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Surgical Correction of Low-positioned Umbilicus after Mini-abdominoplasty

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Background: The umbilicus detachment and reinsertion in umbilical float mini-abdominoplasty results in its lower position with or without shape distortion. This event creates a stigmatizing look, elongating the upper abdomen and creating variable grades of infra umbilical/pubis bulging. This lack of proportion causes an unpleasant, artificial look, and is very difficult to fix. The study aimed to describe a sequence of abdominoplasty and combined upper abdomen horizontal muscle plications to correct umbilicus malposition after a mini-abdominoplasty.

Methods: Over a period of 24 months, 12 patients underwent a liposuction (suction-assisted liposuction) and abdominoplasty with horizontal supraumbilical muscle plication. All patients underwent objective measurements before and after the procedure, using digital image measurements by Mirror Image software, version 6.0 (Fairfield, N.J.). The follow-up evaluation was performed 12 months postoperatively. Statistical analysis was performed using IBM SPSS Statistics V26.

Results: Over 24 months, 12 patients (100%), who underwent abdominoplasty combined with horizontal plication in the upper abdominal wall, have shown adequate umbilicus elevation (2.98 ± 0.242 cm; 95% confidence level), restoring the abdominal muscle wall proportion at 12 months follow-up. One patient (8%) had a seroma, and one (8%) had a small muscular hernia (1.5 cm) in the lower abdomen.

Conclusions: The combination of abdominoplasty and upper horizontal muscle plication can fix the malpositioned umbilicus, restoring the aesthetic and anatomic proportions in those patients who underwent an umbilical float mini-abdominoplasty.
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INTRODUCTION

Mini-abdominoplasty can correct only a few abdominal wall deformities related to muscle fascia relaxation and fat deposition, mainly in the lower abdomen up to the navel. This approach was even described as "limited abdominoplasty."[1–3]

The umbilicus is detached and reinserted during the procedure (umbilical float mini-abdominoplasty) to allow access to upper abdomen defects and may result in a low-positioned navel with or without distortion of the umbilical shape. According to the Wan series,[1] even though properly selected patients with favorable preoperative umbilical positioning were selected, 19% of adult patients had an umbilicus that was considered "too low." This type of deformity may create a stigmatizing look with a seemingly elongated upper abdomen, if we take the umbilicus as the center as is normal, and variable grades of infra-umbilical/pubis bulge (Fig. 1). This lack of proportion created by umbilical reinsertion can cause an unpleasant appearance and is very difficult to fix.

Assuming that muscular/aponeurotic deformities are multidimensional and present as vertical and horizontal stretching of the anatomical axis, the combination of vertical and horizontal plication sutures can restore, when indicated, the dynamic and functional balance of the abdominal wall by better distributing the tension of the suture lines. Because plications can shorten specific segments of the fascia, pulling the adjacent muscles to varying degrees, the umbilical pedicle, as it is a structure fixed to the fascia, may have a modified position according to the orientation of the vectors of a plication. Therefore, horizontal plication in the upper abdomen often leads to the umbilicus pedicle moving upward.[1,4]

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Fig. 1. Example of umbilicus malpositioning post mini-abdominoplasty.

The authors propose conversion from umbilical float mini-abdominoplasty to full abdominoplasty combined with horizontal aponeurosis plication as an alternative technique to correct this deformity and to elevate the umbilicus on the muscle wall to its original position while also removing extra skin.

METHODS

This study was interventional, retrospective, and conducted using a single center. The study was carried out over 24 months (September 2019–September 2020) in accordance with the Declaration of Helsinki, and written informed consent forms were obtained.

Twelve patients underwent liposuction and umbilical float mini-abdominoplasty performed by different plastic surgeons and were referred to the authors' plastic surgery center. Over a period of 24 months, these 12 patients underwent liposuction and abdominoplasty with a sequence of combined muscle plication, including horizontal supraumbilical plication, to elevate the umbilical pedicle on the muscle wall, which was performed by a single surgeon (G.B.) in a private setting. All patients underwent objective measurements of the abdominal wall shape before and after the procedure using digital image measurements by Mirror Image software, version 6.0 (Fairfield, N.J.). The follow-up evaluation was performed 12 months postoperatively. Statistical analysis was conducted using IBM SPSS Statistics, V26.

Inclusion Criteria

The study criteria included patients who had previously undergone mini-abdominoplasty (6 or more months prior) and a low-positioned umbilicus according to Hoyos' proposal of an ideal umbilicus position.[4]

Takeaways

Question: How can we correct a low-positioned umbilicus after a mini-abdominoplasty?

Findings: Through some surgical maneuvers, the authors show how to raise a low-positioned umbilicus after a mini-abdominoplasty by muscular plication and conversion to abdominoplasties.

Meaning: Raising the navel position through muscular plication.

Surgical Technique

Liposuction

Suction-assisted liposuction was performed under regional anesthesia (epidural block) and sedation. The tumescent technique was performed with a 3-mm cannula, at a concentration of 1:300,000 lidocaine: epinephrine to achieve adequate vasoconstriction. Liposuction was performed with a 3.5-mm cannula, three ports, and one side of the tube. The objective was to reduce any irregularities in the previous surgery to obtain more homogeneous tissue coverage.

Abdominoplasty

After the suction-assisted liposuction, abdominoplasty was performed via an incision at the suprapubic area (6 cm from the furcula vaginalis) and tissue was detached up to the xiphoid process through a tunnel beyond the lateral edges of the rectus muscle whenever necessary to achieve adequate tissue release with minimal tension or retraction and total belly muscle exposure. After the low-positioned umbilicus pedicle is dissected and separated from the flap, the tissue around the previous umbilicus becomes a vertical scar to facilitate the closure and positioning of the horizontal scar as low as possible according to the preoperative markings. [**See Video 1 (online),** which shows umbilical pedicle dissection and vertical closure of periumbilical tissue.] In the same procedure, the umbilical pedicle is repositioned superiorly, whereas the supraumbilical flap is tensioned and stretched inferiorly, recovering the adequate distribution tension of the liposuctioned tissue over the deep muscular wall and removing the extra skin.

Muscle Plication

For the correct evaluation and transoperative indication of the plication to be created, it is mandatory to expose the recti muscles and correctly identify their sheath and tendon intersection areas. After correcting the recti muscle diastasis when indicated (vertical plication/two layers of nylon and Vicryl sutures), the author started marking one supraumbilical horizontal ellipsis to shorten the fascia, elevating the umbilicus pedicle on the muscle wall according to the umbilicus positioning patterns proposed by Hoyos[4]. [**See Video 2 (online),** which shows horizontal plication (2 layers).] The maximum vertical axis of the ellipse must be measured by the surgeon to allow the elevation of the umbilical pedicle (Fig. 2). The positioning of the ellipse definitively depends on the placement

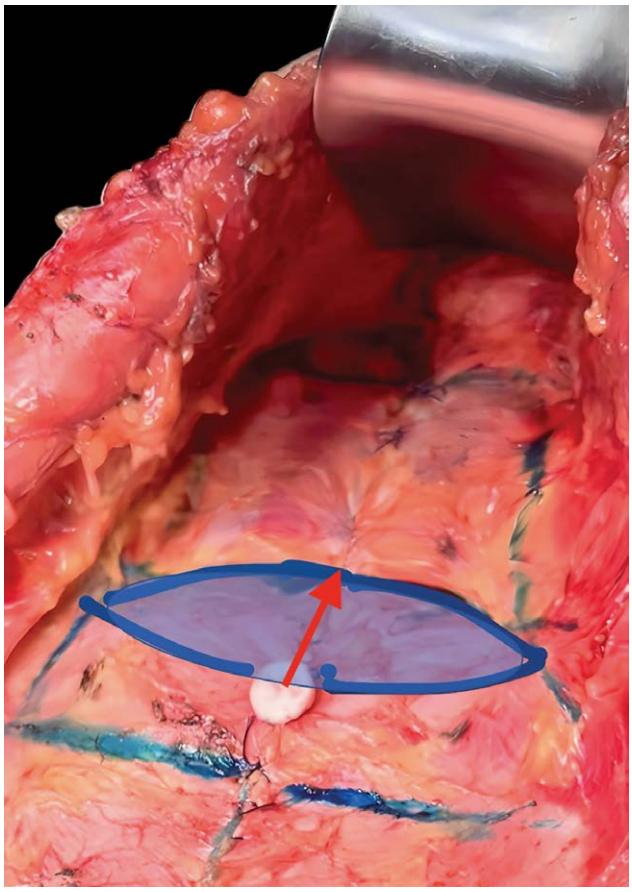

Fig. 2. Supraumbilical ellipsis horizontal plication (in blue). Red arrow indicates the ellipsis maximum vertical axis.

of the upper horizontal segment involving the tendinous intersection of the recti muscle. It is mandatory to anchor the upper part of the ellipse to the tendinous intersection of the recti muscle to move the umbilicus (Fig. 3A, B).

All the procedures were performed in two layers. First, 20 nylon stitches were separated. Second, continuous Vicryl 20 sutures were used.

RESULTS

Over 24 months, 12 patients (100%), who underwent abdominoplasty combined with horizontal plication in the upper abdominal wall showed adequate umbilical elevation (2.98 cm ± 0.242, 95% confidence level), restoring the proportion of the abdominal muscle wall at the 12-month follow-up. The highest elevation was 3.5 cm, and the lowest was 2.1 cm (Table 1).

Three patients (25%) needed to receive an extra horizontal plication above the original one to elevate the umbilical pedicle to the desired location. One patient (8%) developed a small muscular hernia in the rectus abdominis muscle due to a partial aponeurosis tear, and one patient developed a seroma (8%). Figures 4, 5, and 6 show the pre- and postoperative images of three patients after a 12-month follow-up.

DISCUSSION

Initially, mini-abdominoplasty was performed to correct abdominal defects restricted to the lower abdomen. Some patients who request abdominal contour surgery may have all of their deformities below the semicircular line. This technique corrects the limited deformity of the lower abdominal musculofascial relaxation and regional fat deposition.[2–4]

Quite often, surgeons want to improve some supraumbilical skin laxity and/or correct upper muscle aponeurotic defects. Therefore, they are at risk of changing the umbilical position and/or shape.

Once the surgeon reaches the upper abdomen after undermining, there could be an imbalance between the skin/subcutaneous tissue and the muscular wall. This detachment decreases the local skin tension, creating excess skin.[1]

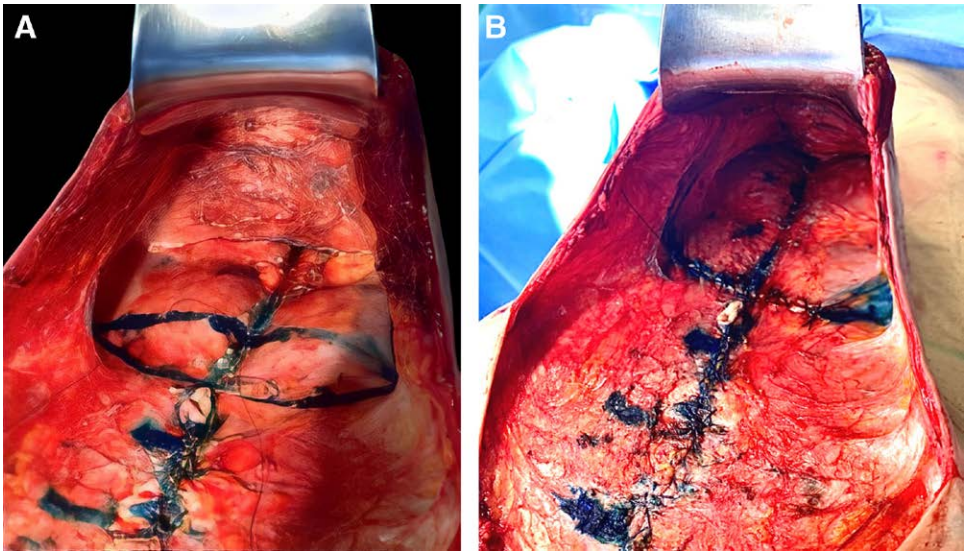

Fig. 3. Horizontal recti muscle plication example. A, Pre upper horizontal recti muscle plication. B, Post upper horizontal recti muscle plication.

Table 1. Postoperative Umbilicus Elevation (12-months Follow-up)

N = 12	Elevation (cm) 12 Months Follow-up
1	3.4
2	3.2
3	3.5
4	3.1
5	2.8
6	3.3
7	2.8
8	3.2
9	2.9
10	3.2
11	2.1
12	2.3

On the other hand, if there is excess skin even before the undermining of the upper abdominal tissue, umbilical disinsertion may worsen the situation. The authors emphasize that mini-abdominoplasty is not indicated to correct supraumbilical skin laxity.

Umbilical detachment and reinsertion during mini-abdominoplasty to access upper abdomen defects may result in a low-positioned navel with variable grades of umbilical shape distortion and bulging of the inferior abdomen.[4,5] This lack of proportion caused by umbilical reinsertion can cause an unpleasant appearance and is very difficult to fix.

There are many articles about navel aesthetics, including their position. Visconti reported that the position of the navel is more acceptable to study participants when it is in accordance with the golden ratio (ie, 1.618).[6] Yu verified that in men and women, the distance from the superior edge of the umbilicus to the xiphoid was 17.5 ± 2.0 cm, and the distance from the inferior edge of the umbilicus to the superior edge of the pubis was 13.9 ± 1.8 cm.[7] Atiye determined that the appropriate umbilical position during abdominoplasty in male patients has a constant golden number relationship that can be identified only between N–N (internipple distance) and U-AX (umbilicus-anterior

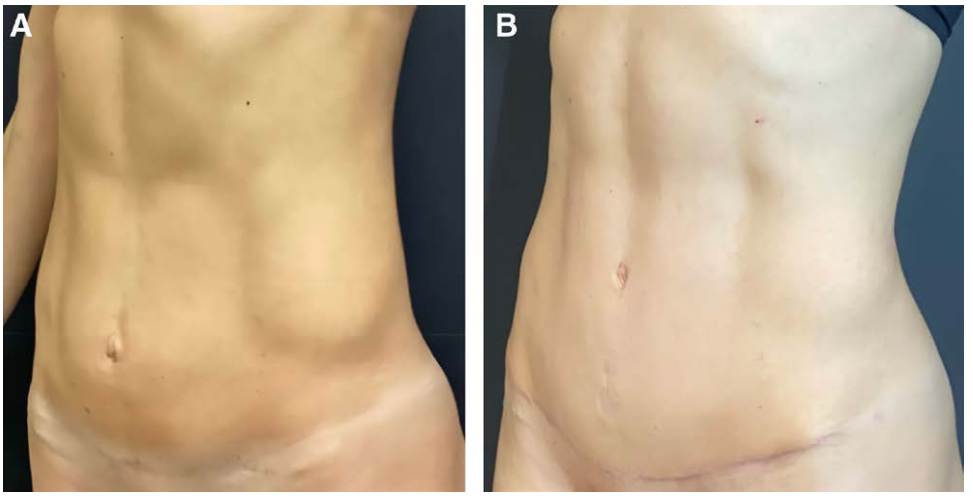

Fig. 4. Pre- and postsurgical correction. A, A 38-year-old woman, preoperative. B, The same patient, 12 months postoperative.

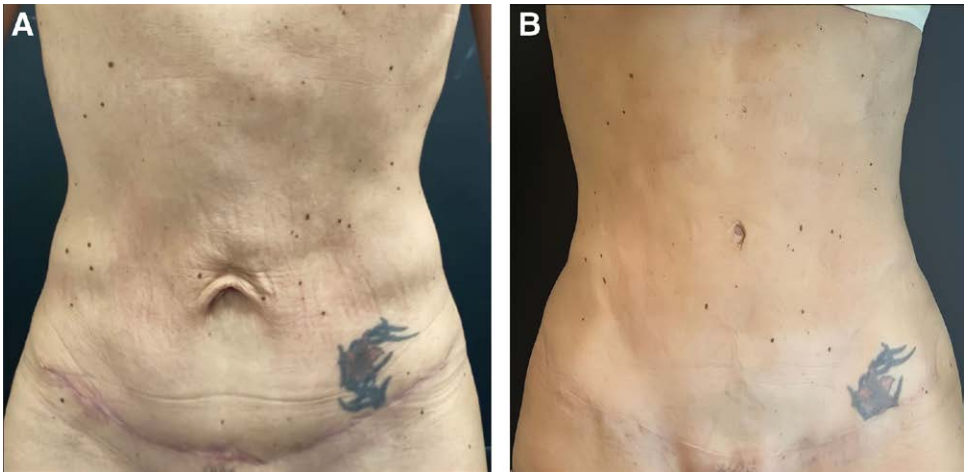

Fig. 5. Pre- and postsurgical correction. A, A 39-year-old woman, preoperative. B, The same patient, 12 months postoperative.

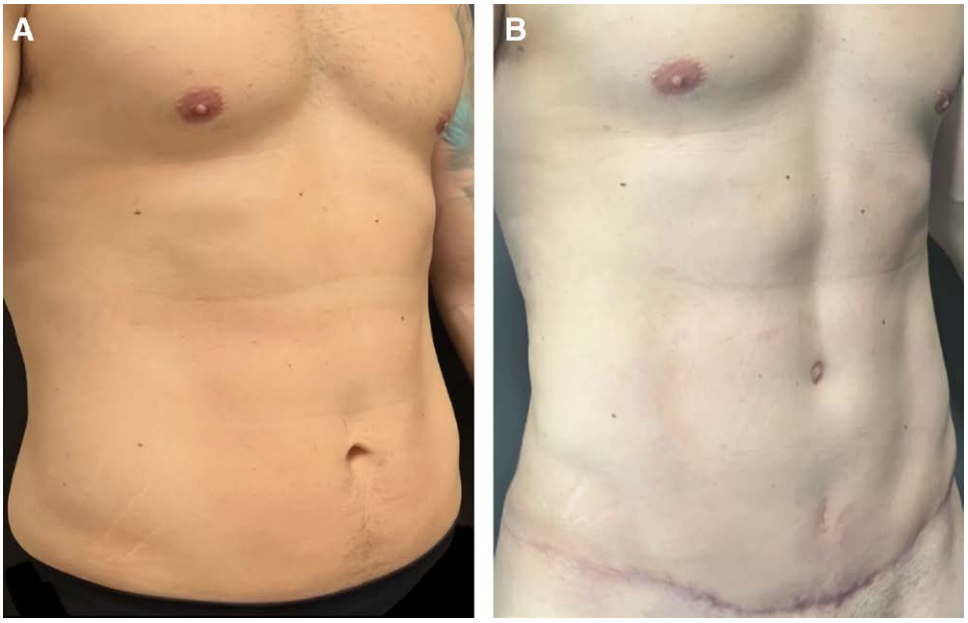

Fig. 6. Pre- and post surgical correction. A, A 29-year-old man, preoperative. B, The same patient, 12 months postoperative.

axillary fold distance).[8] Hoyos proposed that male and female patients have an ideal umbilical zone based on the distance from the xiphoid process to the pubis. In female patients, this zone lies between the junction of the two upper-thirds with the lower third, and for male patients, lies between the two upper-thirds and the third quarter over a line between the xiphoid process and the pubis.[4]

Basically, three muscle groups make up the anterolateral abdominal muscle wall: the rectus abdominis, external and internal obliques, and transversus muscles. All these muscle groups are connected through a system of fibrous connective tissue that is slightly elastic and rich in collagen type 3: the muscular fascia. This system involves all the muscular bellies, connecting them among themselves and creating an important dynamic set of contention.

It is assumed that muscular/aponeurotic deformities are multidimensional and involve vertical and horizontal stretching of the anatomical axis. The combination of vertical and horizontal plication sutures can restore, when indicated, the dynamic and functional balance of the abdominal wall by better distributing the tension of the suture lines. The author recommends that vertical plication should always be performed first to correct diastasis when indicated. Only after adding horizontal plication can the umbilical pedicle be elevated. After this initial sequence, the surgeon must assess whether the pedicle is elevated as planned or whether it will be necessary to add another complementary horizontal plication to achieve the desired position.

This technique represents the conversion of previous mini-abdominoplasty to full abdominoplasty due to the need to adjust the position of the umbilicus on the muscle wall and thereby restore the original anatomic site through horizontal fascial plications. As a secondary surgery, where the first surgeon judged that there was not enough skin to perform a complete abdominoplasty, normally, the authors, to ensure a well-positioned horizontal scar, used a small vertical scar (skin surrounding the dissected umbilical pedicle). With appropriate technical management, these scars heal very well and do not hinder the patient's decision to exchange a small vertical scar on the lower abdomen for a better positioned navel.

The principle is to add as many horizontal plications as necessary to achieve greater accuracy in terms of local tension and the position of the umbilical pedicle. This approach distributes the tension of the suture lines without causing deformities or muscle distortions. Because plications can shorten specific segments of the fascia, pulling the adjacent muscles to varying degrees, the umbilical pedicle, as it is a structure fixed to the fascia, may have its position modified according to the orientation of the vectors of a plication. Therefore, horizontal plication in the upper abdomen is capable of moving the umbilicus pedicle upward. The supraumbilical horizontal ellipse must be anchored to the next recti muscle tendinous intersection above to elevate the pedicle because the tendon is not mobile. Otherwise, the plication will only shorten the local fascia, increasing tension without the need for pedicle mobilization.

It is very important to expose and identify the recti muscle, fascial sheaths, and tendon intersections after flap undermining. In this way, there is enough room to more efficiently create plications with the right tension. Excessive tension can damage, fray, and tear the fascia. This is the reason narrow tunnel dissections in the midline compromise umbilical elevation and flap advancement in these patients.

In 25% of the patients in this series, it was necessary to add an extra horizontal plication to raise the umbilicus to the desired position. This is related to several variables, such as (1) a very short or very long distance between the next tendinous intersection of the rectus abdominis muscle

and the umbilicus pedicle; (2) great asymmetry in the position of tendon intersections; and (3) very thin and friable fascia. The above factors directly limit the creation of the horizontal ellipse, which is responsible for the primary elevation of the navel. Tendinous intersections very close to the umbilical stump will not allow adequate elevation due to the short path from the navel to the anchoring of the superior segment of the ellipse in the tendon. On the other hand, when this distance is too wide, the vertical axis of the ellipse becomes too long and impairs the closure of the plication, causing too much tension or distortion of the adjacent muscle. Large tendinous intersection asymmetries also impair the creation of horizontal ellipses due to obvious geometric and tension distribution issues. However, despite anatomical variations, most patients can benefit from this approach with only one supraumbilical elliptical horizontal plication.

CONCLUSION

In this series, the combination of abdominoplasty and upper horizontal muscle plication has been shown to be able to correct the mispositioned umbilicus, restoring the aesthetic and anatomic proportions in those patients who underwent an umbilical float mini-abdominoplasty.

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DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

PATIENT CONSENT

Patients provided written consent for the use of their images.

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