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THE USE OF UMBILICOPLASTY IN ABDOMINAL SURGICAL INTERVENTIONS

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Abstract

In the present study we investigated the use of various umbilicoplasty methods during the surgical treatment of some diseases of the umbilical region.

During some abdominal surgical interventions, such as large ventral hernias of anterior abdominal wall, umbilical hernias, umbilical fistulas and cysts, it is necessary to completely remove the umbilical ring, which leads to a change in the appearance of anterior abdominal wall. The formation of natural looking new umbilical skin folding in such cases has an important esthetic meaning. This problem is especially relevant among female patients, for whom it is important to preserve the natural appearance of the umbilicus after surgical intervention.

There are various umbilicoplasty methods in the literature, but we found no works containing comparative analysis. Some umbilicoplasty methods, which provide sufficient esthetic outcomes, require the use of large incisions and complex skin flaps. In present study a comparison of the clinical results of some simplest umbilicoplasty methods has been performed, as well, as the new umbilicoplasty method using local skin flaps suggested by us.

During abdominal surgical interventions umbilicoplasty was performed in 28 patients, 12 of them were males; the age of patients ranged from 19-60 years. Such surgical intervention was carried out in 6 patients with umbilical hernia, in 3 patients with umbilical dermoid cysts, in 11 with malformations of the urachus, in 8 – with postoperative and recurrent hernias. The method of umbilicoplasty suggested by us was performed in 14 patients.

There were no cases of infectious complications, or rejection of skin flaps among the operated patients after the use of umbilicoplasty. More satisfying esthetic results were obtained after the use of umbilicoplasty by the method of D. Franco and co-authors and the method modified by us. The advantage of using our modified umbilicoplasty method is the lack of need for additional large incisions. Umbilicoplasty method with local skin flaps suggested by us is a method of choice for the formation of an umbilical ring similar to the natural after some abdominal surgical interventions.

Keywords: *umbilicoplasty, umbilical hernia, umbilical fistula, ventral hernia.*

Introduction

The umbilicus is an important and essential aesthetic component of the abdomen. It is almost entirely composed of a skin fold with a funnel-shaped depression of the fibrous tissue, along with a very small amount of subcutaneous fatty tissue. The umbilicus 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. In some surgical interventions, such as excision of large umbilical or ventral hernias with atrophic changes of the skin over the hernial protrusion, removal of dermoid cysts or other tumor formations, located directly under the umbilical ring, as well as with some malformations of the urachus or vitelline duct, the umbilicus must be removed as a part of the surgical procedure. The absence of the umbilicus significantly worsens the aesthetic appearance of the abdomen and causes psychological damage to the patient. This problem is especially relevant

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among female patients, for whom it is important to preserve the natural appearance of the umbilicus after surgical intervention.

The purpose of umbilicoplasty is to create an umbilicus of natural appearance, consisting of a sharrow funnel-shaped depression, a bottom and a small skin fold in the upper part [*Craig S et al., 2000; Shinohara H et al., 2000; Lee Y et al., 2015*]. Many surgical methods for the restoring of the external aesthetic appearance of the umbilicus are described in the literature. Generally, all described surgical methods can be divided into methods using local skin flaps [*Itoh Y, Arai K, 1992; Miller M, Balch C, 1993; Shinohara H et al., 2000; El-Dessouki N et al., 2004; Tamir G, Kurzbart E, 2004; Ozbek S, Ozcan M, 2005; Pfulg M et al., 2005; Franco D et al., 2006; Rogliani M et al., 2007; Şentürk S et al., 2015*], special methods of suturing the wound in the umbilical region [*Pardo Mateu L, Chamorro Hernandez J, 1997; Schoeller T et al., 2002; Morshed G, 2012; Lee Y et al., 2015*] or grafting with the use of free skin, or chondral flaps [*Matsuo K et al., 1990, Yazar M et al., 2017*]. The methods of umbilicoplasty using local skin flaps of the anterior abdominal wall are the most common ones.

Among the cases in which umbilicoplasty is required, the most difficult is the formation of an entirely new umbilicus at the site of coarse, curved postoperative scars, or immediately after extensive skin excision along with the umbilicus during some interventions. Most umbilicoplasty methods require the use of large incisions and the mobilization of large skin flaps [*Miller M, Balch C, 1993; Shinohara H et al., 2000; Ozbek S, Ozcan M, 2005; Rogliani M et al., 2007; Şentürk S et al., 2015*], which creates the risk of circulatory disorders, infectious complications and gross cicatricial changes in the postoperative period. It should also be noted that surgical interventions for ventral hernias, malformations of the urachus and vitelline duct, umbilicus formations are rarely performed with the participation of a plastic surgeon. The use of a simple method of performing umbilicoplasty by specialists of various surgical directions is important for improving the aesthetic result of the surgical treatment.

Material and methods

The surgical intervention was performed on 28 patients, who underwent umbilicoplasty after the main stage of surgical intervention for surgical diseases with the position of the abnormal focus in the umbilical region. The age of the examined patients ranged from 19 to 60 years from the total number of patients 16 were females, 12 males. Distribution of operated patients by the main disease type is presented in table 1.

Table 1

Distribution of patients by the main disease type, who underwent umbilicoplasty

Type of surgical disease	Number of patients
Umbilical hernia	6
Malformations of urachus	11
Dermoid cyst	3
Postoperative and recurrent ventral hernias	8

Malformations of the urinary duct (urachus) can clinically appear at any age and have various pathological manifestations. The cyst and urachal fistula are the most common manifestations of this anomaly. Among 11 operated patients with developmental abnormality of urachus 6 had cystic cavities of urachus, located directly under the umbilicus. The remaining 5 patients had umbilical fistulas as a result of nonunion of urachus. In 8 operated patients with postoperative and recurrent ventral hernias the umbilicus was completely removed during the previous surgical intervention.

According to literature data there are more than 20 various surgical methods of umbilicoplasty or formation of the new umbilicus, however, there are no significant comparative studies, demonstrating the prevalence of using any other particular method. According to some authors, the ideal umbilicus should have a smooth oval contour, pronounced depth, minimal postoperative scars [*Craig S et al., 2000; Shinohara H et al., 2000; Lee Y et al., 2015*]. In particular, the authors emphasize that the umbilicus with a natural appearance consists of an ellipsoidal ring with a funnel-like deepening of the skin, sometimes there is a T-shaped fold on the bottom, but without protrusion of the skin folds. Figure 1 presents the form of the most preferred

FIGURE 1. *The ideal shape of the umbilicus according to the research data [Craig S et al., 2000]*

natural-looking umbilicus according to the results of 147 women voluntarily participated in the study.

Table 2 presents the main operational methods of umbilicoplasty, which were proposed by various authors. To perform umbilicoplasty, we used 3 basic methods (*Lee Y. – Four flap technique, Franco D. – two lateral cutaneous flaps, Pfulg M. – Triangular skin flap folded onto itself)*, which most closely corresponded to the requirements of this study (simple technique, the use of local skin flaps and an acceptable aesthetic result). Also, after performing surgical interventions for umbilical hernias and developmental defects of urachus, we applied our own modified umbilicoplasty method.

The method of umbilicoplasty proposed by M. Pfulg and co-authors (2005) was applied in 3 patients operated on for recurrent ventral hernias, in which the umbilicus was completely removed during the previous surgery and in one patient with an umbilical hernia. Schematic description of the operation technique is shown in figure 2. The method of umbilicoplasty proposed by D. Franco and co-authors (2006) was used in 4 patients operated on for recurrent ventral hernias and in 2 patients with umbilical hernias. The illustration of the operation technique is presented in figure 3. The method of umbilicoplasty proposed by Y. Lee was used in 1 patient operated on for recurrent ventral hernia and in 3 patients after complete removal of the umbilicus (patients had non-affection of urachus complicated by umbilical fistulas). Schematic illustration of the operation technique is shown in figure 4.

TABLE 2

Main methods of umbilicoplasty according to literature data

Authors	Methods of umbilicoplasty	Number of patients
Morshed G., 2012	Burse string sutures after triangular flap resection	10
Lee Y. et al., 2015	Four flap technique	2
Şentürk S. et al., 2015	Dome V-Y advancement flap procedure	6
Ozbek S., Ozcan M., 2005	Modified unfolded cylinder technique	1
Pfulg M. et al., 2005	Triangular skin flap folded onto itself	2
Lee Y. et al., 2103	Modified inverted C-V flap with conjoint flaps	1
Shinohara H. et al., 2000	Inverted C-V Flap	2
Franco D. et al., 2006	Two lateral cutaneous flaps	7
Bartsich S et al., 2003	Purse string method	3
Matsuo K. et al., 1999	Conchal cartilage composite graft	1
Schaefer I.M. et al., 2012	A three-step technique for umbilicoplasty	1
Malic C. et al., 2007	Inverted U skin flap	25
Mateu P. L. et al., 1997	Purse-String Suture of Three Defatted Flaps	5
Kim Y.S. et al., 2016	Four transposition flaps	1
Rogliani M. et al., 2007	Maltese cross technique	3
Baack B. et al., 1996	Lower and superior flaps technique	3
Itoh Y. et al., 1996	Cone-shaped flap	9
Onishi K. et al., 1995	Lunch box-type method	2

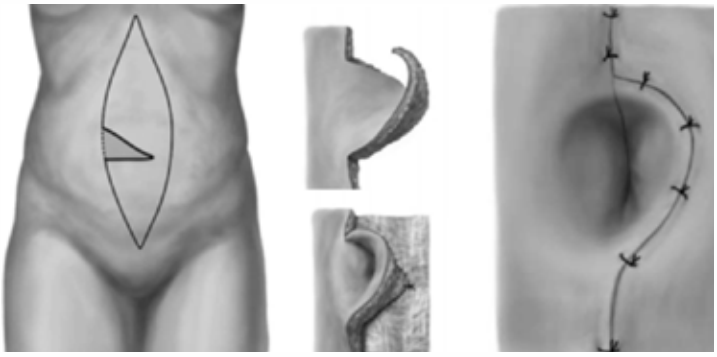

Figure 2. *Illustration of main stages of umbilicoplasty [Pfulg M et al., 2005] A) The skin incision B) Formation of skin flaps C) Formation of umbilical folding*

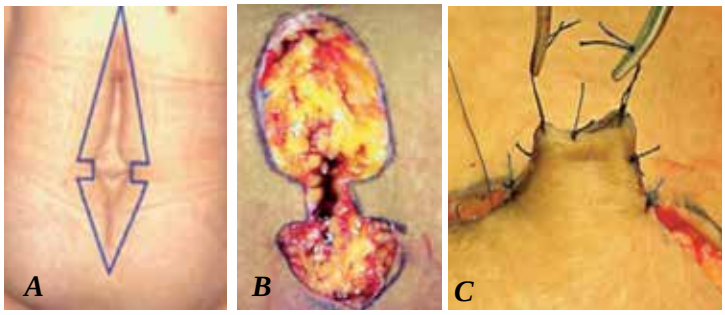

Figure 3. *Illustration of main stages of umbilicoplasty [Franco D et al., 2006] A) The skin incision B) Formation of skin flaps C) Formation of umbilical folding*

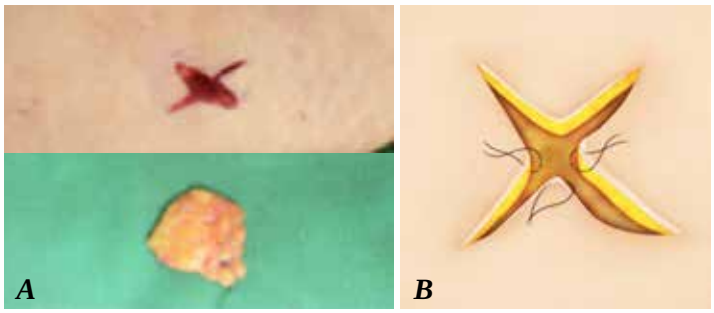

Figure 4. *Illustration of main stages of umbilicoplasty [Lee Y et al., 2015] A) Formation of skin flaps B) Formation of umbilical folding*

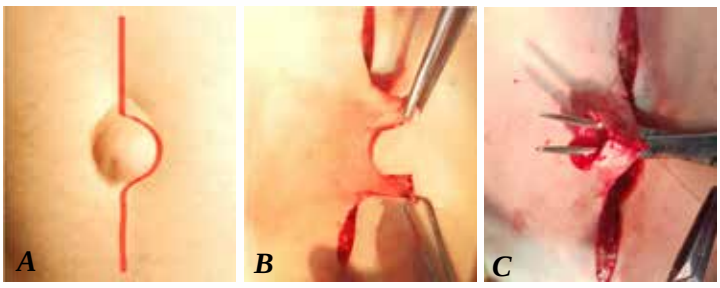

Figure 5. *Illustration of modified umbilicoplasty techniques on the example of surgical treatment of umbilical hernia*
A) Standard midsection of skin, B) circular excision of the altered skin with the formation of a U-shaped skin flap, C) connection of the ends of skin flaps using intradermal sutures with the formation of a cylindrical shape

In the remaining 14 patients operated on for umbilical hernias, developmental defects of urachus and dermoid cysts of the umbilical region, the modified umbilicoplasty method proposed by us was used. To perform the modified umbilicoplasty, a standard median incision was used, with a bypass of the umbilical ring on the left side (Fig. 5A). After performing the main stage of surgical intervention (excision and plasty of the hernia, removal of the urachus cyst, etc.), the pathologically changed skin of the umbilicus is dissected and circularly excised together with the umbilical ring.

As a result of this excision, a horizontal U-shaped skin flap is formed, which is used to form a new umbilicus (Fig. 5B). The two ends of the skin flap are interconnected by intradermal sutures with the formation of a cylindrical shape (Fig. 5C). Cylindrical cutaneous flap is turned out, and the bottom is closed with sutures from the reverse side. Sututres should be applied longitudinally to form a natural longitudinal furrow at the bottom of the umbilicus, after which the bottom of the formed umbilicus is fixed with several nodular sutures to the white line of the abdominal wall in the depth of the wound. If the patient has a thick layer of subcutaneous tissue, it is necessary to circularly dissect the subcutaneous tissue with a diameter of 2-3 *cm*, to provide the necessary depth for fixation of the formed umbilicus. In order to perform umbilicoplasty, absorbable sutures (monocryl 3.0/4.0, vycril 3.0/4.0), having atraumatic cutting needles, were used. At the end the surgical wound is closed with intradermal sutures.

Results

In all cases of umbilicoplasty, there were no infectious complications or necrosis of cutaneous flaps. More satisfying esthetic results were obtained after the application of umbilicoplasty by the method of D. Franco and co-authors (2006) and the method modified by us. In particular, the formed umbilicus had a symmetrical central arrangement, an oval funnel-like shape of sufficient depth

and a small furrow at the bottom. The appearance of the new umbilicus was most consistent with the criteria of S. Craig and co-authors (2000), H. Shinohara co-authors (2000), Y. Lee and co-authors (2015). The mentioned cosmetic appearance of the umbilicus was satisfying for patients. The use of umbilicoplasty by D. Franco and co-authors' method had the advantage of forming a new umbilicus in place of old postoperative scars in patients operated with recurrent ventral hernias. In particular, the section described in the procedure provided good operative approach: it was possible to completely remove old postoperative scars and atrophically altered skin. The technique of performing umbilicoplasty was distinguished by its simplicity. The advantage of using the modified umbilicoplasty method is the lack of need for additional large incisions for the formation of local skin flaps. Clinical examples of the application of umbilicoplasty modified by our method are presented in figure 6, 7 and 8. The method proposed by us is most conveniently used for the formation of a new umbilicus immediately after completion of the main stages of surgical interventions in the surgical treatment of benign formations and umbilical hernias or malformations of the urinary duct.

In the presence of umbilical fistulas, preoperative conservative treatment should be performed to reduce the inflammatory phenomenon in the umbilical region. The use of edged large oval incisions in the umbilical region in the operative treatment of benign surgical diseases does not improve the results of treatment of the underlying disease, and inevitably leads to a significant change in the natural appearance of the anterior abdominal wall. When a large oval skin defect is formed, the natural appearance of the anterior abdominal wall can later be most difficult to correct. The median incision with the bypass of the umbilical ring on the left in these cases provides good operative approach, and also allows to keep a skin flap of sufficient size for the subsequent performance of umbilicoplasty. The advantage of using the modified umbilicoplasty method is the absence of the need for additional large incisions for the formation of local skin flaps. It should also be noted that the choice of the method for performing umbilicoplasty must be approached individually, taking into account some factors, in particular, surgical operations that have been transferred earlier, postoperative cicatricial changes in the abdominal wall, absence or preservation of the umbilicus, constitutional features of the patient, thickness of the subcutaneous tissue, etc.

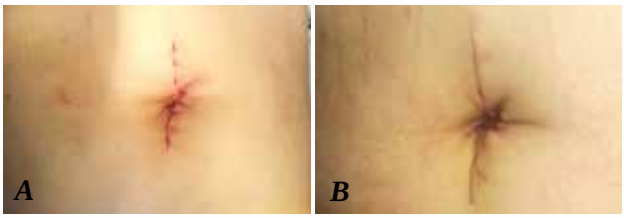

Figure 6. *Clinical example of using umbilicoplasty immediately after removal of the umbiculus in occasion of the urachus cyst, complicated by the umbilical purulent fistula. Male patient, aged 26 years: A) The apearence of formed umbiculus imidietly after surgery, B) The result of umbilicoplasty on the 14th day after surgery*

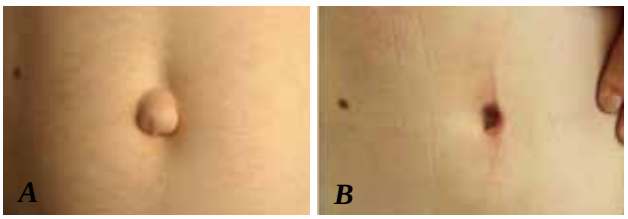

Figure 7. *Clinical example of using umbilicoplasty immediately after hernia repair and hernioplasty of umbilical hernia. Male patient, aged 21 years, 11th day after surgery*

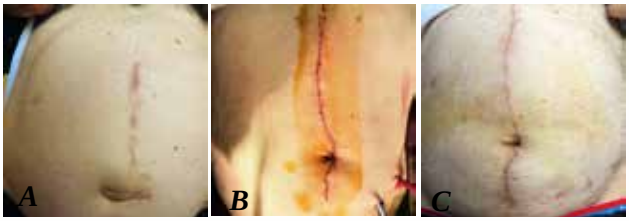

Figure 8. *Male patients, aged 54 years. Diagnosis: Postoperative recurrent ventral hernia, diastase of the rectus abdominis muscles, adhesive disease. A) The type of anterior abdominal wall before surgical treatment, B) The appearance of the anterior abdominal wall immediately after surgery – relaparotomy, separation of interintestinal adhesions, Ultra-pro mesh hernia repair of the anterior abdominal wall according to the "sublay" method, umbilicoplasty by a modified method. C) The appearance of the anterior abdominal wall on the 15th day after surgery*

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