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ORIGINAL ARTICLE

Creating a Neo-umbilicus in Abdominoplasty

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Abstract
Abdominoplasties are among the most widely requested surgical procedures, and, since the umbilicus is an important component of abdominal harmony, achieving an esthetic and natural umbilicus is one of the primary goals of the operation. The aim of this study is to present the results of a neo-umbilicus recreation to provide a deeper and desirable appearance, and also its simplifying effect for a laparoscopic hernia repair when needed. This is a single-center case-series scientific study which is presenting a total of 26 female patients who underwent classical abdominoplasty and neo-umbilicus recreation surgery with modified concomitant defatting suture and fat injection technique. Of the 26 cases, two patients (7.7%) developed seroma, whereas one patient had hypertrophic scar tissue. We did not observe any major complications, and none of the patients required revision or resuturing. Eight of the cases (30.8%) with multiparous pregnancies underwent a laparoscopic umbilical hernia repair. The patients regained their abdominal cutaneous sensitivity at the postoperative 8 ± 6 months. The neo-umbilici were free of visible scars in all individuals, none of the patients had a postoperative malposition, and all patients reported high satisfaction rates. The average follow-up was 18 months, ranging from 9–26 months. The technique described here provides efficient and satisfactory esthetic results that are acknowledged by the patients in the short and long term. The technique is also safe for concomitant hernia repair.
Level of Evidence III.

Keyword Neo-umbilicus · Abdominoplasty · Umbilicus · Position of umbilicus · Abdominal wall reconstruction

Introduction

Being the most important esthetic component of the anterior abdominal wall, the repositioning of the umbilicus requires appropriate consideration and is a challenging task for completely balanced and favorable outcomes. Therefore, management of a harmonious umbilicus shape, size, and positioning has become an important concept since the 1960s, and multiple reconstruction and rebuilding techniques have been proposed [1]. Alongside the use of grafts or flaps, several approaches such as creating a completely different new umbilicus are of concern for the establishment of a preferable umbilical architecture [2].

Transposition of the umbilicus is an unavoidable part of the abdominoplasty surgery, and achieving a natural-looking rebuilt umbilicus is among the primary attributes of the procedure, in addition to the umbilicus relocation complications, including visible scarring, infection, necrosis, disproportions, retraction, and loss of sensitivity [1–3].

Correct positioning of the umbilicus is an existing discussion topic. In the past decade, several formulas, derived from the questionnaires, patient satisfaction surveys, and computer-based algorithms have been proposed so far, centering the iliac crest, xiphoid, and other anatomical landmarks on point [4].

Despite the prevalence of abdominoplasty cases, most publications on the creation of a neo-umbilicus are technical papers or heterogeneous case series with relatively small sample sizes. Herein, the author has presented a modified concomitant defatting suture and fat injection technique and its preliminary results, which also includes multiple benefits; a personalized umbilicus relocation depending on the height and proportion of the patient, a broader area diastasis repair, and when indicated, a simultaneous hernia repair with the use of a wider surgical mesh.

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Patıents and Methods

The sample consisted of 26 women who underwent abdominoplasty with VASER-assisted liposuction and the creation of a neo-umbilicus by the same surgeon and at the same center.

Written informed consent was obtained from all patients, and the study was conducted in accordance with the Declaration of Helsinki. We did not provide a clinical ethical board approval, since all elements of the study were within the routine clinical workup.

Exclusion criteria were as follows: patients with general contraindications for lipoabdominoplasty, chronic diseases including hypertension, diabetes mellitus, autoimmune conditions, previous abdominoplasty procedure, a body mass index greater than 30 kg/m^2, and smokers.

Patients with rectus abdominis diastasis and umbilical hernia were included, and the defects were treated during the abdominoplasty surgery with the assistance of a general surgeon.

Patients were evaluated for the esthetic results, and the superficial tactile sensitivity and spatial orientation were examined using the appropriate methods on the postoperative visits on days 14, months 1, 3, 6, 12, and 18.

Complications and their consequences were also recorded.

Surgical Method

The patient was positioned in the prone position, and the liposuction procedure was applied to the back and the flanks.

Then, the patient was placed in the supine position on the operating table for the abdominoplasty procedure and a customized neo-umbilicus creation technique.

The operative landmarks were marked while tension was applied to the original umbilicus. The area located 9–11 cm above the original umbilicus was marked as the neo-umbilicus to be created, and the region was exempted from the liposuction procedure (Fig. 1).

A standard abdominoplasty was performed through a suprapubic incision, and the excess tissue was excised, keeping the tension on the lateral sides.

Rectus diastasis was repaired and abdominal hernia with the placement of mesh was performed, if required.

Following the removal of excess tissue, the area where the neo-umbilicus will be positioned was marked with the help of four green needles and additional drawings were made in the form of an elliptical rectangle, longer at the top and shorter at the bottom (Fig. 2).

The defatting procedure was applied up to the dermis, and the dermis was fixed to the abdominal fascia from the upper and lateral crura of the rectangle using horizontal mattress sutures via 2/0 prolene.

Separate attachment stitches are made to fix the skin to the Scarpa's fascia using 2/0 PDS, and both ends were spared for a tie-over bolster dressing. Then, additional stitches were made with horizontal mattress sutures extending from the center to the abdominal muscle, and from the lower edge of the rectangle to the bottom to reconstruct the neo-umbilicus (Fig. 3).

To provide the depth of the umbilicus and prevent a flattened structure, we did not apply liposuction around the planned location for the creation of the neo-umbilicus. Furthermore, For the patients with a lesser amount of adipose tissue on the neo-umbilicus area, a microdose of the fat graft was injected into the dermis via 20 gauge sharp green needles, depending on the personal characteristics of the patient.

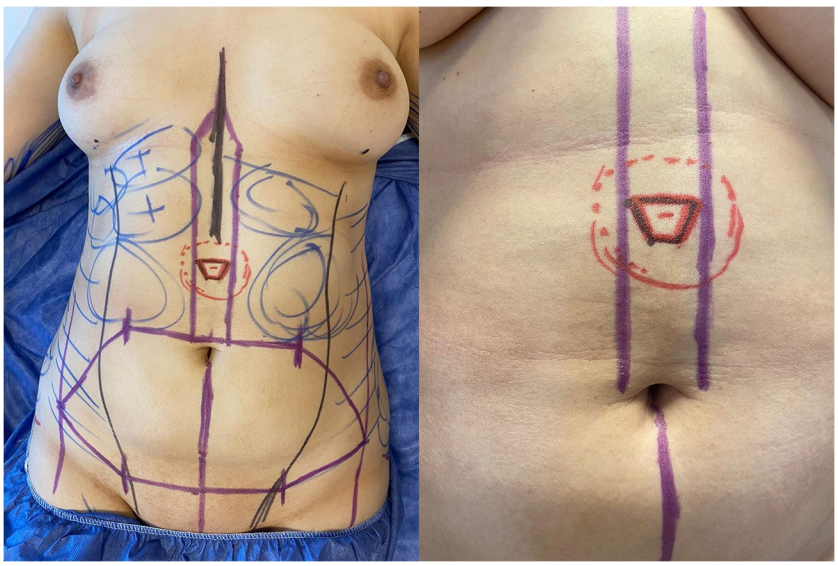

Fig. 1 Preoperative drawings

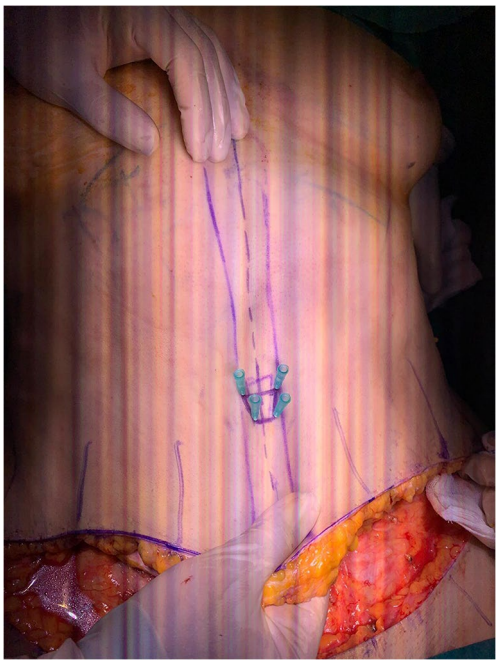

Fig. 2 Following the removal of excess tissue, we located the area of the neo-umbilicus with the help of four 18-gauge needles

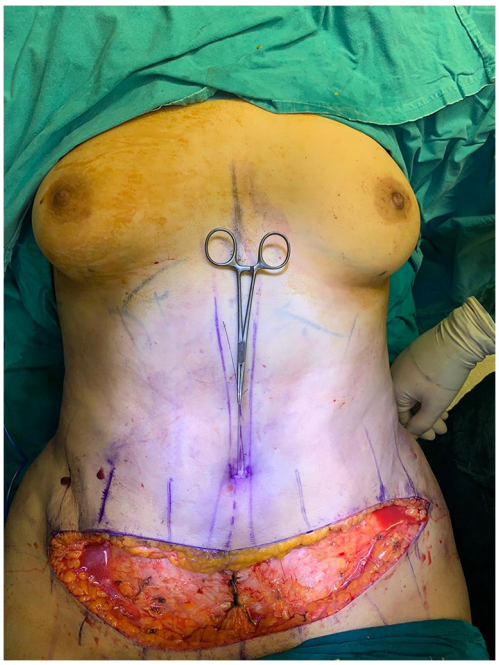

Fig. 3 Horizontal mattress sutures extending from the center to the abdominal muscle, and from the lower edge of the rectangle to the bottom to reconstruct the neo-umbilicus

Following the insertion of two number 12 suction drains and completion of all sutures, a chlorhexidine-impregnated, Vaseline gauze (Bactigras™) was fixed using the spared PDS sutures and left for 3 days for securing the neo-umbilicus.

Patients were fitted with a compression girdle in the operating room, and antibiotics and analgesics were administered.

The drains were removed, and patients were discharged 48 h after the surgery.

Results

During the study period, 26 female Caucasian patients aged 27–46 (mean 38.4; median 36) years underwent abdominoplasty followed by neo-umbilicoplasty. The study data are presented in Table 1.

The average body mass index (BMI) was 23.8 ± 2.6 kg/m^2 (range, 19.4 to 30.2 kg/m^2), with a mean waist-to-hip ratio of 0.77 ± 0.01.

Four patients were nulliparous, whereas three were primiparous, and 19 were multiparous women.

Apart from four women, 16 patients had undergone cesarean section surgeries more than once.

On the preoperative measurements, the umbilicus was positioned at the iliac crest level in 16 patients (61.5%) and above the iliac crests in 10 patients (38.5%). After the surgeries, the neo-umbilicus was recreated at the iliac crest levels in seven patients (27%) and below the crests in 19 patients (73%).

The mean ± SD size of the neo-umbilicus in vertical diameter was 2.0 ± 0.4 cm, with a range of 1.8 to 2.8 cm. The final distance of the neo-umbilicus from the right iliac crest to the mid-umbilicus was 13.6 ± 1.8 cm, and from the left iliac crest to the mid-umbilicus was 13.8 ± 1.6 cm.

The distance from the superior border of the neo-umbilicus to the xiphoid process was 16.8 ± 2.3 cm, whereas the mean distance from the inferior border of the umbilicus to the superior border of the pubis was 12.7 ± 1.6 cm.

Four patients had microdoses of the fat grafts around the neo-umbilicus region upon their request for the desired umblical shape.

Figures 4, 5, 6, and 7 present the examples of neo-umbilicus recreation in patients who underwent abdominoplasty and lipectomy procedures.

The average follow-up was 18 months (range, 9 to 26 months).

Two patients (7.7%) developed seroma, which is not attributable to the technique, and healed by subsequent serial drainages. One patient had hypertrophic scar tissue due to the tightness of abdominal sutures.

We did not observe any major complications, and none of the patients required revision or resuturing.

The neo-umbilici were free of visible scars in all individuals, and none of the patients had a postoperative malposition.

One patient who had undergone simultaneous inguinal hernia repair at the time of abdominoplasty had a flattened

Fig. 4 The appearance of neo-umbilicus in the immediate postoperative period

umbilicus; however, she reported a very high level of long-term satisfaction.

Eight of the cases (30.8%) with multiparous pregnancies underwent a laparoscopic umbilical hernia repair at the time of the abdominoplasty and neo-umbilicus creation surgery, and all had mesh repair for their herniorrhaphies. The mean hernia size was 2.3 ± 0.42 cm.

All patients regained their abdominal cutaneous sensitivity in the neo-umbilicus area, and at the location of the abdominal flap, and the localization a pressure sensation was present at the 8 ± 6 months, postoperatively.

Discussion

As the shape and appearance of the umbilicus are affected by several factors including age, pregnancies, surgeries, frequent alterations of weight, as well as the characteristics of the abdominal muscles and fat tissue, the ideal shape of the umbilicus is considered oval and vertically oriented, preferably with a superior hooding, whereas studies report the most common umbilical shape as the round, followed by an oval shape in both men and women [5–7].

However, given the variability of human body structures and patients' subjective esthetic considerations, a tailored shape and positioning of the umbilicus should be created for each individual. Although several authors recommend the positioning of the umbilicus based on its preoperative location, others suggest a relocation based on the anatomical features, length of the torso, waist-to-hip ratio, and patient preferences. Hence, this approach would yield an ideal positioning of the umbilicus depending on patient-related features, creating an elongated and well-balanced abdomen.

Multiple suggestions have been proposed regarding the ideal position of the umbilicus for a successful abdominoplasty procedure [8, 9]. These suggestions are based on various landmarks, such as the superior level of the iliac crest with a variation in distance ranging from ± 2 cm, while

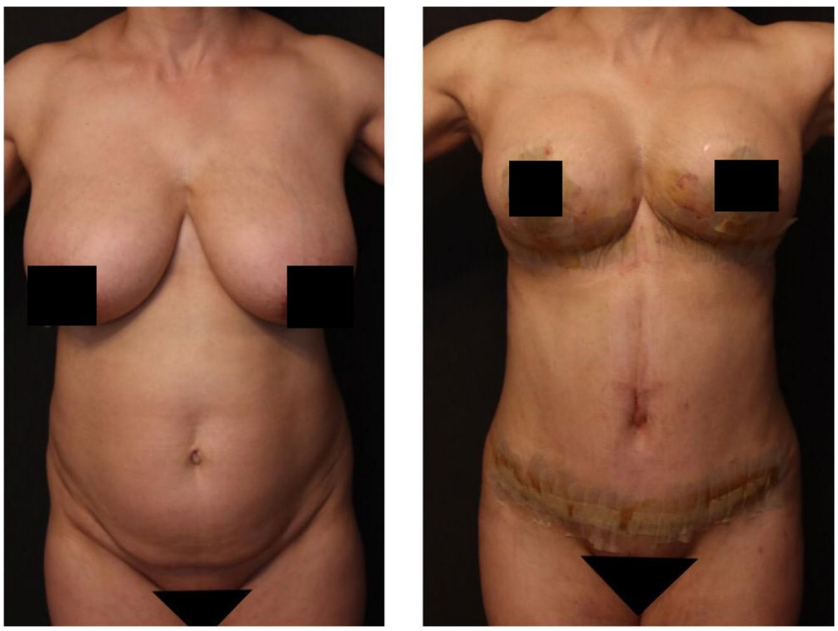

Fig. 5 Preoperative and postoperative appearance of the case 1 (10 days after the surgery)

Fig. 6 Preoperative and postoperative appearance of the case 2 (14 days after the surgery)

Fig. 7 Close view of the neo-umbilicus recreated on case 3 (6 months after the surgery)

others recommend a range of 5 cm below to 3 cm above the iliac crest [10, 11]. Additionally, certain publications advocate for distance ratios between the xiphioid process of the sternum and the pubic symphysis, such as 1.6:1.3, along with the widely accepted 15/10 rule [12, 13].

In their study recruiting 150 women and 150 men of Turkish origin, Bilgen et al. reported a ratio of the distance between the xiphisternum and the umbilicus and the distance between the pubic symphysis and the umbilicus as 1.45, whereas the ratio of the distance between the umbilicus and anterior superior iliac spine and the between anterior superior iliac spine was approximately 0.6/1 [14].

During the abdominoplasty procedure, while most surgeons prefer the preservation of the native umbilical tissue flap with the pedicule and its attachment to the abdominal wall as an autograft, we experienced a different approach to overcome several complications of a spared umbilicus. With the technique described herein, the surgeon might determine the shape of the umbilicus as per patients' preferences. It is important to emphasize that the mentioned technique is not the only approach we utilize, and we do not make any compromises that would involve sacrificing the original umbilicus. The selection of patients suitable for this technique is based on various factors, including BMI, abdominal shape (such as a pendulous abdomen or loss of skin tightness), and the presence of an abdominal hernia that necessitates surgical repair.

The defatting suture technique used in this study to create the neo-umbilicus yields a sufficient healing process without the possible complications of flap attachment due to insufficient revascularization, notably in smokers. Due to our preferences of patient choice, smokers are not enrolled for this type of procedures; however, the approach might be safer for the surgeons who operate on smokers. Also, the attachment stitches would allow an efficient depthness in lower weight individuals in particular.

In a study based on the photographs of female individuals, nearly all represented a lateral to the midline, mostly to the right side, possibly due to the more frequent use of right-side abdominal muscles [15]. In our approach, we also considered the current positioning of the umblici, and the patients' dominant body side, in an attempt to provide the perfect positioning for each patient. Furthermore, with our approach, we overcome the disadvantages of using the original umbilicus graft, such as visible scar appearance and necrosis, while positioning the neo-umbilicus in an optimum location, and recreating its anatomical reference points, the base, the grooving, and the ring. Our technique is also an ideal approach for a simultaneous laparoscopic repair of umbilical hernias with minimal risk of ischemia and recurrences, allowing a stronger repair using mesh prostheses without vascular compromise. In this series, we performed eight concurrent herniorraphies in the cases with two and more previous pregnancies, with or without rectus diastasis, and prosthetic polypropylene mesh was used in all patients owing to the evidence that the use of a mesh is associated with a decreased risk of recurrence. In the hernia repair

Table 1 Results

	Mean ± SD Mean; median	Range
Age (years)	38.4; 36	27–46
BMI (kg/m^2)	23.8 ± 2.6	19.4–30.2
Waist-to-hip ratio	0.77 ± 0.01	
Parity		
Nulliparous	4	
Primiparous	3	
Multiparous	19	
Previous history of a C-section	16	
Umbilicus position		
Iliac crest level	16 (61.5%)	
Above the iliac crests	10 (38.5%)	
Neo-umbilicus position		
Iliac crest level	7 (27%)	
Below the iliac crests	19 (73%)	
Neo umbilicus size (cm)	2.0 ± 0.4	1.8–2.8
Distance from the right iliac crest to the mid-umbilicus (cm)	13.6 ± 1.8 cm	
Distance from the left iliac crest to the mid-umbilicus (cm)	13.8 ± 1.6	
Distance from the superior border of the neo-umbilicus to the xiphoid process (cm)	16.8 ± 2.3	
Distance from the inferior border of the umbilicus to the superior border of the pubis	12.7 ± 1.6	
Follow-up duration (months)	18	9–26
Complications		
Seroma	2 (7.7%)	
Hypertrophic scar tissue	1 (3.7%)	

group, none of the patients required additional postoperative pain control, and intervention and all healed without evidence of umbilical necrosis and delay.

Although several authors propose an open or right lateral approach to preserve the rectus sheet and transverse fascia on different sides to maintain the blood supply, our technique allows a healing process without wound-related complications and umbilical stalk necrosis, which are the widely reported complications of concurrent abdominoplasty and umbilical hernia repair [16, 17].

Several reports suggest the reinnervation period of the umbilicus tissue following an abdominoplasty surgery within a time range of 1 to 5 years [3, 18, 19]. Our results showed that almost 1 year following the operation, tactile and thermal sensitivities were regained. At the end of the follow-up period, none of our patients reported decreased sensitivity or hypoesthesia. The point to be considered is that the relatively shorter period for the gain of sensitivity might be a result of a neo-umbilicus recreation process, and a skin graft technique might turn out with a longer healing duration due to the violation of thoracoabdominal nerves.

The reported minor complication rate following a neo-umbilicus recreation in the abdominoplasty surgery was 28.8–32%. In our series, three out of 26 patients (11.5%) developed minor complications. Although an extra effort was paid to the adipose tissue on the external oblique aponeurosis as suggested by the reports, two patients developed seroma [20].

The major drawback of our study is its small sample size and lack of a control group. In addition, the sensitivity analyses were based on qualitative measures, and no record of the umbilical zones and the cutaneous pressure thresholds have been taken. As the number of cases and follow-up period increase, we could gain more information regarding the recurrence of hernia cases. However, so far, the neo-umbilicus concept is a safe approach allowing a laparoscopic repair of umbilical hernia during abdominoplasty.

In conclusion, the neo-umbilicus technique is a safe, and reproducible technique, with low complication rates, providing a natural-looking umbilicus without scar tissue. Also, a tailoring approach allows the designation of the umbilicus in terms of shape, depth, and location depending on the patients' body structure and preferences. Apparently, this procedure grants a concomitant hernia repair without interfering with the blood supply, and an accelerated wound healing and an early gain of sensitivity.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s12262-023-03876-z.

Data Availability Raw data for the dataset presented herein are not publicly available to preserve individuals' privacy under the European General Data Protection Regulation. However, will be presented as per the editor request.

Declarations

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed Consent For this type of study, all the patients had signed the informed consent.

Conflict of Interest The authors declare no competing interests.

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