

Umbilical reconstruction with the bow tie flap

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Abstract The umbilicus can be absent in congenital malformations that are associated to umbilical agenesis such as bladder exstrophy, gastroschisis or omphalocele or it can be excised during surgical procedures such as umbilical herniorrhaphy, abdominoplasty and laparotomy. We report a new technique for umbilical reconstruction, using a “bow tie”-shaped flap, partially made of scar tissue. We treated three female patients with absent umbilicus as a consequence of congenital malformations or previous surgical treatments. This method provided a good conical shape to the neoumbilicus with adequate depth and a wide external ring. Follow-up at 2 years showed

that a satisfactory shape was maintained. Previously described techniques for neoumbilicoplasty were unsatisfying or seemed too complex in our hands. The reported technique is easy and simple, with good, stable and natural aesthetic results, and it can be effectively used for umbilical reconstruction in all primary or secondary cases of umbilical absence.

Level of evidence: Level V, therapeutic study.

Keywords Neoumbilicoplasty · Omphalectomy · Umbilicus · Reconstruction · Abdominal scar

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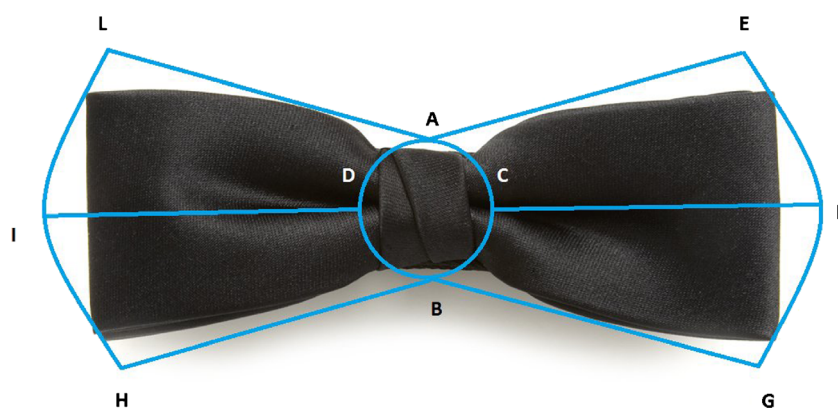
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Introduction

The absence of the umbilicus may occur as a result of various surgical procedures, such as postbariatric abdominoplasty [1], umbilical herniorrhaphy and laparotomy [2] and excision of skin cancer involving the umbilical stump [2], or it can be associated to congenital conditions such as gastroschisis and omphalocele [2]. These congenital abdominal wall defects usually require immediate surgical intervention after delivery which is often performed without neoumbilicoplasty [3]. A residual scar is frequently located in the mid abdomen as a consequence of the surgical treatment of these malformations, in a position easily exploitable to reconstruct the neoumbilicus.

Based on the assumption that the umbilicus is physiologically made of scar tissue, we present a new technique for umbilical reconstruction which uses two small

Fig. 1 The bow tie flap design for umbilical reconstruction—the central edge of the flaps measures 1 cm ($AB = CD$). The main base measures 2.6 cm ($EG = LH$). The lateral sides of the hemitrapezoidal flaps ($AE = BG = LA = HB$) measure 2.4 cm and are equal to the distance $CF = ID$

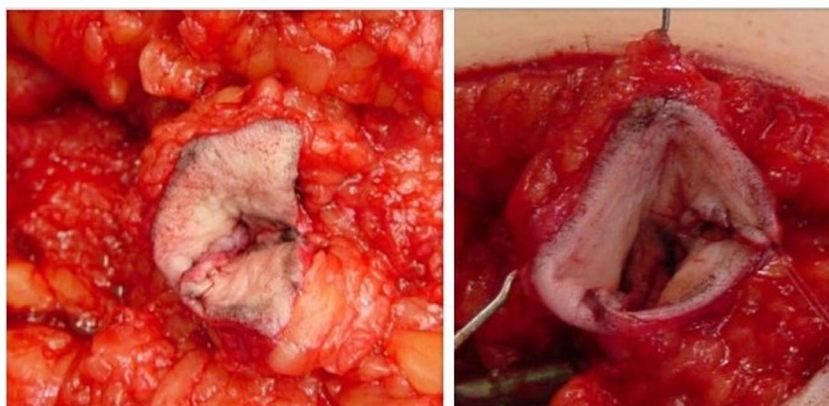


trapezoidal opposite flaps attached at a central flap base designed inside the scar, resulting in a “bow tie” figure.

Surgical technique

Our new procedure for neoumbilicoplasty is performed using local flaps based on abdominal median scar tissue with a bow-tie shape (Fig. 1). Each trapezoidal skin flap is 2.4 cm long while the main base width is 2.6 cm; the central flap base diameter is 1 cm. The thickness of the two mirrored flaps ranges between 8 and 12 mm. To give the neoumbilicus a conical shape, the lateral edges of the two harvested flaps are joined together and sutured from the deep portion up to the surface (Fig. 2). These measurements allow obtaining a neoumbilicus with a depth of 2.2 cm and with an external diameter of 1.6 cm. A daily massage of the neoumbilicus with a moisturizer cream is recommended, using the little finger tip, three to four times a day for all patients, to keep an adequate umbilical depth.

Fig. 2 Shaping—the lateral edges of the two harvested flaps were joined together and sutured from the deep portion up to the surface



Case presentations

Between 2010 and 2014, three female patients, ranging from 24 to 53 years, were referred to our Department for surgical revision of aesthetic defects of the abdominal area including the presence of median scars and the absence of the umbilicus. Neoumbilicoplasty with bow tie flap was safe and effective. All flaps healed without complications, in particular no partial or total skin necrosis of the distal part of the flaps was observed. The aesthetic appearance of the neoumbilicus was natural-looking and pleasant. Conical shape was well maintained at long-term follow-up (range 10–48 months) and no scar contraction occurred inside the flap tissue with a median umbilical depth of 2.1 cm (range 1.9–2.2 cm) and a median external diameter of 1.5 cm (range 1.4–1.6 cm). Patients were completely satisfied with the surgical outcomes according to the 4-point Likert scale (poor, fair, good, very good): the results were subjectively evaluated as “good” in one case (Case 2) and “very good” in two cases (Case 1 and 3) by the patients (Table 1).

Table 1 Umbilical depths and external umbilical diameters

	Umbilical depth	External umbilical diameter
Case 1	2.1 cm	1.6 cm
Case 2	2.2 cm	1.6 cm
Case 3	1.9 cm	1.4 cm

We present these three cases in details. Written consent for the publication was obtained from all the patients.

Case 1

A 40-year-old nurse attended the clinic with an abdominal transverse scar of about 26×4 cm complaining of asymmetry of the abdominal contour and subcutaneous tissue, scar conflict and absence of the umbilicus; the scar was the consequence of the surgical correction of congenital gastroschisis performed right after delivery (Fig 3).

As she was overweight (BMI = 36), an abdominoplasty revision was not deemed applicable. Under general anaesthesia, a W plasty revision was planned to elongate the indented horizontal scar; a bow tie-shaped flap was designed to reconstruct the umbilicus having its base inside the scar tissue. The central flap-base was left attached to the abdominal fascia, having the vascular supply from it. Two random trapezoidal flaps, attached to the central base, were planned with an orientation perpendicular to the scar with the larger edge away from the base. The horizontal scar was excised and revised with a W plasty.



Fig. 3 Case 1—transverse indented abdominal scar with absent umbilicus

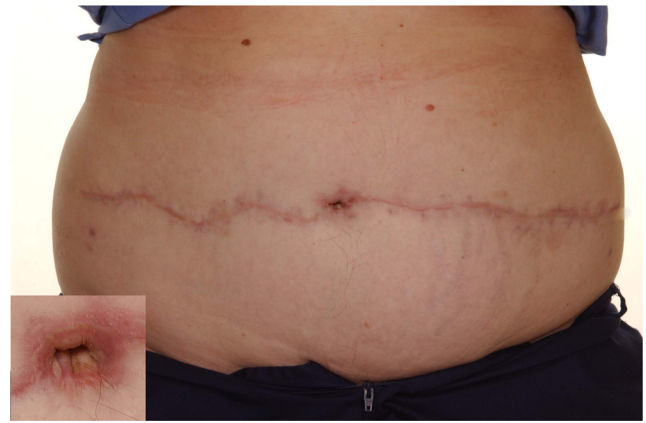


Fig. 4 Case 1—One year of follow-up

The patient was very satisfied with both the improved symmetry of the whole abdomen and the new umbilicus at 6 months and 1 year follow up (Fig. 4).

Case 2

A 24-year-old woman was referred to our clinic with surgical sequelae of perinatal correction of congenital omphalocele including the absence of the umbilicus. She presented with a median vertical scar of 19×4 cm, highly indented and strongly adherent to underlying fascial planes (Fig. 5).

Under general anaesthesia, a “fleur de lys” abdominoplasty was planned with an inverted T scar pattern. The midline scar was completely excised with the exclusion of the periumbilical scar tissue, which was spared. A bow tie-shaped flap was planned exploiting the residual scar tissue with the base of both flaps located on the abdominal fascia as previously described.



Fig. 5 Case 2—vertical abdominal scar with absent umbilicus



Fig. 6 Case 2—Two years of follow up with good external umbilical width in spite of bad quality of the “fleur de lys” vertical abdominal scar

The flaps were oriented horizontally and perpendicular to the scar. A conical-shaped neoumbilicus was reconstructed by suturing the two flaps together. Immediate postoperative result showed a natural-looking neoumbilicus and an improved abdominal contour; these findings were confirmed at 6 months and 2 years clinical follow up (Fig. 6). Nevertheless, the stretched vertical scars were worth secondary revision. The stretching of the scar tissue over the time was not confined to the donor area of the bow tie flap, but it extended to the rest of the vertical scar despite having sutured the skin edges in three layers, as usual. At the same time, the scars of the neoumbilicus looked very net and there was no stenosis at long-term follow up. This pointed out that the flap skin was not contracting even though the surrounding scars were prone to become stretched and hypertrophic.



Fig. 7 Case 3—Postbariatric abdominoplasty sequelae

Case 3

A 53-year-old woman underwent a postbariatric abdominoplasty with a fleur-de-lys pattern performed by a general surgeon. After the procedure, a necrosis occurred in the mid and inferior part of the abdominal flap. Topical negative pressure with vacuum-assisted closure (VAC) dressing was applied to heal the defect. After 2 years and several revisions, she presented to our clinic complaining about an inverted T scar measuring 23 cm in the horizontal limb and 10 cm in the vertical limb, with a central defect of subcutaneous tissue due to the previous necrosis (Fig. 7).

Under general anaesthesia, a secondary fleur-de-lys abdominoplasty was planned with an inverted T scar pattern. The umbilicus was reconstructed with a horizontally oriented bow tie-shaped flap planned inside the previous abdominal scar.

At 2 years clinical follow up, the neoumbilicus maintained its shape, even though the patient gained weight again during this period (Fig. 8).

Discussion

Absence of the umbilicus can occur after surgical treatment of omphalocele, gastroschisis or bladder exstrophy [4, 5]. Necrosis of the umbilical scar can also occur after cosmetic or reconstructive abdominal surgical procedures [5]. Spontaneous secondary healing has been proposed as an alternative to create a neoumbilicus, based on the assumption that the physiological umbilicus is a scar resulting from a wound that has healed by secondary intention [6]. There have been several reports on neoumbilicoplasty using grafts [3, 7], or local skin flaps [1, 2, 8–17]. The goal is to create a natural-looking umbilicus with sufficient depth, which can last over a long period of time. Umbilical reconstruction is frequently complicated by shrinkage of the walls and stenosis of the external ring. These events tend to happen more frequently if a skin graft is used. The use of a flap, which is better able to resist contracture, can obviate this eventuality.

Pflug et al. distinguished two approaches to reconstruct the umbilicus [2]: the first group of techniques use single or multiple flaps having their blood supply from the abdominal skin, which are then turned down to and anchored on the fascia [1, 8, 12–14]; on the other side, the second group of techniques use flaps of variable size that have its base on the abdominal fascia relying on the

Fig. 8 Case 3—Two years of clinical follow-up



abdominal wall vascularization; in this condition, flaps are then elevated to the abdominal skin level to create the umbilical conical structure [9–11, 15, 16]. Moreover, the umbilicus can be reconstructed using scar tissue or scar-free skin. In patients with a midline scar, Franco et al. [1] used to excise it, preserving two rectangular scar-free flaps in the abdominal flap skin, joining them together and anchoring them to the fascia to create a neoumbilicus. On the other side, Yotsuyanagi et al. [16] described umbilical reconstruction using scar tissue, with the flap base on the rectus sheath. Park et al. [4] described the use of scar tissue as an elliptical flap to reconstruct the umbilicus while performing the abdominal scar revision. Dessy et al. [17] described the use of a double opposing “Y” incision to obtain a neoumbilicus after omphalectomy, suitable both in thin and fat patients. Recently, Barbosa et al. [7] advised the use of a different surgical strategy tailored on local tissue availability.

Our flaps exploit the scar tissue present at the abdominal midline in patients with omphalectomy without the need to create new scars. They take their vascular supply from the fascia that allow keeping a deep base of the umbilical inverted truncated cone, while the bow-tie shaping of the lateral flaps allows obtaining a well-projected three-dimensional structure with an external ring wider than the apex of the cone.

In conclusion, the bow tie flap design can be transversally or vertically planned depending on the orientation of the previous abdominal scar. Our procedure allows a good conical umbilical shape without additional donor site scars. Surgical technique is easy to perform and reproducible. Results are long lasting with no scar contracture occurring in the flap at long-term follow up. We advocate the bow tie flap design as an easier and effective

alternative to previously described methods for umbilicus reconstruction.

Compliance with ethical standards

Disclosures Gisella Nele, Annalena Di Martino, Mariagrazia Moio and Fabrizio Schönauer declare that they have no conflict of interest.

Patient consent Patients provided written consent before their inclusion in this study.

Ethical standards For this kind of article formal consent from a local ethics committee is not required.

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