*omphalos* in Greek) or belly button is essential to the overall aesthetic appearance of the abdomen. However, very little has been written about the exact location of it on the anterior abdominal wall.

We have to remember that the navel is and always will be a reminder of our humanity and the origin of life.

The umbilicus, also known as navel, belly button, tummy button, or umbilical dip, is a scar on the abdomen, some distance above the pubis. It indicates the site where the umbilical cord attachment existed before birth.

During in utero development, the umbilicus functions as a channel to allow blood flow between the fetus and the placenta. This skin depression, at the bottom of which is a concealed scar left by the closure of the umbilical cord, is where all layers of the abdominal wall fuse together. Accordingly, the inward retraction of the umbilical vessels after birth results in the scar formation at the base.

At the bottom of the umbilical cavity, there is a prominence called umbilicus mammilla. As the thinnest point of the abdominal wall, the umbilicus mammilla is consequently most susceptible to hernia formation.

The position of the umbilicus is variable. However, the umbilical depression most commonly lies at the junction of the linea alba (midline) and a line drawn between the anterior superior iliac spines or roughly between L3 and L5 vertebrae with the average position being at the level of the lower third of the fourth lumbar vertebra, according to Eycleshymer and Schoemaker [10].

Ideally, the distance from the umbilicus to the anterior vulvar commissure is 18–21 cm, and the pubic hairline is 5–7 cm cephalad to the anterior vulvar commissure. However, the position of the umbilicus can be shifted due to scoliosis, excess abdominal fat, abdominal wall skin laxity/redundancy, umbilical hernia, previous surgeries, and other factors.

The umbilical shape, size, length, depth, and overall appearance varies among individuals (Figs. 1, 2, 3, and 4).

For instance, factors such as the depression depth, opening size, size of the base of the skin, presence of any central ridges, and other components greatly depend upon the subcutaneous fat content, skin laxity, muscle tone, and presence of ascites.

**Fig. 1** Deep umbilicus. Note the off-center position of the umbilicus compared to the linea nigra superiorly

**Fig. 2** Deep umbilicus and centrally-positioned

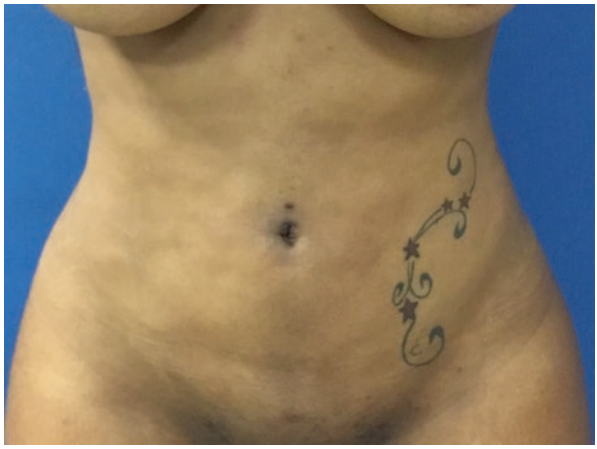

**Fig. 3** Circular opening and centrally-positioned umbilicus with no superior hooding

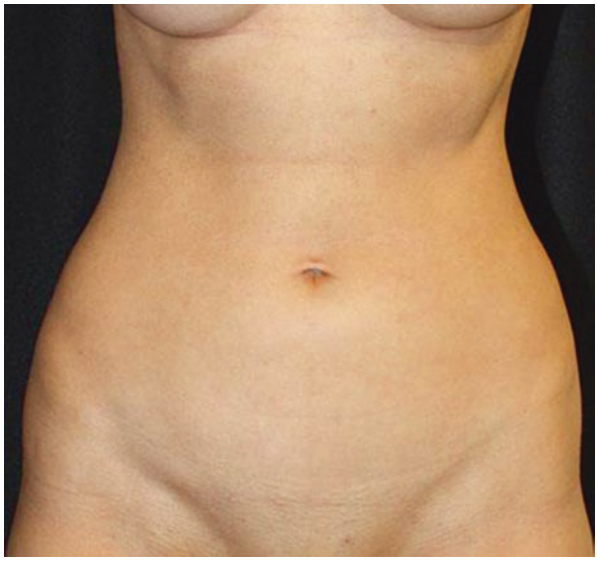

**Fig. 4** Mild superior hooding with narrowing of the umbilical opening

## Technique

During the executionof a tummy tuck, a circumferential incision around the umbilicus is performed, with a dissection of the umbilical cord leaving all the structure free in the abdominal wall (Figs. 5 and 6).

The dissection of the abdominal dermal fat flap with the later removal of excess skin and muscle plicature (without any fixation of the belly button dissected) must be performed.

The belly button is clamped below the umbilical dermal border with a Cocher clamp and sectioned on this portion with a scalpel (Fig. 7). The location of the new belly button is confirmed by bimanual maneuver and it is marked

**Fig. 5** Performing circumferential incision around the belly button with scalpel number 11

**Fig. 6** Dissection of the umbilical cord completed

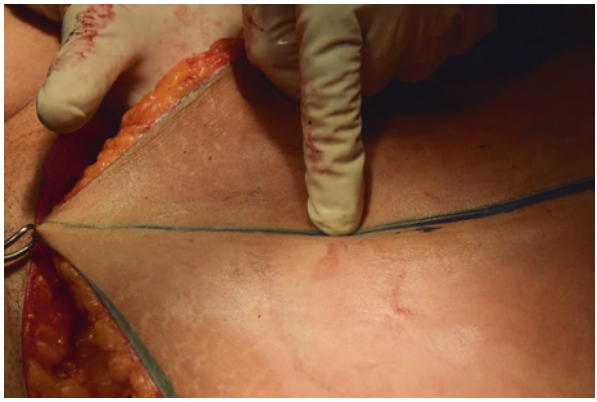

**Fig. 7** Bimanual maneuver to establish the correct position in the midline

with a needle tattoo with methylene-blue (Figs. 8 and 9). Using Metzembaum scissors, a 1.5 cm diameter tunnel is made in the subcutaneous cell tissue reaching the dermis (Fig. 10), then the sub-dermis is scraped off at the tattooed point (Fig. 11).

**Fig. 8** Tattooing the point of fixation with needle

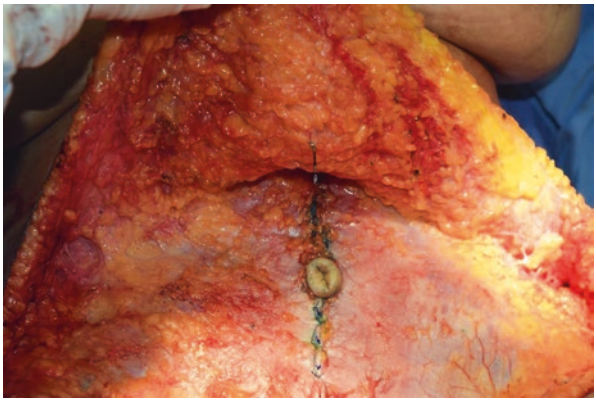

**Fig. 9** Complete transfixion of the flap and tattooing of the cellular subcutaneous tissue before the tunnel construction

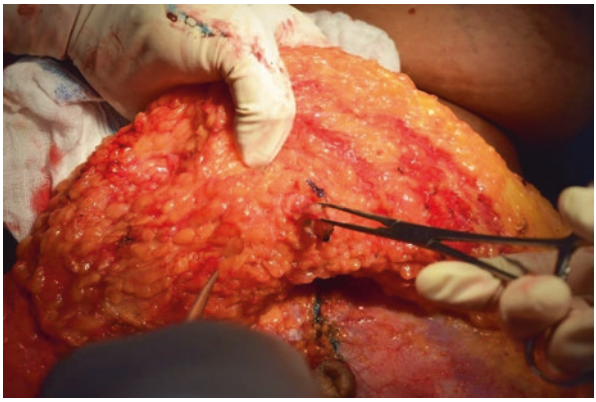

**Fig. 10** Removing the cellular subcutaneous tissue to create a tunnel for the new navel

Three points of fixation between the umbilical cord with the dermal spot must be created:

The first point, located in the cephalad point of the umbilical cord, is fixed by a stitch in a "U-shape" with inverted knot (Vicryl 2.0) transfixing all the dermis and returning to the beginning point in order to complete it (Fig. 12).

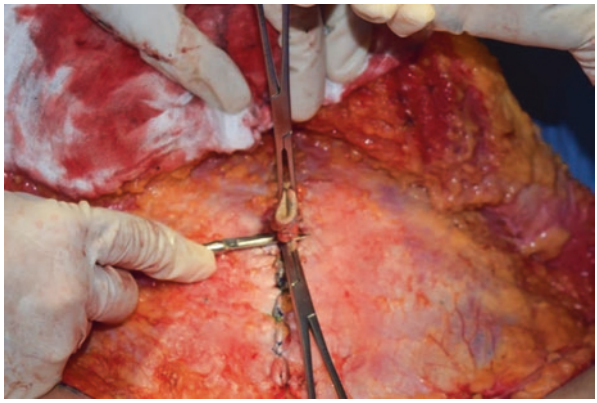

**Fig. 11** Deleting the umbilicus with scalpel

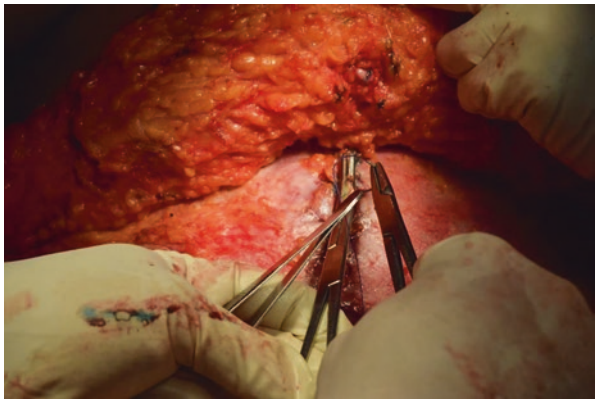

**Fig. 12** Performing the first stitch of fixation with Vicryl 2.0

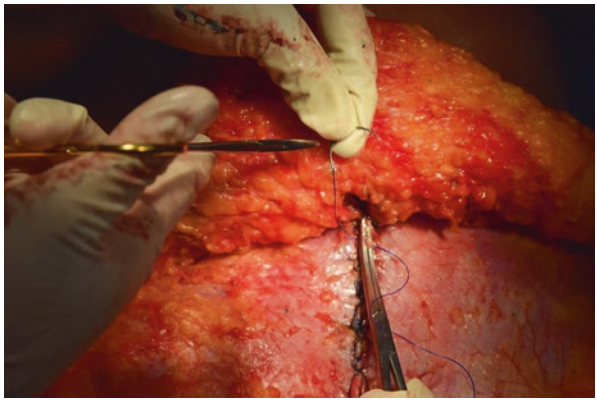

**Fig. 13** Middle point of fixation with Prolene 2.2

The second stitch is made with an inverted knot (Prolene 2.0) located in the middle. It is fixed by clamping the sub-dermis, taking care to not exteriorize the suture (Fig. 13).

The third point has the same characteristics as the first one. It is located in the lower position to complete the process of creation of the new belly button (Fig. 14).

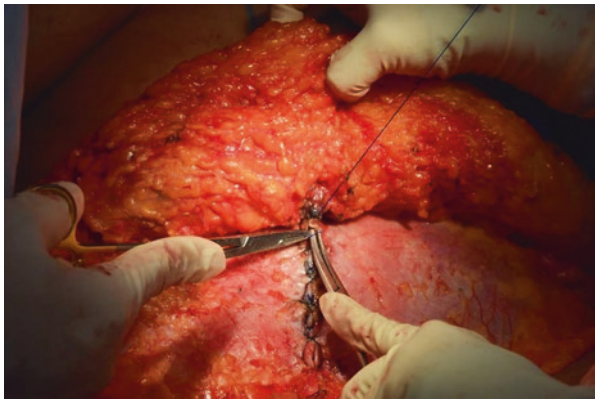

**Fig. 14** Finishing the fixation of the neo-umbilicus with the third stitch (Vicryl 2.0)

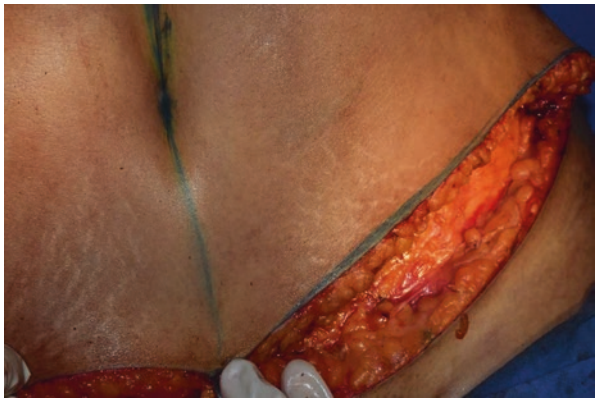

**Fig. 15** Checking the final appearance of the navel before closing the tummy tuck

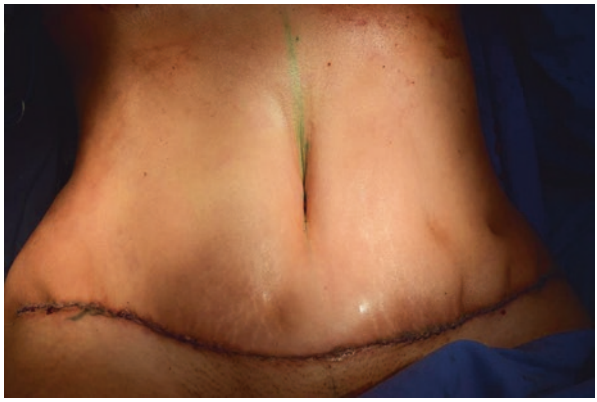

**Fig. 16** Immediate result, the depression in flanks is caused by the use of Baroudi's adhesion stitches

Then the tummy tuck is completed depending on the technique used by the surgeon. A pressure dressing with soft cotton is placed on the wound and left untouched for about 10 days (Figs. 15 and 16).

## Results

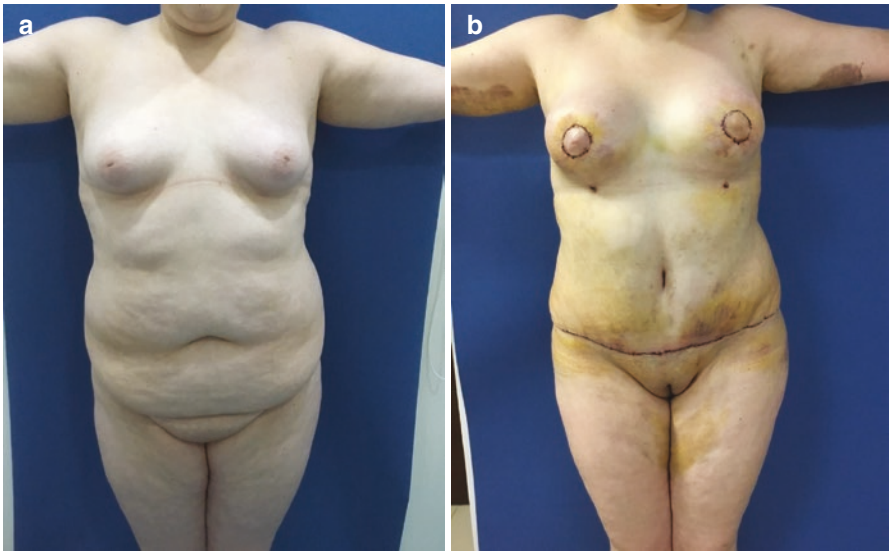


**Fig. 17** (**a**, **b**) Pre- and post-operation (5 days)

**Case 1** (Fig. 17a, b): This was a 30 year-old patient with a severe lipo-dystrophy who underwent an abdominoplasty in conjunction with liposuction. She presented a deep umbilicus, centrally-positioned, affected by the above excess skin. After 5 days post-operation, patient shows a deep umbilicus in balance with the rest of her abdominal area.

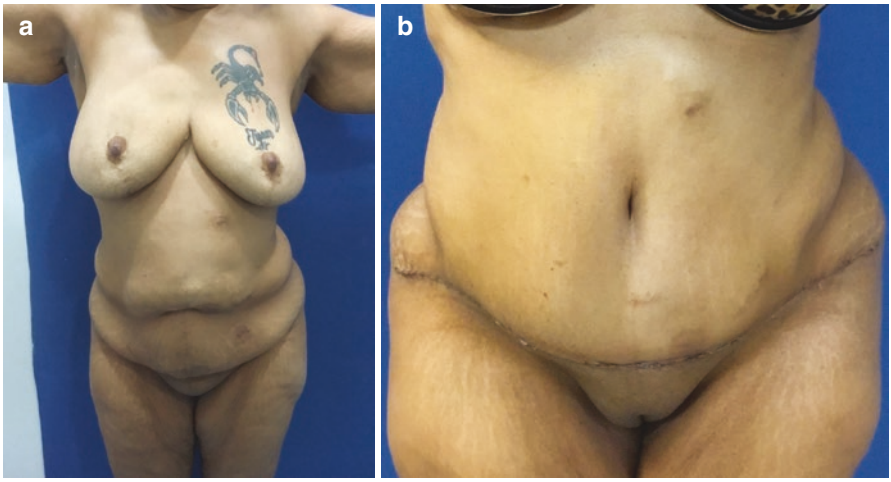


**Fig. 18** (**a**, **b**) Pre- and post-operation (2 weeks)

**Case 2** (Figs. 18a, b): Female, 40 years old with a massive weight loss and excess of skin in the abdominal area. The belly button is lost under superior abdominal flap. Fourteen days post-operation and the umbilicus was located in the midline giving a good balance to this area.


**Fig. 19** (**a**–**c**) Pre- and post-operation (3 weeks)

**Case 3** (Fig. 19a–c): This is a 33 year-old patient with several alterations produced by previous pregnancies and with stretch-marks in the middle and lower abdomen. A lipo-abdominoplasty was performed. Note the natural umbilicus appearance without scars.

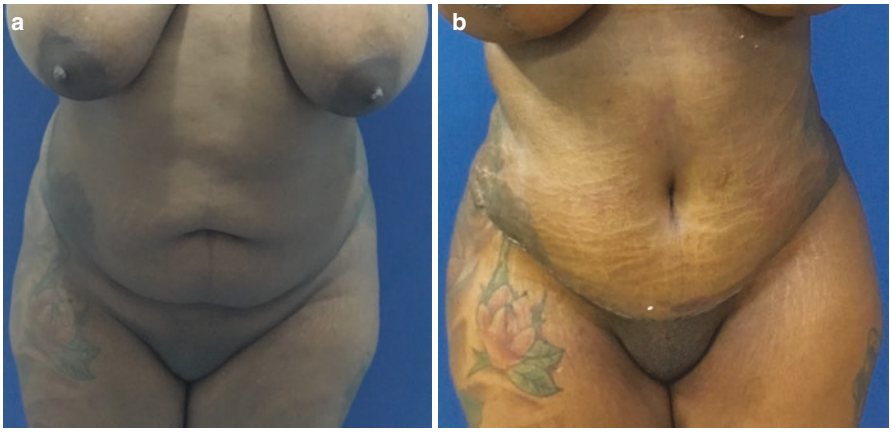


**Fig. 20** (**a**, **b**) Umbilicoplasty pre- and post-operation (2 weeks)

**Case 4** (Fig. 20a, b): This is a patient who underwent a lipo-abdominoplasty with umbilicoplasty without scars. Note central umbilicus with horizontal line produced for the upper abdominal flap. Note after surgery, the circular opening and centrally-positioned umbilicus with no superior hooding.

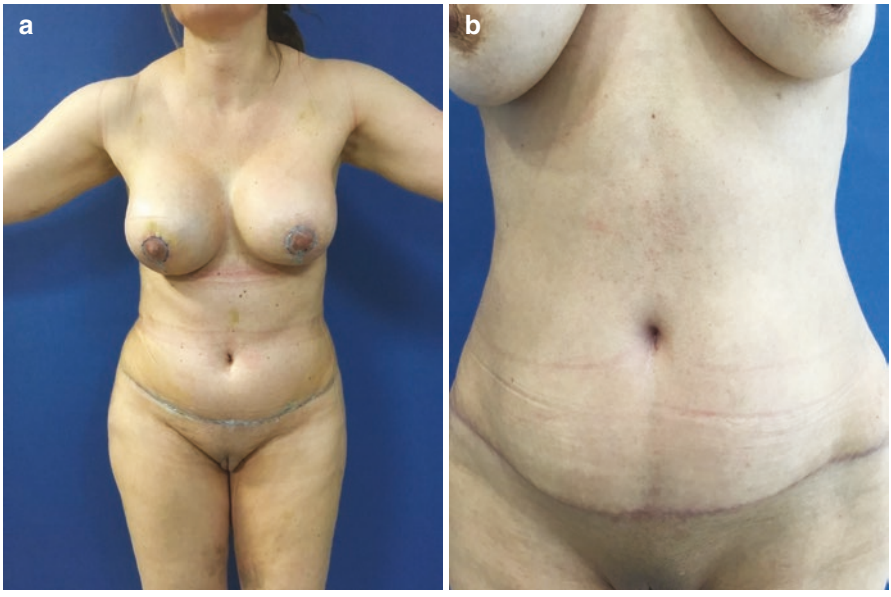


**Fig. 21** Umbilicoplasty without scars, 4 months post-operation

**Case 5** (Fig. 21): Four months post-operation, appearance of the new belly button in a 43-year old patient who underwent an abdominoplasty.

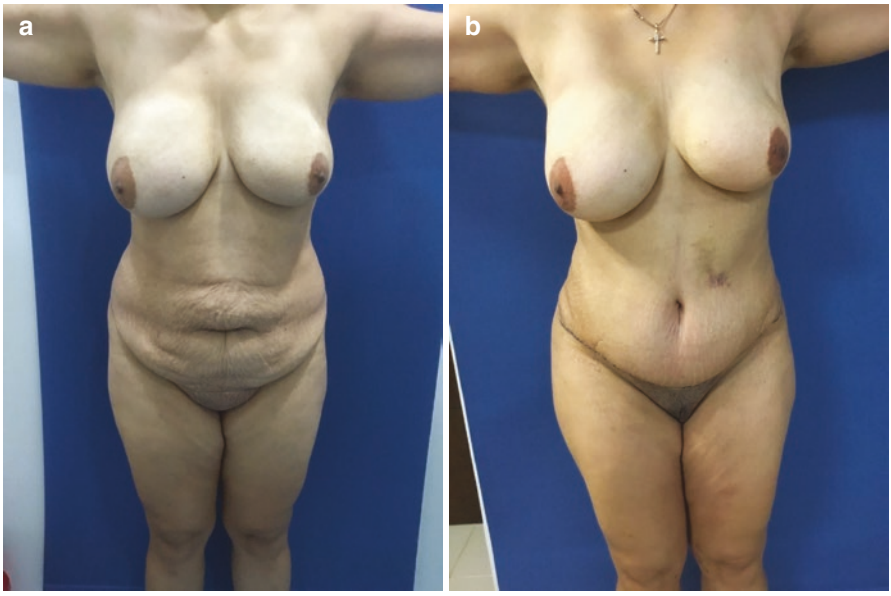


**Fig. 22** (**a**, **b**) The natural appearance of the navel, even with the presence of stretch marks, which usually produce distortions to the scars

**Case 6** (Fig. 22a, b): Pre- and post-operation (4 months), 44 year-old female with a several stretch marks after pregnancy.

I have observed that there is a tendency for the recreated belly button to become deeper in the long-term, producing a better and more natural result. Therefore, I recommend this technique.

## Complications

Some insignificant complications were recorded. These were redness, pruritus, local dermal necrosis and dysesthesia.

## Discussion

After performing a tummy tuck, the healing process of the navel is often tortuous, presenting with frequent dehiscence, decidual suffering, local necrosis, and late hypertrophic scars and keloids.

This is an issue of concern for both the patient and the surgeon. This technique does not leave external scars, minimizes these types of issues, and the result is very close to the natural form of this important anatomical part and aesthetic structure of the abdomen.

### Conclusions

These days, a natural-looking appearance is important and is highly sought after by the majority of cosmetic surgery clients. For this reason, an aesthetically-pleasing umbilicus after an abdominoplasty is imperative.

An abdominoplasty and umbilicoplasty have very powerful effects on a patient's self-image and sense of well-being. As surgeons, we are all perfectionists, constantly in search of the most adept, flawless, and impeccable surgical outcome. For these reasons, this technique is a good option!

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# Reconstructive Neo-umbilicoplasty

Patrick Trevidic, Charbel Tawk, and Gisella Criollo Lamilla

## Introduction

Although it is of minimal functional importance, the umbilicus is a key aesthetic landmark of the anterior abdominal wall and its absence is a frequent cause for concern and patient complaint.

The reconstruction of the umbilicus is a procedure that refines the outcomes of abdominal surgery.

Although the umbilicus is depressed and adheres to deep planes, it is the only scar in the human body that is acceptable to individuals. Its absence significantly affects the aesthetics of the abdomen, making it an essential part of the anatomy.

## The Aesthetic Nature of the Umbilicus

The aesthetic appeal of the abdomen is directly related to sound umbilical conformation. Reconstruction of the umbilicus either after its loss from any pathology or other reasons must follow the anatomical features to provide a natural appearance after treatment. The new umbilicus should have a good shape and appropriate position; should not have an unaesthetic appearance, stenosis, or enlargement; and should have a natural appearance.

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W. L. Murillo (ed.), *Omphaloplasty*, https://doi.org/10.1007/978-3-319-64313-7_13

## Technique

### Drawing, Position, and Shape

An aesthetically-pleasing umbilicus has sufficient dimpling and natural superior hooding with an almond shape.

The umbilicus is located at the midpoint of the lower abdomen and is the major aesthetic unit of the abdominal wall. It is composed almost entirely of dermal and fibrotic tissue, with a very small amount of subcutaneous fatty tissue, and is usually located approximately 9–12 cm above the superior margin of the mons pubis, slightly above a line connecting the anterior superior iliac spines.

The ideal umbilicus should have a natural contour, prominent depth, minimal additional scars, and proper superior hooding.

Shinohara et al. emphasized that an umbilicus with a natural appearance consists of a ring, a tubular wall, a sulcus, and a bottom, without any excess skin that would interfere with the aesthetic aspect of the umbilicus.

In addition, Lee et al. suggested that an aesthetically- pleasing umbilicus must possess the following properties: a vertical ratio of 46:54 (with respect to the xiphoid process and the lower limit of the vulvar cleft), a midline horizontal position, and an oval shape with no hooding or superior hooding.

It is a depressed scar surrounded by a natural fold of skin approximately 1.5–2.5 cm in diameter. Its natural position is at the height of the line joining the highest point of the two anterior superior iliac crests; this point is located between the third and fourth lumbar discs. The position in the vertical plane is known to vary, and in cases where it is located more anteriorly, the umbilicus adds to a more graceful-looking abdomen. Regarding the sagittal plane, the umbilicus exhibits laterality up to 8 % of the width of the abdomen in 98.3 % of subjects. It is formed by a base, which corresponds to the corrugated part surrounded by a groove or ring. Its upper portion, which surrounds the depressed portion, is called the impeller. The umbilicus should be small, have a T-shaped depression, be round or oval, and have a slight fold of skin on its upper portion.

**Four Flaps Technique:** (Photographs 1, 2, 3, 4, 5, 6, 7, and 8)

We use the four flaps technique. It is a simple and reliable technique.

As illustrated in the drawing (Photographs 9 and 10), we elevate the four flaps and remove the fatty tissue with a straight removal under the upper and lateral flaps and a slight descent under the inferior one, to mimic the depression of the umbilicus.

Three of the four newly-created flaps (those in the 3, 6, and 9 o'clock directions) are firmly anchored to the anterior rectus fascial layer.

Three points (the 3, 6, and 9 o'clock abdominal flaps) are anchored to the deep dermis of the umbilicus and to the medial line of the aponeurosis with a 4-0 absorbable suture.

The last flap is anchored on the aponeurosis with a slight upper movement to create a bulge of fat inside the neo-umbilicus.

**Photo 1** Drawing of the four flaps technique

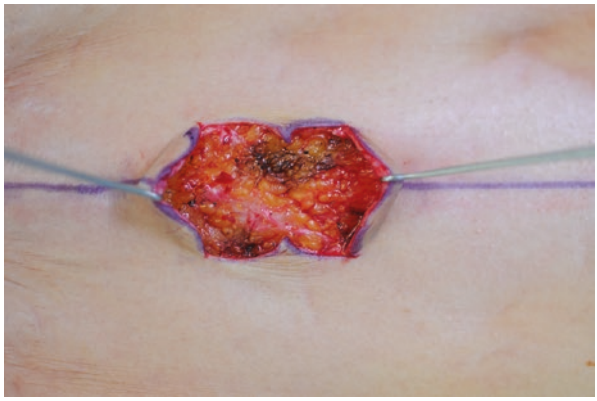

**Photo 2** Elevation of the flaps

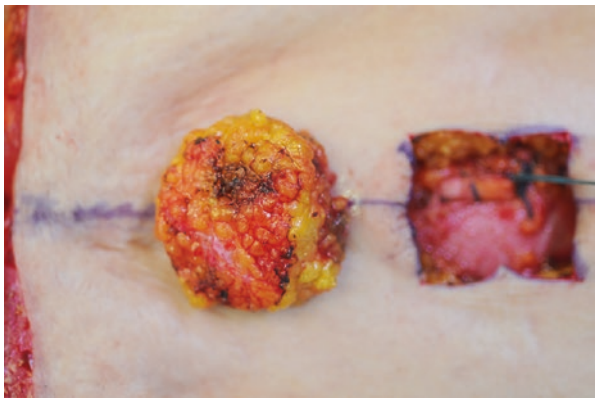

**Photo 3** Fat removal

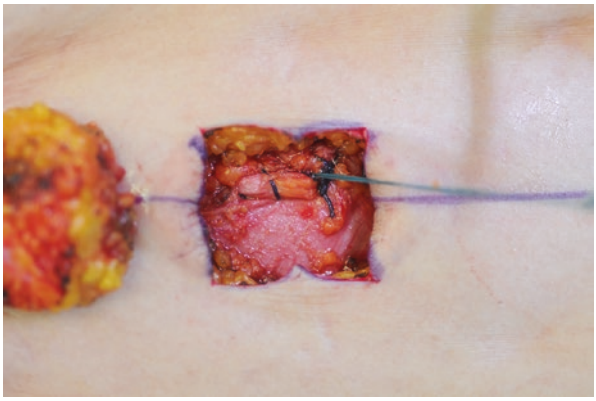

**Photo 4** Aponeurosis plane

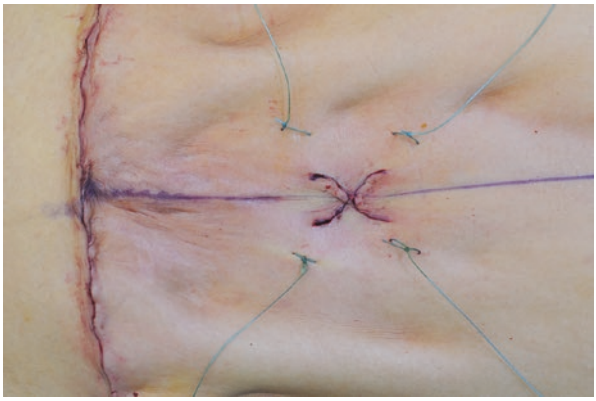

**Photo 5** Anchoring flaps on aponeurosis

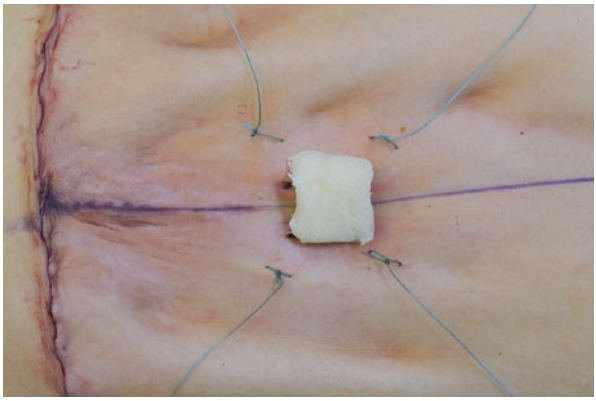

**Photo 6** Dressing for 5 days

The dressing is important and a we use a bolster for 5 days to fix the flaps and make an adhesion on the aponeurosis.

The outcome of this new umbilicus is much better in a fatty abdomen (Photographs 9, 10, 12, and 13) than in a lean one (Photograph 11), because the depression at the upper part of the new umbilicus is much more natural.

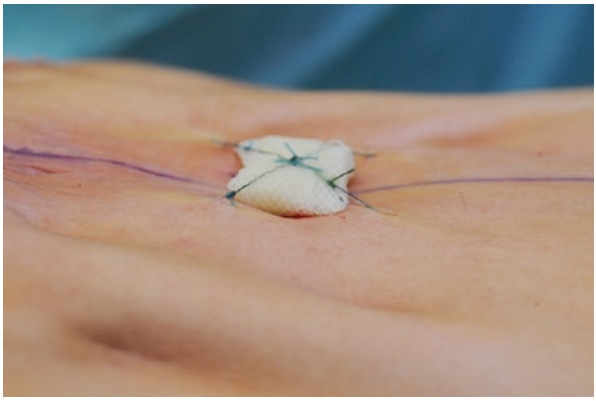

**Photo 7** Fixation of the dressing

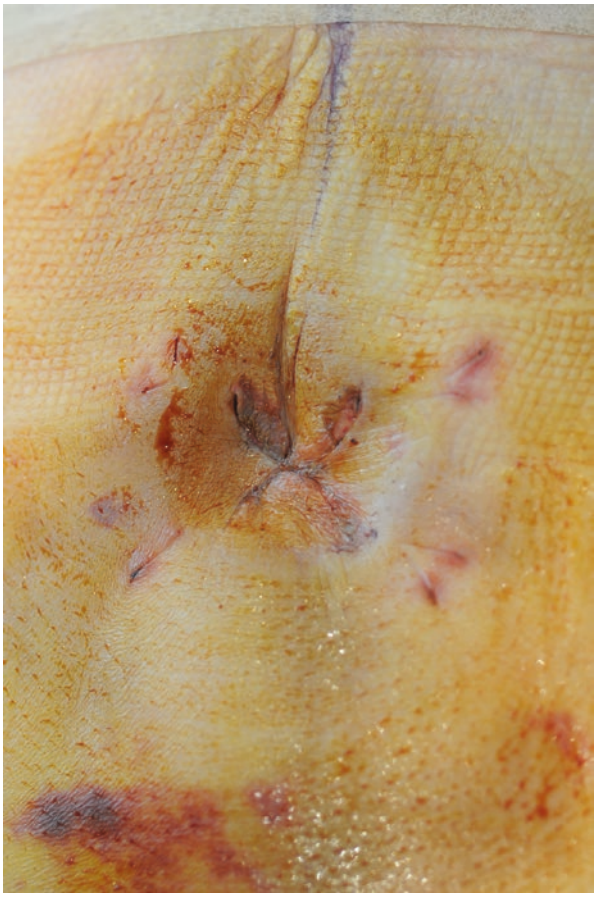

**Photo 8** Dressing removal

**Photo 9** Normal case post-operation 1

In some cases, to create this upper depression, we perform a fat grafting under the upper triangular flap 3 months after performing the umbilicus technique.

## Indication and Discussion

In our practice, the first indication is abdomen dermolipectomy with umbilical hernia repair.

In this case, the necrosis of the umbilicus is quite frequent, because the hernia treatment (even with some de-epidermised flaps) has de-vascularized the umbilicus.

To avoid weeks of dressings to obtain a directed healing with poor outcomes and non-aesthetic appearances, we choose to perform the resection of the umbilicus and creation of a new one, using the neo-umbilicus technique immediately during the repair of umbilical hernia.

**Photo 10** Normal case post-operation 2

**Photo 11** Lean case pre-operation and post-operation

**Photo 12** Clinical case 1 pre-operation and post-operation

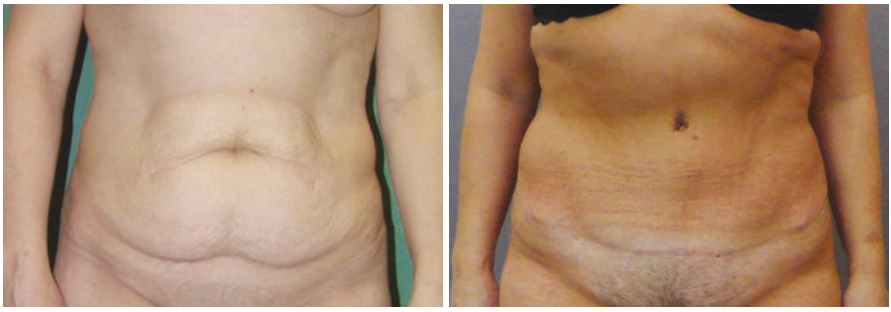

**Photo 13** Clinical case 2 pre-operation and post-operation

The patient is informed and photographs are shown before the operation.

This technique was also designed for individuals who congenitally lack umbilical tissues due to bladder exstrophy, gastroschisis, omphalocele, and cloacal extrophy.

We also use the neo-umbilicoplasty after the excision of a protruding umbilicus, traumatic umbilical malformation, breast reconstruction using abdominal tissues, umbilical herniorrhaphy, and severely hypertrophic and disfigured umbilicus. In these cases, no umbilical tissue was available for use, leaving only the adjacent abdominal soft tissue.

## Other Techniques

A lot of various methods have been employed in order to reconstruct the umbilicus, including the purse-string method with a poor definition and the use of an ear conchal cartilage graft (from a donor) to rigidify the neo-umbilicoplasty.

These other techniques are mainly variations of how many flaps are created and used.

For example, the double triangular and trapezoid flap: this technique changes the size and shape of the four triangles technique. The previous transverse suprapubic scar is incised, and the skin and subcutaneous tissue are dissected from the

aponeurosis. The location of the neo-umbilicus is marked on the abdominal flap, and a 2-cm vertical line is also marked on the midline. From each extremity of this line, two opposite equilateral triangles with 1 cm on each side are marked. Therefore, two lateral trapezoid skin flaps are defined. An incision is made through the subcutaneous adipose layer, and its excess is removed up to the aponeurotic layer. Then, four skin flaps are created. These flaps are anchored to the aponeurotic layer using 4/0 nylon stitches to simulate the central depression of the umbilicus, and they are finally sutured to each other using 5/0 nylon stitches.

There is also the triangular skin flap technique: a triangular skin flap is designed within the elliptical skin excision over the umbilicus either in a vertical or horizontal direction. One side of the triangular flap is attached to the remaining skin border. This side of the triangle measures about 4 cm while the other two borders measure 7 and 6 cm, respectively. After wide suprafascial undermining, correction is performed of the rectus diastasis. Over the longest side of the triangle, the flap is folded onto itself and sutured upon itself. The tip of this conical skin structure is then firmly attached to the fascia of the abdominal wall by a 2/0 resorbable suture. The redundant skin around the neo-umbilicus is resected and skin closure is performed. This technique can be used in cases with an absent or destroyed umbilicus. This umbilicoplasty technique needs to be combined with either a vertical or horizontal scar over the umbilical position to be able to guarantee sufficient size of the umbilicus.

Every method has advantages and disadvantages; however, none of the above methods can guarantee optimal results.

## Complications

The most common complications in neo-umbilicoplasty are wound infection, skin dehiscence, flap necrosis, hematoma, disruption, malposition, asymmetry, and unpleasant aesthetic appearance.

The goal of a new umbilicus is easily achieved and patients should be informed of this.

### Conclusion

The umbilicus plays an important role in the aesthetic appearance of the abdomen and it is a structure of feminine symbolism, and has significant psychological, physical, and social value. So, its restoration during reconstructive or aesthetic surgeries, such as an abdominoplasty, is a challenge for every plastic surgeon practicing abdominal surgery.

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# Reconstruction of the New Umbilicus: Indications and Choices

Alfredo Donnabella

*In abdominoplasty, the umbilicus corresponds to the surgeon's signature.*

The modern world has brought a new type of food to people: food rich in fat and carbohydrates and of little protein value. Consumption of these foods have caused the weight gain of individuals to become uncontrolled, leading to a new disease that is found worldwide: morbid obesity. At the beginning of this millennium, bariatric surgery became a common procedure and it is today the best method to control or treat obesity. This type of surgery achieves a significant weight loss in the individuals and has therefore brought a new type of patient to the plastic surgeon: thin patients with large amounts of excess skin and deformities in the body contour. Plastic surgery is common to reconstruct defects caused by this excess skin . Among requested surgeries, the most common is abdominoplasty, and an apron-like skin fold frequently occurs on the abdomen. Commonly found in these patients are skin folds in various stages and sometimes multiple skin folds, skin excess lateral (circular) and cranial-caudal, and skin excess in the suprapubic region, altering the anatomy of the genital region and distorting the umbilicus.

The only scar in the human body that an individual makes a point of possessing is the umbilicus. Although it presents as depressed and adhered to the deep planes, which is characteristic of pathological scars, the umbilicus is essential for the beauty of the abdomen. In abdominoplasty, the new umbilicus should have a good shape, an appropriate positioning, should not present a stigmatizing aspect, stenosis, or enlargements, and have a natural appearance. The beauty and natural character of the abdomen is directly attributed to a well-formed umbilicus.

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The umbilicus is described as a depressed scar surrounded by a natural skin fold. The umbilicus is about 1.5–2.5 cm in diameter [1, 2]. Its natural position is at the height of the line joining the highest point of the two anterior–superior iliac crests. This point is located between the third and fourth lumbar discs [3–5]. In the vertical plane, this position may vary to a higher or lower point [3] and when the umbilicus is located in a more cranial position, it gives the abdomen a more graceful aspect. Mauro Deós, a Brazilian plastic surgeon, drew attention to the position of the umbilicus in the vertical plane: an umbilicus located in a more cranial position gives the sensation of a longer abdomen and a narrower hip, usually found in slender patients. On the other hand, when the scar is located more inferiorly, the sensation is the opposite, shorter abdomen and broad hips, as found in patients over the ideal weight (Fig. 1).

Rohrich et al. in a work titled "*Is the umbilicus truly midline? Clinical and medico legal implications"* show that in the sagittal plane, the umbilicus shows a right or left laterality in 98.3 % of the individuals. Therefore only 1.7 % of the umbilici are located on the median line, which is contradictory to what is described in most papers. This lateralized position can reach up to 8 % of the width of the abdomen [4].

The umbilicus is formed from a base, which corresponds to the corrugated part, surrounded by a groove or ring. Its upper portion, which surrounds the depressed portion, is called the impeller (Fig. 2). Craig, Faller, and Puckett in "*In search of the ideal female umbilicus"* analyzed the most graceful form of umbilicus: it should be small, with a T silhouette in depth, rounded or oval, and with a discreet skin fold in its upper portion [1, 5].

**Fig. 1** Visual change of the abdomen with the umbilicus placement

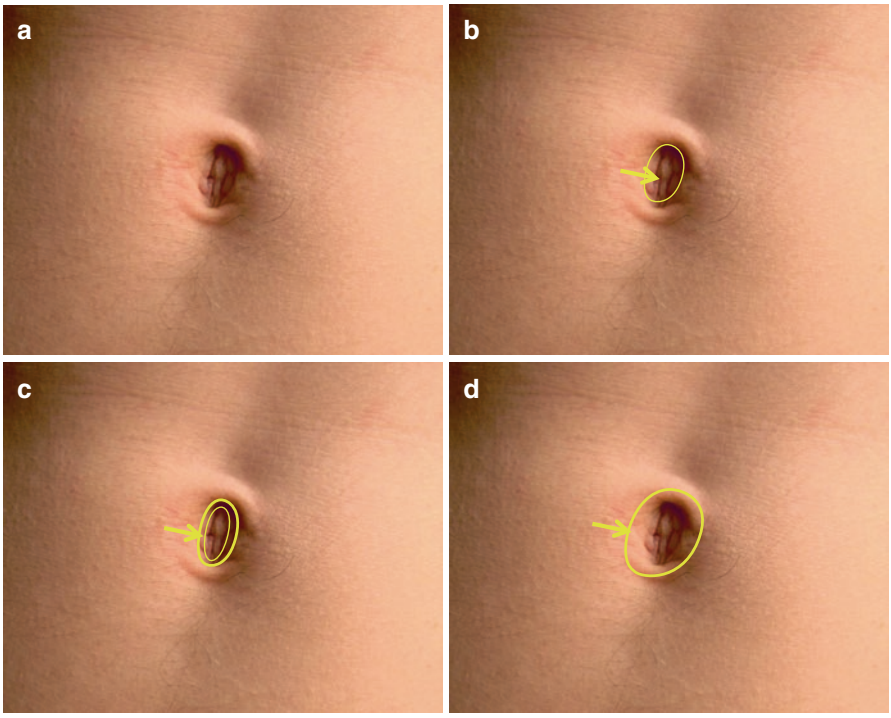


**Fig. 2** (**a**) Anatomically harmonious umbilicus. (**b**) Corrugated central area. (**c**) Groove or ring portion around the corrugated area. (**d**) Impeller portion surrounding the central depression

The classification of Pittsburg [20] proposed by Hurwitz, Rubin, and others classifies the abdomen in 4 degrees

| | | |
|---|---|---|
| Grade 1 | Normal | Without surgical indication |
| Grade 2 | Excess skin, presence of wrinkles with moderate excess of fat, but without folds | Mini-abdominoplasty or liposuction |
| Grade 3 | Abdomen in apron | Classic abdominoplasty |
| Grade 4 | Multiple folds with tissue excess in the epigastrium | Modified abdominoplasty, including fleece (anchor) or upper body lift |

Based on this table, it is possible to define which surgical method fits each type of patient. The vast majority of post-bariatric patients fall into grades 3 and 4, and thus abdominoplasty with or without a median scar is recommended. The presence of the median scar is very important to surgical planning since it can define which method of omphaloplasty should be used.

In classic abdominoplasty, in which there is no resulting median scar, it is always possible to preserve the umbilical stump by performing its exteriorization through the abdominal flap.

In abdominoplasty with a median scar (anchor or liz flower), the surgeon can take advantage of the remaining umbilical stump or use primary neo-omphaloplasty

with optimal results. To avoid the stigma of the "operated navel", we can now, with good results, use primary neo-omphaloplasty. In some cases, neo-omphaloplasty is mandatory (Fig. 3). It is estimated that about 20–30% of bariatric laparotomy surgeries will result in incisional hernias and, and in some cases, this hernia encompasses the umbilicus. In these cases, the risk of umbilical stump suffering or necrosis is great, so primary neo-omphaloplasty is a great option. The aesthetic results of primary neo-omphaloplasty are very good and several surgeons opt for this procedure. A good tactic was presented by this author [22], in which all the anatomical units of the umbilicus are reconstructed.

Reconstruction of the umbilicus still poses a challenge. Several techniques have been found in the literature: using local flaps [4, 5, 7–17, 24]; use of skin or cartilage grafts [5, 16, 18]; or use of sutures only [2, 19–21], some of which have reasonable results, but don't give a natural character to the new umbilicus. For reconstruction of an ideal umbilicus, all the anatomical units of the umbilicus must be reconstructed. A modification of the technique shown by Franco and Medeiros [6] is presented in which the anatomical units (e.g., corrugated area, umbilical sulcus, and impeller) are reconstructed step by step. The umbilicus can be eliminated along with the surgical specimen. For reconstruction of the umbilicus, whether due to the absence of an umbilicus (in cases of hernias or destruction by previous scars) or due to aesthetic reasons, two parallel rectangular patches are used, which are sutured together and fixed to the aponeurosis of the rectus abdominis muscles. These flaps should measure 1.5 cm tall by 2.0 cm wide but may be slightly larger. The flaps

**Fig. 3** Situations in which there is no possibility of using the umbilical stump. Neo-omphaloplasty is mandatory

should have the transition with the skin in a curvilinear shape and not at right angles. The curvilinear form should be observed in its distal portion (Fig. 4).

The flap fixation is made by using two parallel points that reach the dermis of the flap on one side, with the flap dermis on the opposite side also reaching the aponeurosis in its midline. This way the union of the two flaps is obtained by lightly compressing the distal portion of the flaps (Figs. 5, 6 and 7). With the fixation of the two flaps compressing the distal edge in the aponeurosis, it is possible to form the wrinkled part. There is a pleat in the flaps that gives the appearance of the umbilical sulcus because it includes the dermis of the flap in the suture (Fig. 7).

The fat tissue is then drawn around the new umbilicus with stitches with Vicryl®1 (polyglactin) and a 4-cm needle. This large needle should be used to include as much fat tissue as possible (Fig. 8). With the approach of the fatty tissue adjacent to the new umbilicus, there is an increase in volume of the edges around it thereby giving it the necessary depth. This approach is essential for the definition of the depth of the neo-umbilicus. As it is impossible to deepen the wrinkled part beyond

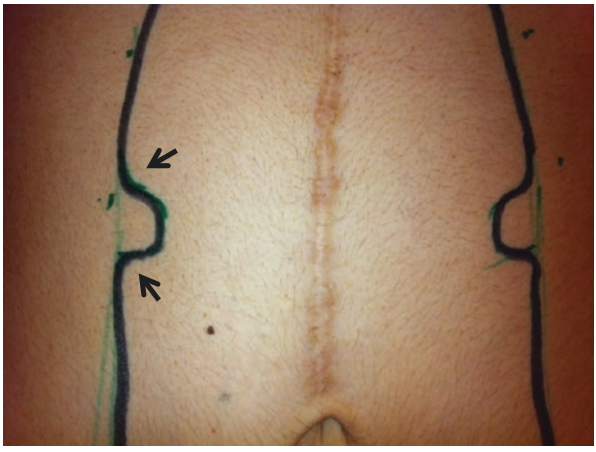

**Fig. 4** Patch marking, curvilinear skin/flap transition (arrows)

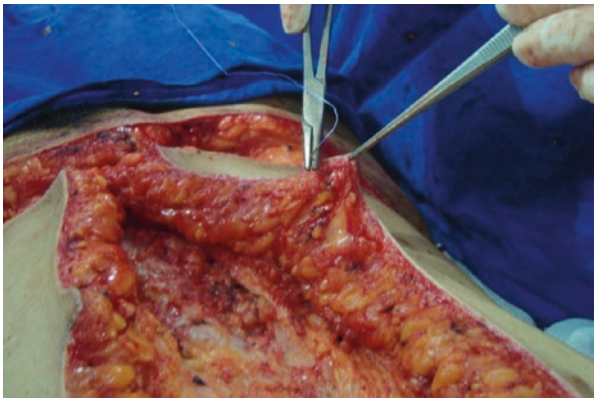

**Fig. 5** Fixation of the flaps, point reaching the dermis of the flap

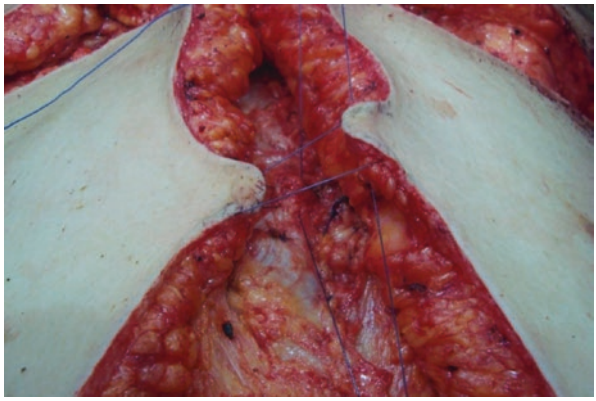

**Fig. 6** Fixation of the flaps, point reaching the lateral flaps and aponeurosis

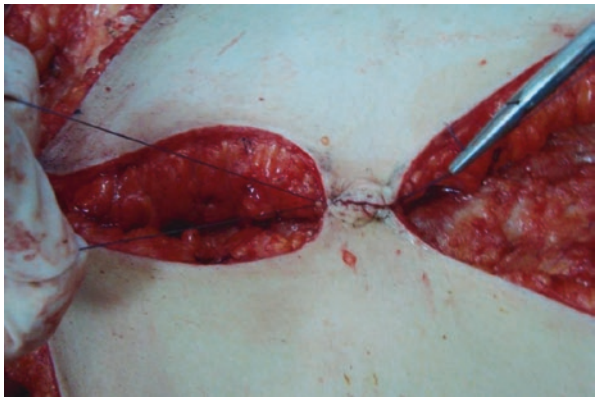

**Fig. 7** Flaps fixed in the aponeurosis, formation of the wrinkled part and furrow

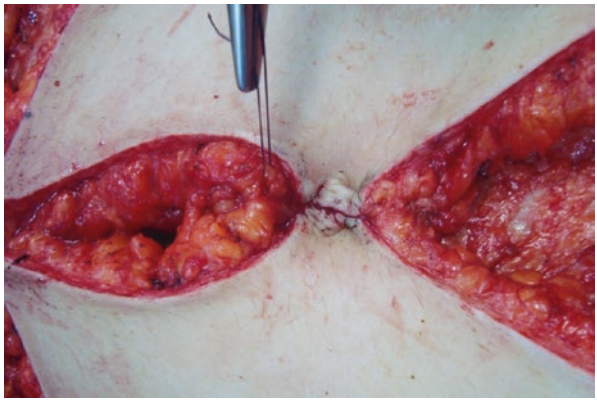

**Fig. 8** Approaching the fat around the neo-umbilicus

the aponeurosis, the solution is to raise the tissues around the neo-umbilicus to achieve the adequate depth. The tissue we have available is the greasy tissue. It should be treated gently, as the risk of tissue damage is real.

To avoid liponecrosis, care must be taken not to tighten these points too much. The procedure is completed by suturing the skin (Fig. 9). Due to the fact

**Fig. 9** Final result

that the flaps are short, a curvature of the skin occurs around the new umbilicus, forming the impeller.

The formation of all the anatomical units is possible: wrinkled part, groove and impeller, besides a good depth in the reconstructed umbilicus. Because it includes the dermis of the flap on the suture, there is a pleating of the flaps that gives the appearance of the umbilical sulcus. With the approach of the fatty tissue adjacent to the new umbilicus, there is an increase in volume of the edges around it, which gives the necessary depth. No cases of umbilical stenosis have been observed, because there is no circular scar around the new umbilicus, thus also avoiding the stigma of an operated umbilicus. There is usually no hypertrophic scar or keloid scar on the new umbilicus, although pathological scarring may occur on the supra- or infra-umbilical vertical scar. Over time, the ptosis of the skin located in the cranial portion of the reconstructed umbilicus is expected to occur, forming a discrete fold, which gives more naturality to the final reconstruction. Due to the fact that the flaps are short, a curvature of the skin occurs around the new umbilicus, forming the impeller. By keeping these flaps between 1.5 and 2.0 cm, the result is a small, harmonious umbilicus.

When used for reconstruction in abdominoplasty, the technique presented by Silva and Abramo [19] can be used to determine the height of the umbilicus in the abdomen. It consists of a larger flap of skin that is left to later define the flap of 1.5–2.0 cm. The great difficulty in reconstructing the umbilicus is to achieve depth in the new umbilicus, particularly when the patient presents scarce adipose tissue. The technique of bringing in adjacent fatty tissue solves this issue. Keeping a curve at the base of the flap, instead of a right angle, avoids the approach of the edges and, thus, a more rounded umbilicus is obtained, avoiding an elongated and closed scar. These features can be seen in Figs. 10, 11, 12, 13, 14, and 15.

The technique for the reconstruction of the umbilicus presented here accounts for the anatomical units, provides a very natural look, and overtime generates slight excess of skin on the upper part, giving a more natural appearance. The resultant umbilicus exhibits appropriate depth and size. The technique avoids the appearance of scarring and secondary stenosis by hiding the circular scar incision and keeping its position in the middle of the navel.

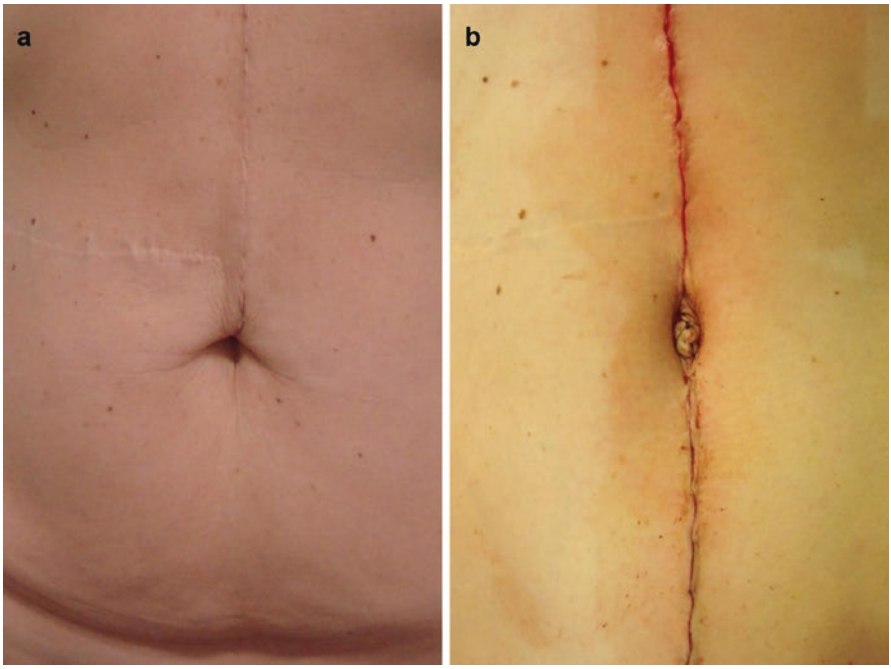


**Fig. 10** (**a**, **b**) Pre- and immediate post-operative

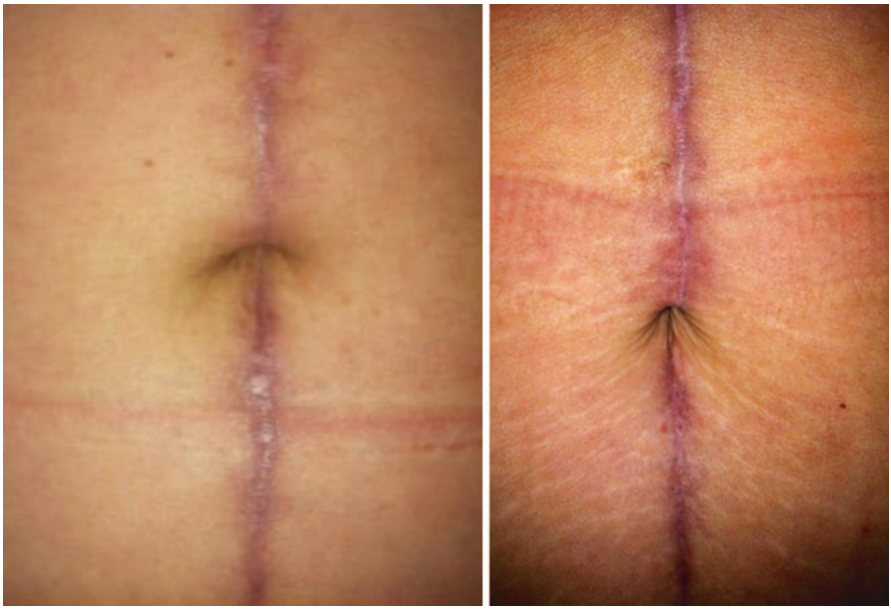

**Fig 11** Late post-operative

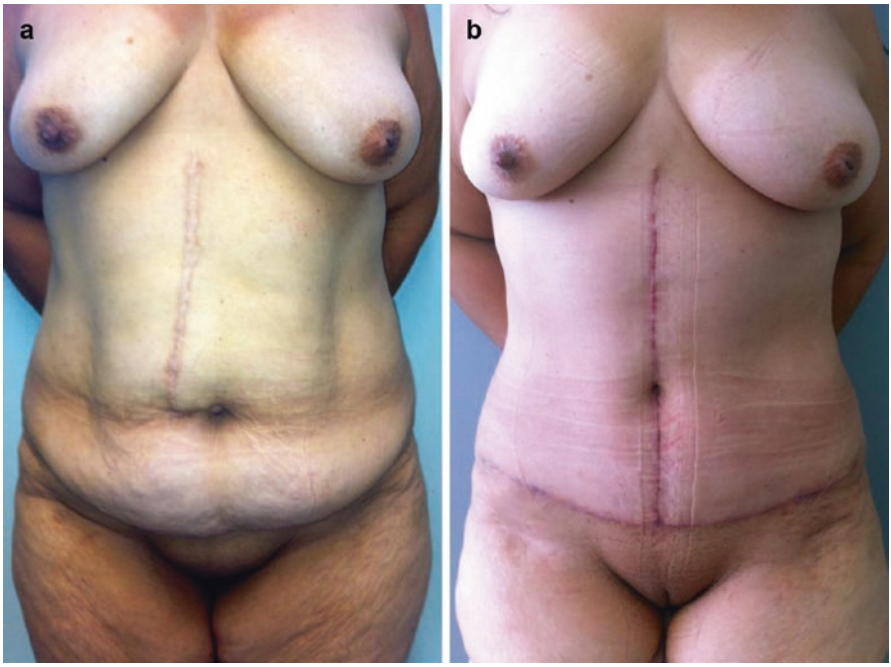


**Fig. 12** (**a**, **b**) Pre- and post-operative. There is a small protrusion in the umbilicus denouncing the presence of umbilical hernia


**Fig. 13** (**a**, **b**) Pre- and post-operative. Patient with incisional umbilical hernia

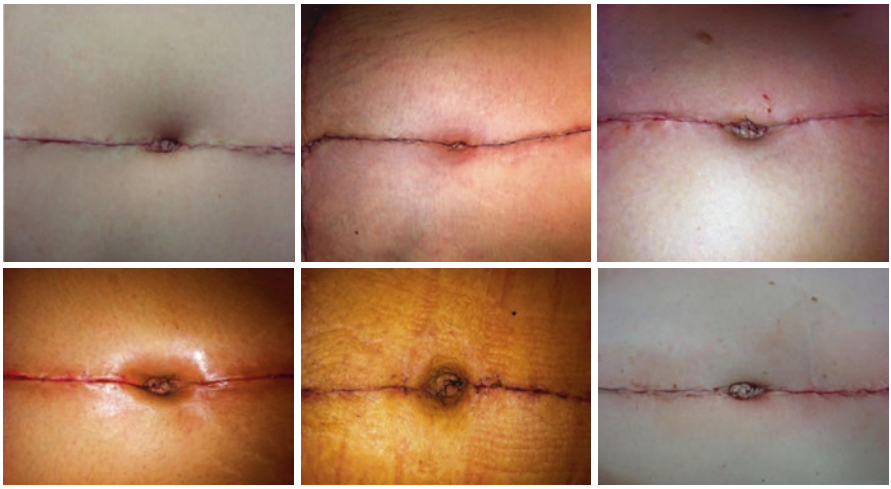

**Fig. 14** Immediate post-operative period

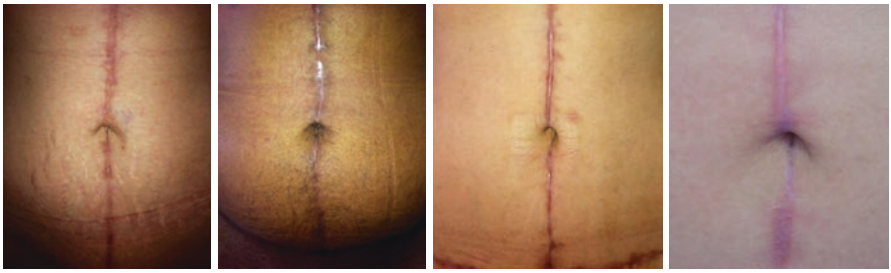

**Fig. 15** Late post-operative

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# Management of Esthetic Alterations of the Umbilicus

Guillermo Blugerman, Diego Schavelzon, Gabriel Wexler, and Marcelo Lotocki

## Introduction

The umbilicus is an anatomical element on which different civilizations have focused. The abdomen is perceived as a plain anatomical area interrupted by a single topographical feature, the umbilicus. The umbilicus is the only scar that, if not preserved or restored in surgical procedures, results in an unnatural appearance. It is the only point of direct and firm adherence of the deep fascial planes and the skin. Its presence divides the abdomen into supra- and infra-umbilical areas, with anatomical, histological, and biomechanical differences that affect skin behavior during pregnancy and after abdominal liposuction. The lower abdomen is thin, elastic and has a tendency to develop atrophic stretch marks, whereas the upper abdominal skin is thick and less elastic.

## Anatomical Review

The umbilicus is a second-intention healing scar. It is the result of the umbilical cord stump falling off 5–6 days after birth. In the third month of intrauterine life, the umbilicus is formed by a small hole pierced by two umbilical arteries and the umbilical vein through which the fetus is attached to the placenta, surrounded by gelatinous layer of Wharton. After birth, once the cord is ligated, blood stops circulating

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through these vessels. The vessels collapse and obliterate and gradually transform into fibrous cords.

The adult navel has a depression circumscribed by an umbilical skin fold called the umbilical roll. At the bottom of the depression is a small irregular eminence, the nipple, which has in its apex the umbilicus scar, and it is separated from the umbilical roll by the umbilical groove. The umbilical roll can take various shapes depending on the skin and subcutaneous tissue disposition.

## Umbilicus Location

The umbilicus is located below the midpoint, between the xiphoid and the pubic symphysis [1]. The umbilicus scar is from 18 to 23 cm above the vulvar commissure in women, with a range of 2–4 cm below the horizontal line connecting the anterior superior iliac spines. It has a circular or slightly oval vertical shape, a mean diameter of 1 cm and a variable depth according to the thickness of the adipose tissue. This form undergoes changes throughout life. Weight changes, pregnancy, abdominal surgery, and hernias are important factors that influence umbilicus shape and position. Anatomically, the navel is located at the height of the third and fourth vertebral joint [2], but this localization method is not very helpful in surgical planning. We usually locate the umbilicus in the midline, two fingers over a line that joins both anterior superior iliac spines.

## Aesthetic Deformities

Vertical or T-shaped umbilici have greater esthetic appeal than other shapes (horizontal, protruding, distorted) [3]. With our ideal umbilicus in mind, we classified umbilical esthetic deformities in the following groups:

- alteration of shape and position
- alteration of thickness of the umbilical roll and periumbilical area
- scars and healing disorders.

The umbilicus is deeply fixed to the fascia so when upper abdominal laxity occurs, this extra skin falls in front and to the sides of the umbilicus, causing what is known as a sad umbilicus. This problem can be primary or secondary after abdominal liposuction. To determine the appropriate treatment, we should note the umbilicus location in respect to the other structures in the abdomen and thus determine whether we are dealing with a high, normal, or low insertion umbilicus, with respect to the iliac crest. A low inserted umbilicus can tolerate more upper abdominal laxity without distorting its shape compared to a high umbilicus where mild flaccidity results in a sad umbilicus. Based on the external appearance of the umbilicus when viewed from the front, we have classified the sad umbilicus into three grades. Grade I is the umbilicus that loses the slightly vertically oval or round shape,

becoming an oval with the longest axis in the horizontal plane (Fig. 1). Grade II is the umbilicus with upper abdomen skin falling over it but not covering it completely (Fig. 2). Grade III is the umbilicus that has become a slit because the upper abdomen skin has covered it completely (Fig. 3). In this stage, the scar or depression is completely hidden.

The thickness of the umbilical roll and the periumbilical area is determined by the amount and distribution of its subcutaneous tissue. An increase in thickness is rare. The most common alteration is the reduction of thickness of the subcutaneous tissue that can occur in a physiological process such as pregnancy, where the

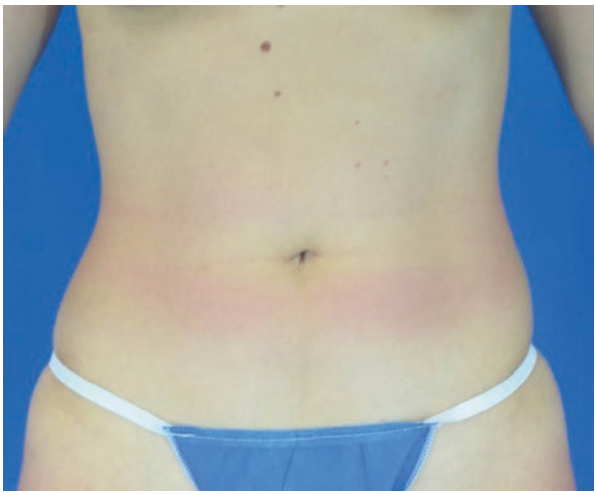

**Fig. 1** Sad umbilicus grade I

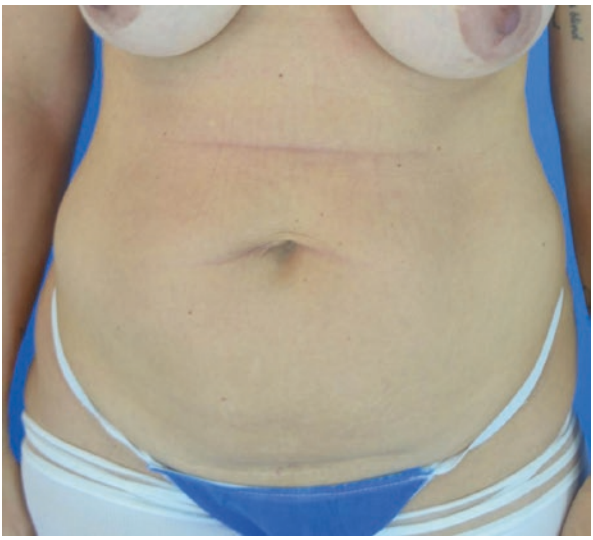

**Fig. 2** Sad umbilicus grade II

**Fig. 3** Sad umbilicus grade III

intraabdominal expansion causes compression atrophy of the supra-umbilical skin triangle, or from iatrogenic causes such as liposuction.

Healing disorders in the umbilical area include hypertrophic scars and keloids. This can occur after umbilical hernia correction, nevus resection, umbilicoplasty, abdominoplasty, laparoscopic surgery, and traumas. The spectrum can vary, from just a visible hypertrophic scar to a tumoral keloid that completely occludes the navel.

## Treatment Options

### Alteration of Shape and Position

When the upper abdomen skin falls over a normal or high inserted umbilicus, there are three main options:

1. Upper abdomen mild to moderate flaccidity without lower abdomen flaccidity: umbilicosliding [4].
2. Upper abdomen severe flaccidity without lower abdomen flaccidity: reverse abdominoplasty or traditional abdominoplasty.
3. Upper abdomen mild to moderate flaccidity with lower abdomen mild flaccidity: mini-abdominoplasty with floating umbilicus [5].

If the upper abdomen falls over a low inserted umbilicus, the options are abdominoplasty: traditional or reversed.

## Umbilicosliding Technique

A cross is marked in the umbilicus with the center in its nipple, thereby designing four triangular flaps (Fig. 4). The umbilicus is held with a Gillies hook [6], pulled up and cut. Blunt dissection proceeds to free fibrotic adhesions. With the umbilicus completely mobile, the new position is decided. It is difficult to mobilize the umbilicus more than 3 cm.

The aponeurotic defect is sutured with braided 0 and with the same stitch, as a quilting stitch [7], the supra-umbilical skin is fixed in its new position (Fig. 5). If there is a hernia, two or three stitches are required to plicate the rectus muscle and close the defect. The flaps are fixed to the aponeurotic layer, stitching the inner base of each triangular flap to the fascia 1 cm away from the center of the new umbilicus. All the subcutaneous tissue and skin sutures are with Monocryl 3/0. Finally, a purse string stitch is performed to connect the four flap tips and anchor them to the fascia in the center of the new umbilicus. With this surgical procedure, sliding the umbilicus towards the pubis, the moderate flaccidity of the upper abdominal is better tolerated without distorting the umbilicus (Fig. 6). Umbilicosliding can be associated

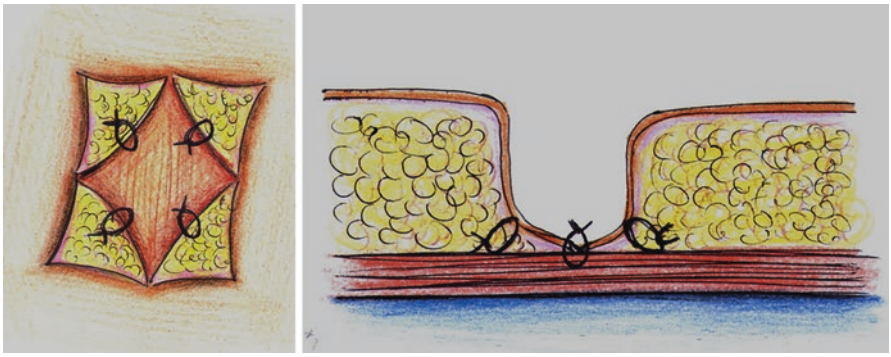

**Fig. 4** Diagram of flaps design and fixation to the abdominal wall. Frontal view (left) and sagital view (right)

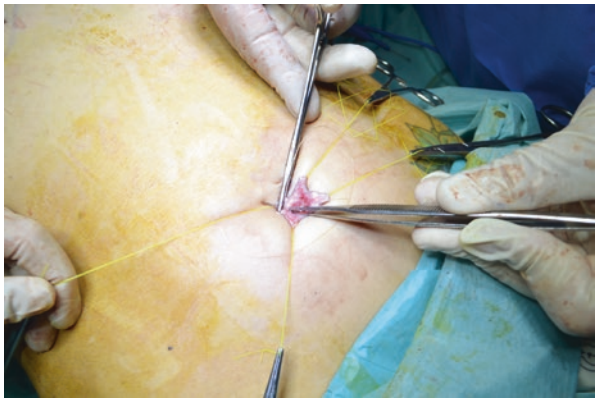

**Fig. 5** Intraoperative image of the four umbilical flaps being sutured by their base to the abdominal wall

**Fig. 6** Patient with sad umbilicus grade II (left) and 3 months umbilical sliding postoperative (right)

with abdominal liposuction or tunneling with blunt cannulas so that the abdominal skin can adjust better to the new position.

## Alteration of Thickness of the Umbilical Roll and Periumbilical Area

When the subcutaneous tissue of the umbilical roll or periumbilical area has suffered atrophy or resection, it has to be restored in order to obtain a natural appearance. To restore any tissue in the body, it is always better, if possible, to use the same kind of tissue that was lost. Therefore, we choose to use Enriched Adipose Micrografts with autologous plasma (EAM).

Micrografts are obtained with a Micro Graft Fat Cutter (MGFC) or the Blugerman Fat Cutter (BGC) after tumescent anesthesia of the donor area. Micrografts obtained with these instruments have the same survival rate as those grafts cut with scalpels, surpassing the survival rate of grafts obtained with liposuction cannulas [8]. When small amounts of micrografts are needed, we use syringes and centrifugate the material at 3000 rpm for 3 min to separate fat from liquid. If the amount needed is over 100 $cm^3$, we use the ByS peristaltic pump and leave the material to decant for 10 min. After separation, the liquid is discarded and activated plasma is added to the micrografts (platelet-rich plasma when grafting volumes are below 20 $cm^3$ and total plasma if grafting volume is over 20 $cm^3$), thereby obtaining a gel (EAM).

The recipient area is not infiltrated with anesthesia, instead it is dissected with carbon dioxide gas in a process called pneumodissection. This enhances the receptor area, creating $CO_2$ tunnels, opening arteriovenous shunts and increasing the oxygen partial pressure without competing in volume with the graft (as local anesthesia does). EAM is then injected through microcannulas of 1 and 1.4 mm in the periumbilical area, umbilical roll, and supra-umbilical triangle. The receptor area should not be overfilled because for the grafts to survive, they must be surrounded by vascularized receptor stroma that will nourish them. It is better to perform serial graftings than trying to correct a tissue deficit in just one procedure as this can result in liponecrosis, infection, fibrosis, and more tissue deficit.

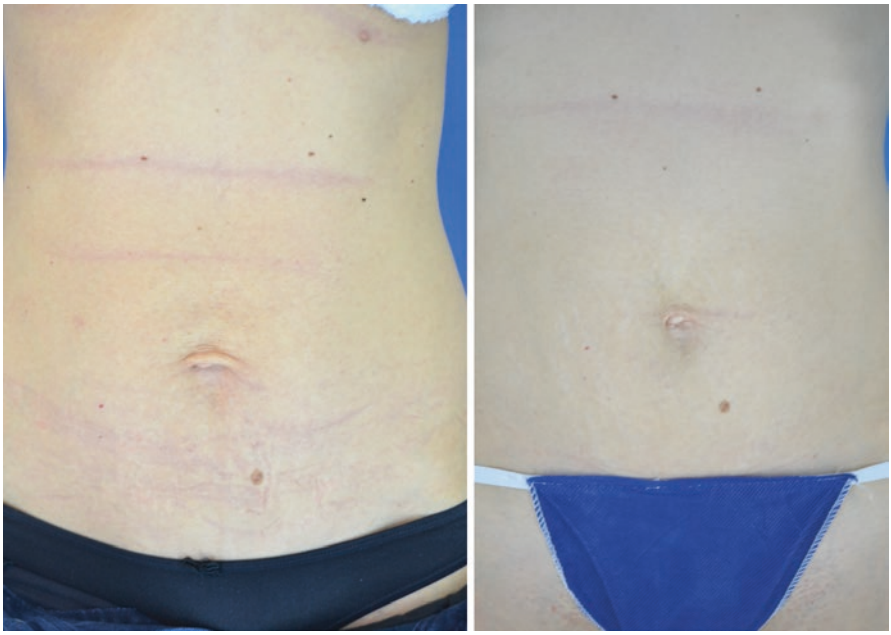

**Fig. 7** Post pregnant patient showing supraumbilical triangle atrophy (left) and 2 months after EAM (right)

This EAM protocol has a high satisfaction rate among patients and surgeons (Fig. 7). It is important to inform the patient that the final result might require repeat sessions of EAM. We have performed up to three sessions to correct some fat over-resection in the periumbilical area.

## Scars and Healing Disorders

Unesthetic scars and healing disorders are a frequent problem that plastic surgeons have to deal with. The umbilicus, the only physiological scar in the body, is no exception. Here we focus on three situations:

1. A patient with a wound healing disorder history is appointed for umbilical surgery (umbilicoplasty, hernioplasty, abdominoplasty).
2. A patient that has undergone an umbilical surgery presents with a healing disorder in an early stage.
3. A patient that has undergone an umbilical surgery presents with the sequela of a healing disorder, a hypertrophic scar, or a keloid.

In the first case, management is based on prevention and close follow up. During surgery, a soaked gauze with 1 mL of 5 Fluorouracil (5 FU) 50 mg/mL is applied for 5 min before skin closure. This protocol was adapted from hand

surgery [9]. Close follow up is indispensable to intervene in the acute phase of wound healing disorder.

A wound healing disorder in an early phase must be treated in order to decrease the inflammatory reaction. In these cases, an intralesional infiltration protocol with 5 FU and triamcinolone is used [10]. We use 0.9 mL of 5 FU and 0.1 mL of triamcinolone. For the application, a Luer lock 1 mL syringe and 30 G needle are preferred. This allows a better dosage and correct plane of infiltration. This solution is injected every 3 or 4 weeks until the scarring process is normalized. Between infiltrations, topical retinoids and pressure garments are indicated if needed.

In the third situation, we mix the above protocols [11]. Starting with an infiltration protocol, that is followed with topical retinoids and pressure garments. The surgical correction is planned when the scar is soft and without signs of inflammation. During surgery, a soaked gauze with 5 FU is applied over the wound for 5 min. Close follow up is a must in order to intervene as early as possible (Fig. 8).

When treating patients with a background of hypertrophic scarring and keloids, talking thoroughly with them and a relative is essential. We must explain the situation until we are sure that they understand that the healing disorder is a condition of the patient, the scarring process is the way their body reacts to wounds, and that we are going to use all our techniques and knowledge to achieve an acceptable scar, but we cannot guarantee anything. Patient education is essential for follow up. The first symptoms of acute inflammation in a scar that will start to grow are itching and pain. Whenever those symptoms appear, the patient must return for treatment adjustment.

**Fig 8** Patient with lower abdomen and umbilical distortion due to wound healing disorder (left) and 4 months after 3 sessions of 5 FU infiltration and surgical correction (right)

### Conclusion

The umbilicus is the anatomical structure that interrupts continuity in a pleasing abdomen. It has its own anatomical variability of shapes and locations. A correct diagnosis is the first step to obtain a high rate of happy patients. In this chapter, we exposed our protocols for management of different umbilical esthetic alterations. Every aspect is essential for the abdominal esthetic unit, the location, the form, the quality of the surrounding skin and subcutaneous tissue, and, of course, scars.

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# Omphaloplasty: X-Shaped Flap Technique

Alfredo Hoyos

## Introduction

The umbilicus has an important role in the natural and aesthetic appearance of the abdomen [1, 2]. Since the first surgical procedures on the abdominal wall were performed, multiple techniques have been tried to restore the normal anatomy in this region by reconstructing the umbilicus [1, 3–14].

The umbilicus is the only "natural scar" present after birth, and its nature and anatomy have been carefully designed so that it can remain through the entire life in perfect harmony with the body. The normal umbilicus is a depressed scar surrounded by a skin fold, located over the linea alba usually at the level of the iliac crest [15] (Fig. 1). As the body ages, the appearance of the umbilicus changes: from small and vertically oriented in young patients to rounded and transversally oriented and displaced into a lower plane in the elderly and overweight patients (Fig. 2).

Because various pathologies affect this embryological remnant, reconstruction techniques have become a major concern to restore a natural look [1–4, 11, 16, 17]. Moreover, with the advent of abdominoplasty, it has become important to get aesthetically pleasant results [18] since clothing such as underwear or swimwear does not cover this area (Fig. 3). Nowadays, many techniques have been described for better-looking and long-term results [17, 19, 20].

The most frequent cause of abdominal wall anatomy distortion is the change due to pregnancy [21]. These alterations include: hyperpigmentation (mostly over the linea alba) that occurs in up to 90 % [22] of these patients as a result to the natural hormonal effect and over-stretching of the abdominal skin resulting not only in the development of striae [23] but also in disruption of the normal umbilicus anatomy. This is even more evident in Latin/Hispanic patients that tend to have darker skin. When the old umbilicus is placed in its new position over the flap, the pigmentation

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**Fig. 1** A 35 year-old female. Aesthetically pleasant umbilical shape and ideal position, note superior skin fold and the vertical position over the linea alba

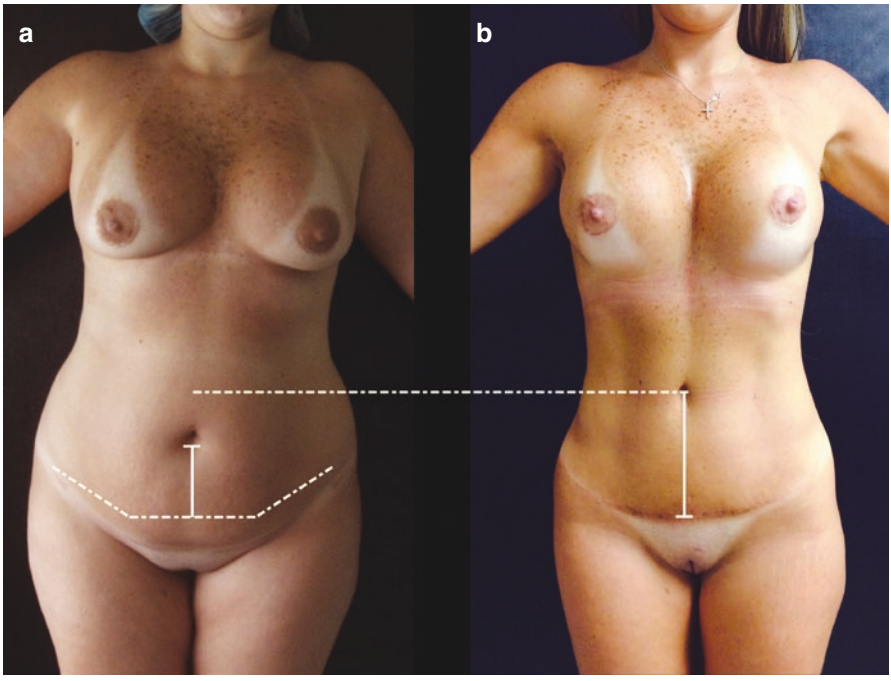


**Fig. 2** Umbilical position on an overweight patient, (**a**) pre-operation showing the lowered position measured using a line from the pubis to the umbilicus. (**b**) Post-operation showing a youthful-looking umbilicus. Note the increased pubic-umbilical distance

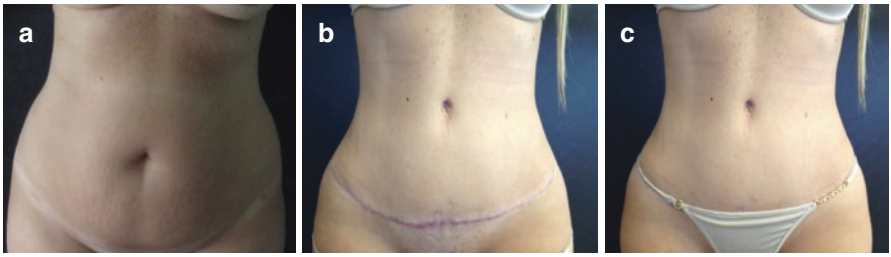


**Fig. 3** A 35 year-old woman who underwent 4D dermolipectomy with a 2-week delayed umbilicoplasty. (**a**) Pre-operation, (**b**) Post-operation showing the neo-umbilicus and the lipectomy scar, (**c**) Post-operation with underwear, note that the scar is totally hidden under the underwear

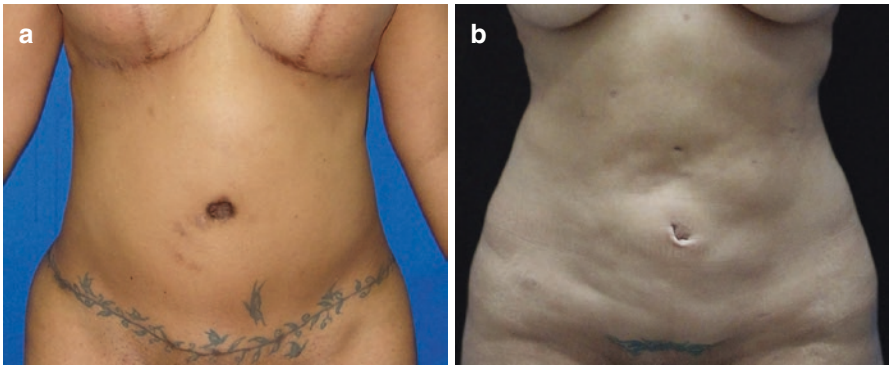


**Fig. 4** Poor results achieved with other different umbilicoplasty techniques. (**a**) Hyperpigmented umbilicus compared to the abdominal flap. (**b**) Distorted umbilical anatomy. Note the skin fold rotation and displacement

difference makes the results unnatural and far from the aesthetically desired outcome (Fig. 4a).

Umbilical deformities can also occur as a result of fibrosis' side effects, scarring after other abdominal procedures like liposuction or mini lipectomy (Fig. 4b), presence of hernias, and over-stretching due to pregnancy.

We describe a different and reproducible technique for umbilicoplasty called "X-shaped incision" technique. This technique is mostly associated with abdominoplasty, which allows us to achieve better aesthetic results by placing the neo-umbilicus at a more accurate anatomical position and avoiding the undesirable morphology changes of pregnancy and pigmentation mismatch, since the old umbilicus is cut out and replaced with a new one.

## Pre-operative

Preparation includes anesthesiologist evaluation and lab tests according to the AHA (American Heart Association) guidelines [24]. Patients with anemia (serum

hemoglobin <12 mg/dL) are excluded. Markings are performed following lipoabdominoplasty concepts and high definition techniques. Pre-operative photographs are taken.

## Markings

Several locations have been proposed for the most aesthetically pleasing umbilical location in women [23, 25]. There is still no consensus and three locations are mostly used. The first is a point over a line between the xyphoid process and the pubis, at a point that is 60 % upwards on this line [15]. The second location is the point where the midline intersects a line between the anterior–superior iliac spines [23]. The third location is 15 cm measured up from the pubic bone [25].

Experience has shown us that it would be better to consider an area in which the umbilicus should be placed rather than a specific point. According to this, we do not use the iliac crest as a point of reference because it has a wide variation in width and height depending on the female bone shape. Instead, we have defined an "Ideal Umbilicus Zone" as the area delimited over the midline (from the xyphoid process to the pubis) between the midpoint and the joint of the two upper thirds with the lower third. Within this line, the umbilicus should be placed in a higher or lower position according to the height of the patient (Fig. 5). Therefore, the longer the torso and the younger the patient, the higher the umbilicus location can be. On the contrary, older patients and patients with breast ptosis (due to the visually shorter torso) might have the umbilicus placed in a lower location.

After defining the best location for the umbilicus, the zones for deep and superficial liposuction are marked (Fig. 6). This allows for extra fat resection after the lipoabdominoplasty.

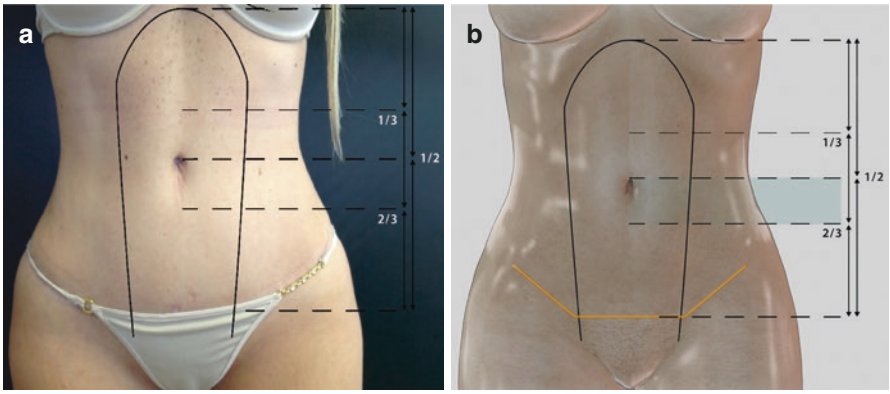


**Fig. 5** The Ideal zone for the neo-umbilicus placement is located between the mid point betwen the xiphoid and pubis and 1/3 of this distance

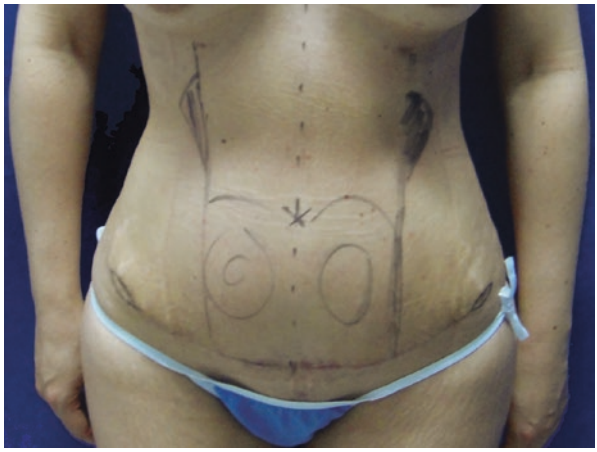

**Fig. 6** Pre-surgical marking: the neo-umbilicus position is marked as well the areas for additional liposuction

## Surgical Technique

Umbilicoplasty is mostly done following the lipoabdominoplasty procedure (normally by 2 weeks). We prefer delaying the procedure in order to reduce additional trauma to the abdominal flap, avoiding a drop in blood supply to the distal flap. The decision on performing delayed neo-umbilicus depends on the flap tension and the amount of liposuction over the abdominal flap. Both of these factors are evaluated during the procedure. The timing to perform the neo-umbilicoplasty is determined by the removal of the abdominal drain (closed Drain- Blake™ ETHICON, INC Johnson & Johnson) when the drainage is less than 50 mL in a period of 24 h.

After the umbilicus position is marked, a cross (X-shaped) incision, with 60° in the apex angles, is made across the linea alba deep enough to reach the rectus abdominis fascia (Fig. 7). Upper incisions must be 10 mm long and lower ones 5 mm. As a result, four triangular flaps are made: superior, inferior, left, and right. The three lower flaps are sutured with a continuous subcuticular stitch and fixed upwards to the abdominal fascia at the base of the upper flap (Fig. 8). The superior flap is then fixed loosely to the fascia in a perpendicular manner.

## Post-Operative

The wound is covered with gauze embedded with topical antibiotic (nitrofurazone) to induce a round umbilicus shape. After week 1, the gauze is removed and a silicone spherical splint or a marble is left in the umbilical hole for 2 extra weeks.

Loose garments and a foam vest are indicated for use from 4 to 6 weeks after the lipoabdominoplasty. After the umbilicoplasty, only the loose garment is used for 2–4 extra weeks (Figs. 9 and 10).

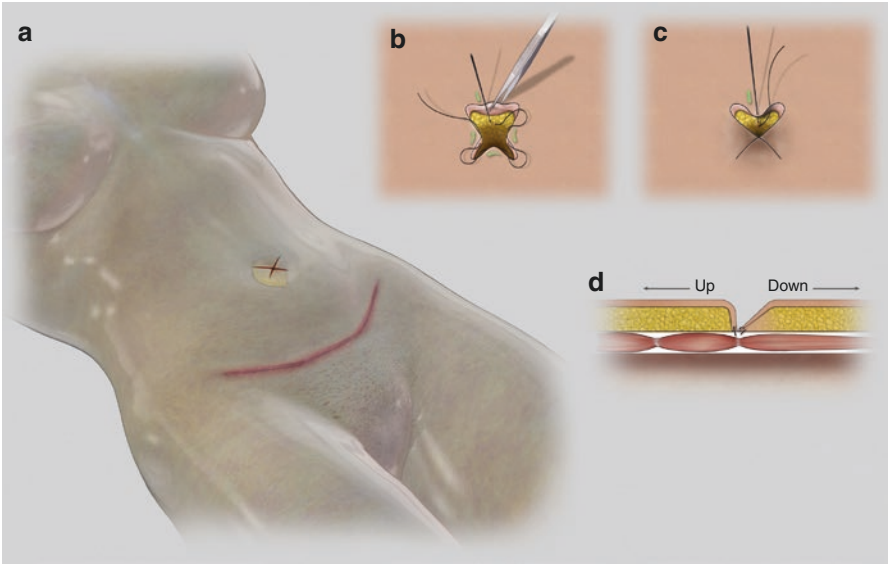


**Fig. 7** X-shaped umbilicoplasty technique illustration: (**a**) planning of incisions, (**b**) the three lower flaps are sutured with a continuous subcuticular stitch and fixed upwards to the abdominal fascia, (**c**) the superior flap is fixed loosely to the fascia in a perpendicular manner, (**d**) side view of the suturing showing the loose and perpendicular attachment of the superior flap

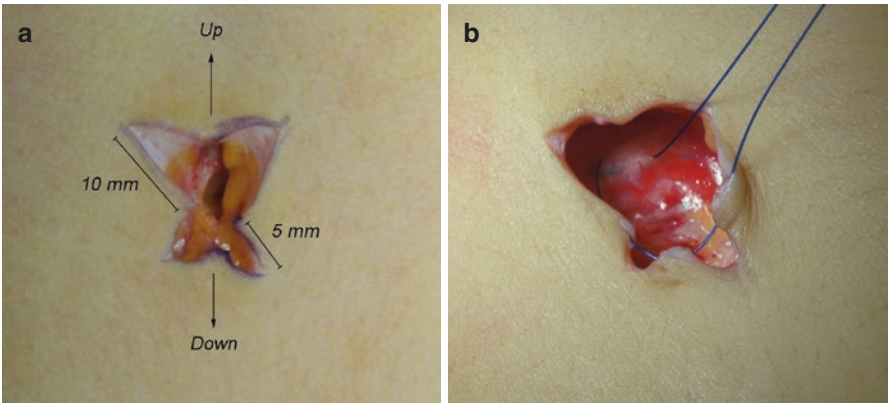


**Fig. 8** Butterfly incisions: (**a**) Upper incisions must be 10 mm and lower incisions 5 mm. Note the butterfly-like appearance of the wound. (**b**) Fixation of the three lower flaps to the abdominal fascia using continuous sutures

## Conclusion

Many techniques have been described for umbilicoplasty as the primary goal is to achieve a natural and youthful appearance of the umbilicus. However, most publications do not report long-lasting or satisfactory results.

X-shaped umbilicoplasty describes a new way to remake the navel for patients, mainly after full lipoabdominoplasty, but also after tumor resections, hernia reconstructions, or any other procedure involving umbilical deformities.

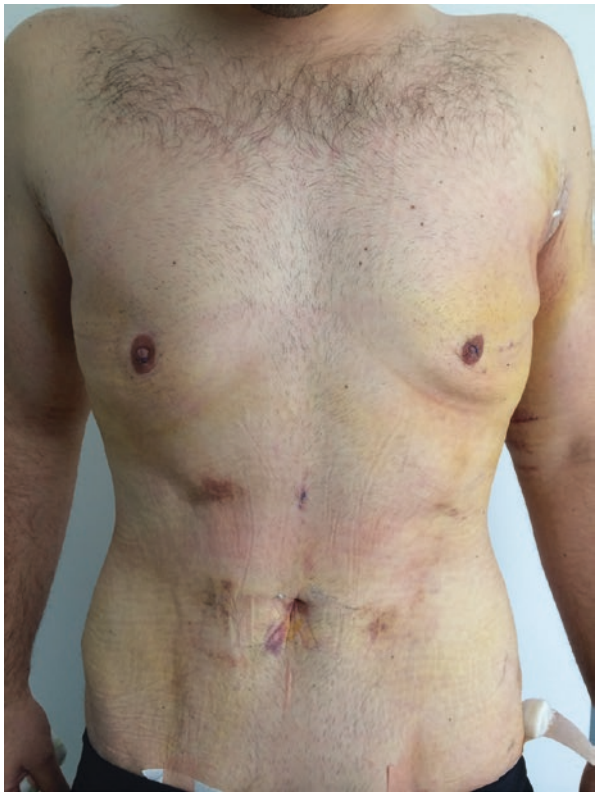

**Fig. 9** Neo-umbilicoplasty. A 38 year-old man who underwent Butterfly neo-umbilicoplasty after full lipoabdomino-plasty and liposuction. Final post-operative view after 1 week -


**Fig. 10** Neo-umbilicoplasty: (**a**) pre-operative, (**b**) 2-weeks post-operative after abdominoplasty without umbilicoplasty, (**c**) final post-operative view 4 weeks after umbilicoplasty and 6 weeks after abdominoplasty

Delaying umbilicoplasty may improve the flap perfusion and thus reduce the ischemia and necrosis risks of the lipectomy flap. This delay also allows for further liposuction over the flap and/or additional skin resection, if needed. Creation of the new umbilicus can be performed under local anesthesia with minimal morbidity. Most of the scar is on the tip of the flaps and these ends are buried above the muscular fascia. Also, no open wounds are left in this technique so no secondary healing is necessary.

A special issue is how to convince a patient to have two surgeries instead of one, and to remain without a navel for a period of time (~2 weeks). Informing the patient

about the advantages of performing a delayed neo-umbilicoplasty, like the possibility of improve liposculpture with equal or less risk of flap necrosis, better umbilical scar and shape, and improving the final abdominal appearance, usually makes the patient decide to go for a two-stage procedure instead of a single operation.

## Disclosures

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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# Umbilicoplasty in Bikini Form

Saad Barhoum

## Introduction

The plastic surgery literature describes innumerable techniques for how to perform an umbilicoplasty or neo-umbilicoplasty. In the course of abdominoplasty, each surgeon must perform the technique that comes most naturally to them, with which they feel most comfortable and which promises a stable aesthetic result over time. In my case, I identify fully with the technique I describe herein, which I have done on approximately 2,900 abdominoplasties over 14 years. The results are predictable with a very natural umbilicus that endured in time.

It is not one single technique, nor one invented by myself; rather it is an amalgama for it's a compound of several techniques already described in literature, and it is mainly inspired by the descriptions by Dr Avelar and my professor Dr Hamilton A. Gonella. I have called it Umbilicoplasty in Bikini Form, because throughout the entire operation (since its marking until the exit of the navel through the abdominal skin), the triangular shape of a bikini is present.

## Materials and Methods

During the period between January 2007 and January 2017, the author performed a total of 654 abdominoplasties in his private practice, 5 in man and 649 in women with a history of one or more pregnancies. The patients' ages ranged from 25 to 59 years old, and in all cases the technique of the Bikini-Shaped Umbilicoplasty

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was applied. Herein, we present cases of up to 7 years of healing evolution and postoperative relocation of the navel in abdominoplasties.

The following characteristics were analyzed:

1. Navel position
2. Naturalness in umbilical traits
3. Preservation of the original umbilical stump
4. Umbilical depressions
5. Final internal umbilical scar without any visible external stigmas

## Markings

This is done at the same time as the abdominoplasty marking using a skin marker and a wooden applicator.

With the sharped end of an applicator, three strokes of 0.8 cm each are made, forming an equilateral triangle of upper base and downward tip, oriented towards the pubis simulating the frontal part of a bikini. This triangle is located in the upper point of the umbilical cylinder, just on the boundary between the umbilical skin and the abdominal skin (see Photo 1).

## Surgical Technique

1. Two simple Guillies' hooks are pinned on the upper and lower part of the umbilical marking, and then they are raised to reveal the umbilical cylinder (Photo 2).
2. Using a number 15 scalpel blade, the marking of the navel in the form of a bikini is cut and separated from the abdominal skin. The wrinkles and folds of the navel are preserved to maintain its originality and particular seal, maintaining the uniqueness of each navel (Photo 3).

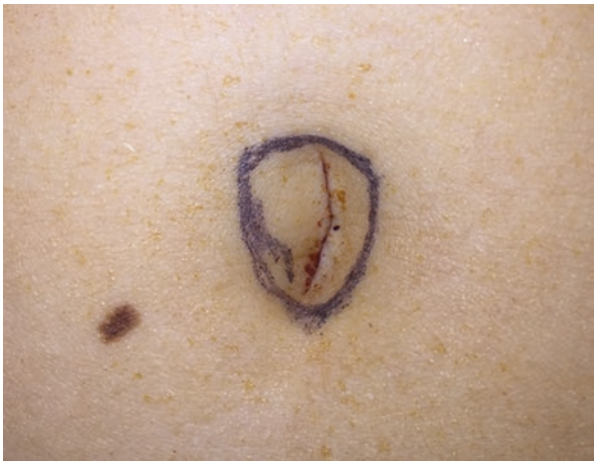

**Photo 1** Design for marking umbilical skin incision in a bikini shape (the shape is an equilateral triangle, with superior base, in which each side measures 0.8 cm)

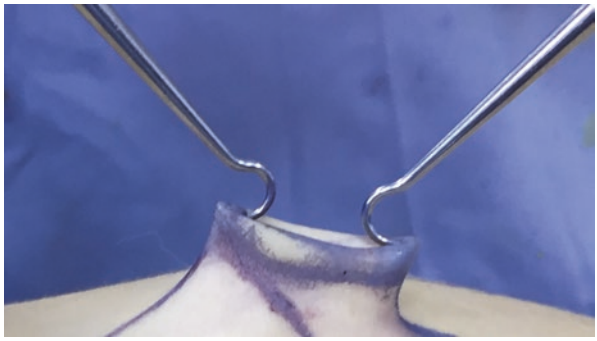

**Photo 2.** Presentation of the belly button, with two gillies' hooks are used to raise and show the belly button before the incision is made on the marked area

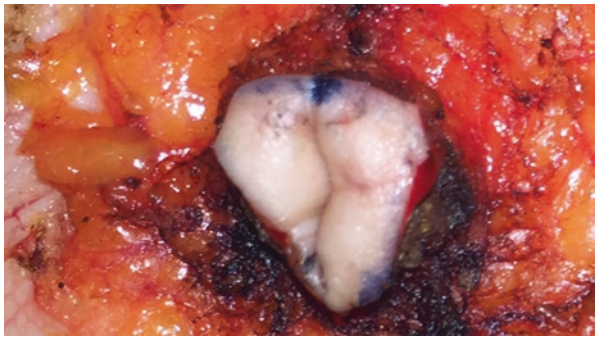

**Photo 3** Incision on belly button skin with a surgical scalpel #15 blade, completely separating the belly button from the abdominal skin

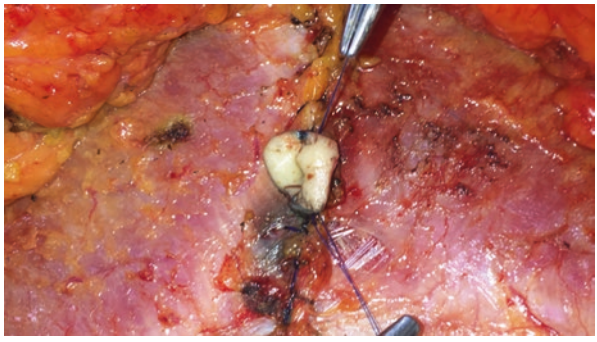

**Photo 4** Fixation of cardinal points, superior and inferior to the deep dermis of the belly button, to the abdominal fascia with polypropylene sutures

3. Once the abdominal flap has been detached and the plication of the abdominal rectus is finished, the umbilical stump is lifted above the plication and given two points, one at the upper end (or triangle base) and the other at the lower end (or triangle apex). The suture used is polypropylene 4-0. These points, which are left with long surplus suture material, fulfill two functions: the first is to fixate the deeper navel dermis to the fascia of the plicated rectus (this will later allow the natural indentation of the navel), and second to serve as a repair mechanism when the final suture is made (Photo 4).
4. Once the abdominal flap is positioned at its final site with a central repair point, the abdominal point where the umbilical stump is to be liberated

through is marked on the skin. First, we mark the midline of the abdomen, then with the help of a single curved Kelly Clamp, a simulated projection is made with its tip by lifting the abdominal skin that is precisely above the navel position. This spot is marked with a single dot of skin marker on the central line of the abdomen, and this will correspond to the center of the new navel. Taking this point as center reference, we draw another equilateral triangle around it, in the form of a bikini, with the same dimensions described in *Markings* (Photos 5a, b).

5. With a scalpel blade number 15, a bikini-shaped incision is made over the marking of the abdominal skin where the umbilical stump is to be projected and placed, this cut is deepened down to the subcutaneous cellular tissue by removing a cylinder of tissue from the skin down to the subcutaneous tissue, and finally using scissors, the subcutaneous cellular tissue is thinned up to 1 cm before the dermis to give a three-dimensional appearance to the final navel (see Photo 6).
6. The long surplus repair points are drawn out through the place where the navel will go and are attached with an inverted knot to the deep dermis of the abdominal skin, in the following order: the upper end (or triangle base) of the navel is attached to the center of the triangle of abdominal skin and the vertex of the navel is fixed to the deep dermis of the apex of the triangle of abdominal skin. They are brought closer by approximating and bringing the umbilical stump to the surface of the bikini-shaped triangle of abdominal skin, resulting in a natural three-dimensional sinking of the new navel, leaving a partially deep final suture, not visible externally (Photos 7a, b).

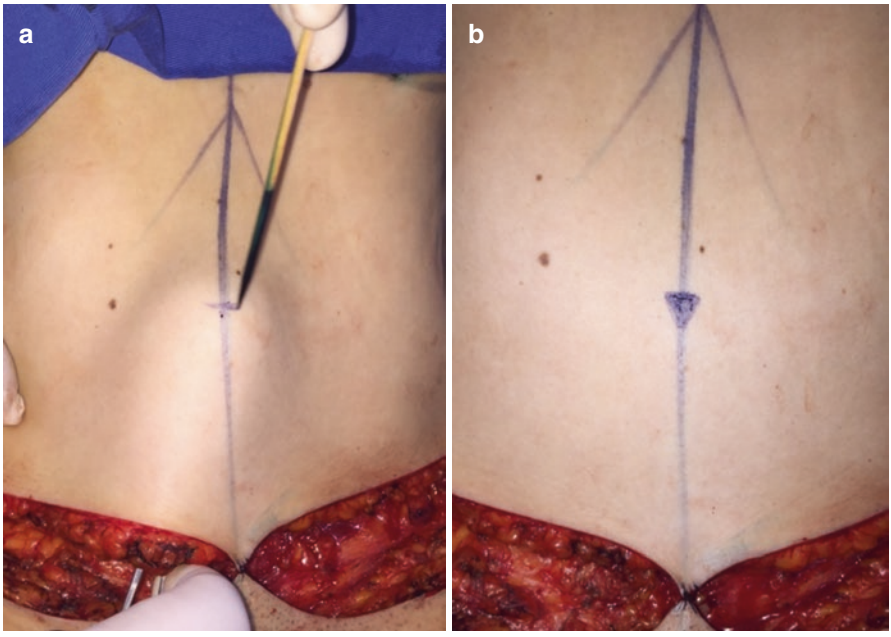


**Photo 5** The umbilical stump projects over the already stretched abdominal skin; the new belly button is designed at this point in the central abdominal line and maintaining the bikini shape described in Photo 1

**Photo 6** Incision in abdominal skin following precise marking with the #15 blade; the skin is removed together with a deep cone of subcutaneous tissue

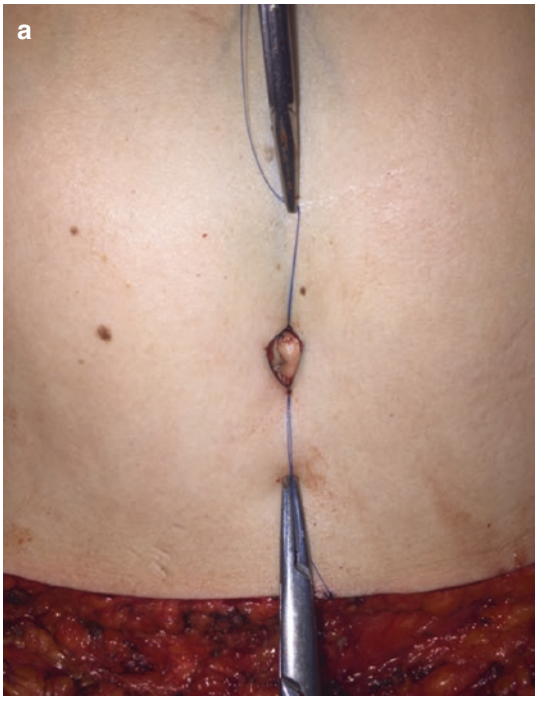


**Photo 7** The two cardinal superior and inferior points of belly button fixation are sutured to the deep dermis of the abdominal skin, giving the belly button a natural concave look

**Photo 7** (continued)

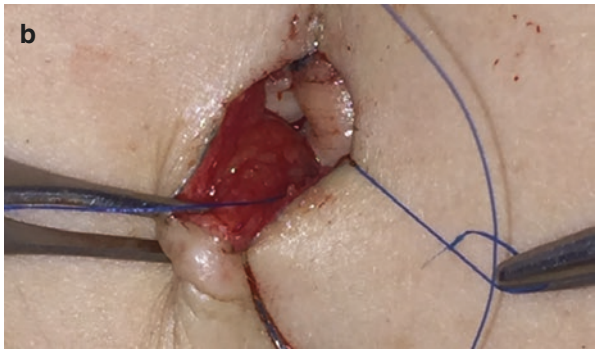


**Photo 8** The belly button is sutured to the abdominal skin with 4-0 polypropylene U stitches

7. The final union of the umbilical stump edges to the abdominal skin is made with a sub-dermal U-shaped suture, preserving the knots on the umbilical skin stump. I use polypropylene 4-0, which is removed 15 days after the operation (Photo 8).

## Results

This is a technique of easy manufacture, repeatable, with stable results over time and it does not present stenosis or severe complications such as umbilical stump necrosis. In a very natural manner, the stump is re-fixed upon its new location on the abdominal skin, using a suture of separated points in a U-shape, with knots carefully located in the inner skin of the stump, avoiding trauma with a needle or knots on the external abdominal skin. The result is a very subtle final scar located on the inner side of the umbilical stump; therefore, it is practically imperceptible to the eye. This has been of great satisfaction to the patients, as the umbilicus reserves its usual three-dimensional depth giving it an appearance of naturalness. Although all the umbilical stumps are designed in the form of a bikini during the surgical act, we have perceived that with time and healing some patients adopt longitudinal or round navel shapes, which we have found, depends on the musculature and physical activity of the patient.

## Complications

There were no complications directly related to the abdominoplasty or the umbilicoplasty technique; No cases of necrosis, stenosis, or umbilical stump infection have been reported thus far. Three cases of total dehiscence of the umbilical suture were presented due to exaggerated physical exertion of the patients and another five cases of partial dehiscence of the umbilical suture were caused by spontaneous drainage of seroma from the navel. All these cases were repaired and re-sutured easily without aesthetic sequels.

### Conclusion

The bikini-shaped technique that we applied on our patients who underwent umbilicoplasty is an easy-to-re-create surgical technique. With positive characteristics such as stable time-enduring results, appropriate location of the navel on a soft abdominal wall, natural appearance to the eye and touch, harmonious with the body, three-dimensional depression, no visible external scar, and no complications attributable to the surgical procedure itself, make this technique a trustworthy option for our surgical practice.

Despite cutting our various umbilicus stumps with the same design on the abdominal skin, we have noticed in the follow-up of our patients over the years that the final geometry of the navel presents variations in: longitudinal or rounded navels. Through observations, we contribute these changes in characteristic to the elasticity of the skin, muscle tone and physical activity of the patients.

In the sample group presented, it is important to note that 99 % of patients who underwent abdominoplasty were female, who had a higher personal concern with the aesthetic appearance of their abdomen and navel than the male patients. Women's abdomens are exposed frequently, be it at the beach or at swimming pools whilst wearing a bikini, or through fashion with low coverage. This detail is a constant reminder from our patients at the consultancy before performing a tummy tuck. Being able to provide technical and aesthetic advantages like the one described in this article, adds great value to umbilicoplasty.

**Post-operative cases:**

1. Navel, 24 h after operation (Photo 9).
2. Navel, 15 days after operation, after having newly removed the suture (Photo 10).
3. Navel, 60 days after operation (Photo 11).
4. Navel, 18 months after operation (Photo 12).
5. Navel, 3 years after operation (Photo 13).
6. Navel, 7 years after operation (Photo 14).

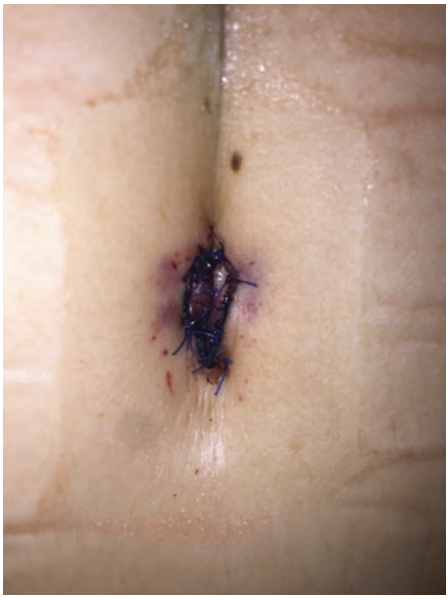

**Photo 9** 24 h post op

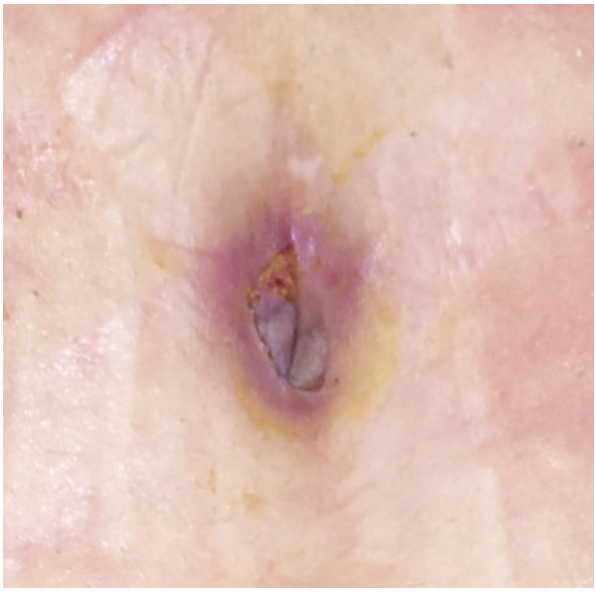

**Photo 10** 15 Days post op. At this time the stitches are removed

**Photo 11** 60 Days post op

**Photo 12** 18 Months post op

**Photo 13** 3 Years post op

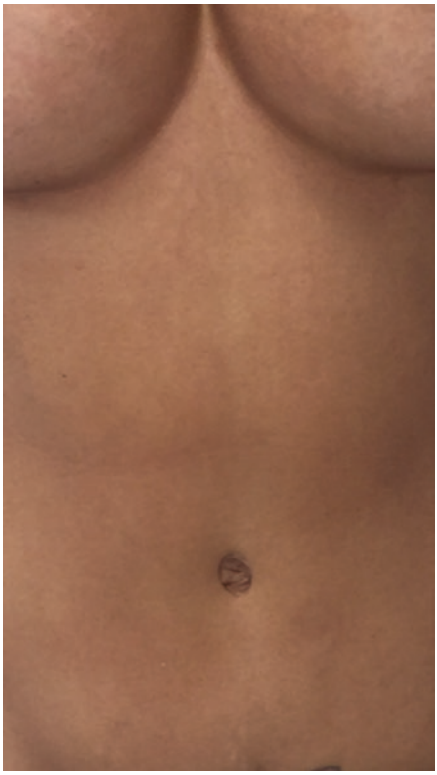

**Photo 14** 7 Years post op

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W. L. Murillo (ed.), *Omphaloplasty*, https://doi.org/10.1007/978-3-319-64313-7