A New Method of Umbilical Transposition

Bommie Florence Seo,
Seong Yeon Kim, Hyun Ho Han,
Suk-Ho Moon, Jong Won Rhie,
Sang Tae Ahn, Deuk Young Oh

Department of Plastic and Reconstructive
Surgery, Seoul St. Mary's Hospital, College
of Medicine, The Catholic University of
Korea, Seoul, Korea

Background Creating a natural-looking umbilicus during closure of the donor-site in abdominally based free flap breast reconstruction is a factor of satisfaction for both the patient and surgeon. We present a simple method of umbilical transposition that results in an aesthetic, natural-looking umbilicus.

Methods From March 2011 to November 2014, fifty three consecutive female patients received abdominal flap breast reconstruction. Twenty patients (from March 2011 to February 2013) underwent umbilical transposition through a cross like incision in the abdominal flap, with fascial fixation sutures but no dermal flaps. Thirty three patients (March 2013 to November 2014) received umbilical transposition in the following method. An oval-shaped incision is made at the location of the new umbilicus on the abdominal flap. This oval is deepithelialized, and full-thickness incisions are made at the 2, 6, and 10 o'clock directions to create three triangular dermal flaps. These are pulled down to the abdominal fascia using sutures that pass through the umbilical stalk and the abdominal fascia at the 3, 9, and 12 o'clock directions. This results in an umbilical stalk lined with dermal flaps, creates a natural periumbilical concavity, and anchors the abdominal flap inward to minimize tension. The cranial flap enhances superior hooding.

Results Patient and surgeon satisfaction, surveyed 2 months after surgery with a satisfaction scoring system, were higher in the dermal flap group.

Conclusions The technique using three dermal flaps in an oval skin incision is simple, relatively easy to learn, and results in an aesthetic, natural-looking umbilicus.

Keywords Abdominoplasty, Mammoplasty, Surgical flaps, Umbilicus

No potential conflict of interest relevant to
this article was reported.

INTRODUCTION

An aesthetically ideal umbilicus sits at the center of a depression on the midline of the lower abdomen at, or slightly above the superior level of the iliac crests, has a longer vertical length than width, and a superior hood (the T-shaped umbilicus) [1,2]. This structure, the remnant base of the umbilical cord, lacks any function save for being the aesthetic landmark that defines the medial abdominal sulcus. The navel, or belly button has become a key cosmetic feature

in popular culture, and may affect the person's sexuality. An abnormally shaped or misplaced umbilicus will distort the morphology of the abdomen, attract unwanted attention and cause psychological stress to the patient.

Various methods that strive to create an aesthetic umbilicus have been described. Early techniques faced problems associated with scar contracture and hypertrophy, which many have tried to overcome with different, angled incisions. Other important aspects include the appropriate location of the umbilicus, which should be centered on a smooth concavity in the center of the abdomen, the size and proportion of width and length, its shape and degree of protrusion or retrusion, and a slight amount of superior hooding.

We introduce an easy-to-learn technique that involves three dermal flaps, with which we have experienced satisfactory results.

METHODS

Ethical statement

This study was approved by the Institutional Review Board of the

Received: Jan 11, 2017 Revised: Jan 26, 2017 Accepted: Jan 26, 2017
Correspondence: Deuk Young Oh Department of Plastic and Reconstructive
Surgery, Seoul St. Mary's Hospital, College of Medicine, The Catholic
University of Korea, 222 Banpo-daero, Seocho-gu, Seoul 06591, Korea.
E-mail: ohdeuk1234@hanmail.net

Copyright © 2017 The Korean Society for Aesthetic Plastic Surgery.
This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/4.0/>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited. www.e-aaps.org

Catholic University of Korea. All data were analyzed anonymously and according to the principles in the Declaration of Helsinki 1975 (revised in 2008).

Patients

From March 2011 to November 2014, fifty three consecutive patients received abdominally based free flap reconstruction for breast cancer at our department. From March 2011 to February 2013, the authors used a conventional method of umbilical transposition for twenty of these patients [3]. From March 2013 to November 2014, thirty three patients underwent umbilical transposition in this new technique. All received unilateral mastectomy and reconstruction. A single surgeon (DYO) harvested the flaps and performed umbilical transposition.

Surgical procedure

The umbilicus is carved out of its surrounding adipocutaneous tissue through a periumbilical oval incision during elevation of the abdominal flap. It is marked at the 3, 6, 9, and 12 o'clock directions to prevent any kinking or twisting. After harvest of the abdominal flap, repair of the rectus fascia and elevation of the cranial and caudal adipocutaneous flaps, the umbilicus is "sit" onto the abdominal fascia. A cuff of soft tissue at the lower one third of the umbilical stalk is sutured to the abdominal fascia using 3-0 absorbable monofilament sutures at three points: the 3, 9, and 12 o'clock directions (Fig. 1). Minimal bites should be taken when fixating the stalk in order not to compromise umbilicus circulation. The needles are

kept on the sutures which are each clamped by Mosquito forceps.

The new location of the umbilicus is then decided. There are many different methods one can use, but we use the umbilicus marker to mark the center of the future umbilicus on the abdominal midline.

Conventional method

Centered on this mark, a cross shaped incision with a horizontal axis of 1cm length and vertical axis of 2 cm length is made down to the subcutaneous adipose tissue. A circular area of subcutaneous tissue is excised to create a central concavity. The cranial flap with its new opening is then draped over the abdomen and is approximated with the caudal flap. The three absorbable sutures fixing the umbilical stalk to the fascia are pulled through the new opening. Each suture is passed through the subcutaneous margin of the new opening at its corresponding 3, 9, and 12 o'clock directions. Skin closure is done with #5-0 nylon sutures.

Three dermal flaps method

Centered on the mark on the abdominal flap, an oval shape with a longitudinal long axis of 2 cm and a horizontal short axis of 1 cm is drawn and de-epithelialized. Full thickness incisions are made through the underlying dermis at the 2, 6, and 10 o'clock directions to create three triangular dermal flaps (Fig. 2A-C). A circular area of the subcutaneous fat layer underlying the new umbilical opening is defatted to enhance the periumbilical crater (Fig. 2D). Excessive removal of tissue may lead to thinning of the skin flap and contour irregularity, therefore the amount of excision should be tapered toward the margins, centered on the dermal flaps in the center.

After the cranial flap with its new umbilical opening is draped over the abdomen to come into approximation with the caudal flap, the three absorbable sutures fixed with Mosquito forceps are pulled through the opening (Fig. 2E). The needle of each suture is then passed through the tip of each dermal flap and knotted so that the umbilical stalk, abdominal fascia, and the dermal flap comes into approximation (Fig. 3). Therefore the tip of the superior dermal flap is fixed at the 12 o'clock direction of the umbilicus, and the tip of the lateral flaps are fixed to the 4 o'clock and 8 o'clock directions. This creates the periumbilical concavity by pulling the dermal flaps inward toward the abdominal wall. This also allows the dermal tissue to encase the umbilical stalk, and also pulls the skin flaps together, decreasing skin tension.

The subcutaneous layers of the umbilicus and the umbilical opening are then approximated with absorbable sutures, and the skin is closed with nylon sutures under almost no tension (Fig. 2F). Dressing is done with ointment and foam, and sutures are removed 2 weeks after surgery.

Satisfaction evaluation

All patients were asked to score satisfaction on the location and shape of their umbilicus at 2 months after surgery. They were shown

Fig. 1. A cuff of soft tissue at the lower one third of the umbilical stalk is sutured to the abdominal fascia using 3-0 absorbable monofilament sutures at three points: the 3, 9, and 12 o'clock directions.

Fig. 2. (A) At the position of the new umbilical opening, an oval with a length of 2 cm and width of 1 cm is drawn, inside which a 'Y' shaped incision line is drawn. (B) Full-thickness incisions are made along the lines of the 'Y'. (C) The skin inside the oval is de-epithelialized. (D) Defatting of the underlying adipose tissue is done to further enhance the periumbilical concavity. (E) The periumbilical fixation sutures are passed through the new opening. (F) Subcutaneous closure is done with #3-0 Monsyn® sutures (B.Braun, Melsungen, Germany) and skin closure is done with #5-0 Ethilon® sutures (Ethicon, Somerville, NJ, USA) under minimal tension.

a scale of 0 (very unsatisfied) to 10 (very satisfied) by a nurse in the outpatient clinic in the absence of the surgeon. Each patient was asked twice to focus on the umbilicus only, and not on the overall

Fig. 3. Schematic summary of the surgical technique. The three dermal flaps are sutured to the abdominal fascia, to form a lining of dermis around the umbilical stalk. The points of sutures at the 3 o'clock direction are pinpointed in blue circles. The umbilical stalk (3A), the abdominal fascial (3A'), and the dermal flap (3A'') are approximated with absorbable sutures. The green circles are approximated during subcutaneous closure, and purple circles are approximated during skin closure.

surgical outcome.

Surgeon satisfaction was evaluated by three board certified plastic surgeons outside of the surgical team who independently scored overall aesthetic satisfaction of photographs of the patients' abdomen at 2 months after surgery. The same scale of 0 (very unsatisfied) to 10 (very satisfied) was used.

Statistical analysis

Subjective satisfaction scores and surgeon satisfaction scores between the two groups were statistically analyzed by the Mann-Whitney test using SPSS version 13.0 software (SPSS Inc., Chicago, IL, USA).

RESULTS

From March 2011 to November 2014, fifty three consecutive patients received abdominally based free flap reconstruction for unilateral breast cancer. The age of the patients ranged from 34 to 62. The follow-up period ranged from 6 months to 24 months. Twenty patients (between March 2011 and February 2013) received umbilical transposition in the previous method (transposition through a cross like incision in the abdominal flap, with fascial fixation sutures but no dermal flaps). Thirty three patients (between March 2013 and November 2014) underwent umbilical transposition incorporating three dermal flaps (Fig. 4-9). Demographic details are

Fig. 4. Preoperative and 2-month postoperative views of a patient who underwent deep inferior epigastric artery perforator reconstruction for unilateral breast cancer.

Fig. 5. Preoperative and 2-month postoperative views of a patient who underwent deep inferior epigastric artery perforator reconstruction for unilateral breast cancer.

Fig. 6. Preoperative and 6-month postoperative views of a patient who underwent deep inferior epigastric artery perforator reconstruction for unilateral breast cancer.

Fig. 7. Preoperative and 6-month postoperative views of a patient who underwent deep inferior epigastric artery perforator reconstruction for unilateral breast cancer.

Fig. 8. Preoperative and 10-month postoperative views of a patient who underwent deep inferior epigastric artery perforator reconstruction for unilateral breast cancer.

Fig. 9. Preoperative and 15-month postoperative views of a patient who underwent deep inferior epigastric artery perforator reconstruction for unilateral breast cancer.

Table 1. Demographic data of the patients included in the study

Group	Previous method	Three dermal flap method
No. of patients	20	33
Age (year), mean (range)	50.05 (38–57)	47.02 (34–62)
Unilateral/Bilateral breast cancer	All unilateral	All unilateral
Reconstruction flap, n (%)		
MS-TRAM flap	10 (50.0)	10 (30.3)
DIEP flap	10 (50.0)	23 (69.7)
History of abdominal operation, n (%)		
Cesarean section (Pfannenstiel incision)	3 (15.0)	1 (3.0)
Cesarean section (vertical midline incision)	2 (10.0)	1 (3.0)
Myomectomy	2 (10.0)	0 (0.0)

MS-TRAM, muscle-sparing transverse rectus abdominis musculocutaneous; DIEP, deep inferior epigastric perforator.

depicted in Table 1.

Subjective patient satisfaction scores in the three dermal flap umbilical transposition group were very satisfactory. On statistical analysis, this method (average satisfaction score 8.36) showed superior results compared with the previous method (average satisfaction score 6.40) ($P < 0.0001$). Three third party surgeons that were not on the breast reconstruction team gave the three dermal flap um-

bilical transposition photographic results an average aesthetic satisfaction score of 7.90, and the previous group an average score of 6.98 ($P < 0.0001$).

Other than four patients in the conventional group and four patients in the three dermal flaps group that experienced marginal congestion of the umbilicus, no major complications were seen. This congestion was seen in patients when we placed the sutures at a slightly higher level on the umbilical stalk. Because these sutures approximated the umbilical stalk with the abdominal fascia, venous drainage of the stalk in between would have been vulnerable to pressure, resulting in congestion. This is why we favor the lower one third of the stalk for fixation. The congestion resulted in partial necrosis of the umbilical skin in four patients, which healed within two weeks. One of the patients in the three dermal flaps group who experienced skin necrosis displayed mild hyperpigmentation of the caudal aspect of the umbilicus after healing. There were no cases of scar widening or scar contracture in either group.

DISCUSSION

The umbilicus is a remnant structure originating from the base of the umbilical cord, the lifeline that exchanges nutrients and waste during the intra-uterine period. Its structures become rudimentary ligaments postpartum, creating the characteristic depression of the

umbilicus [4]. Although it has no physiologic function, the ‘belly button’ has become a key cosmetic feature of the abdomen. A recent computer-aided analysis of the ideal umbilicus by Lee et al. [2] presented a panel of 21 examiners the abdominal images of 37 Playboy models to find that the shape of the aesthetically pleasing umbilicus is small, vertical, and hooded superiorly (a T-shaped umbilicus). The anatomical basis for this natural superior hooding comes from the dominant superiorly-vectored pull of the round ligament, which is opposed by the weaker force of the median umbilical and paired medial ligaments [4].

Procedures that involve elevating the abdominal flap, including abdominoplasty, transverse rectus abdominis musculocutaneous (TRAM) flap, or the deep inferior epigastric perforator (DIEP) flap, require reconstruction of the umbilicus. Historically, umbilicoplasty, transposition of the original navel through a new location in the upper abdominal flap, or umbiliconeoplasty, the creation of a *de novo* umbilicus, have been performed [4]. While abdominoplasty has a history of nearly a century, transposition of the original umbilicus to the new abdominal flap was only first reported in the 1950s, before which the umbilicus was routinely discarded [5].

Most surgeons usually opt to use the original umbilicus through a new incision in the cranial abdominal flap. Various incisions have

been reported, including circular, oval, vertical, or transverse incisions. However, due to the occurrence of circumferential scar contraction, hypertrophic scarring and umbilical stenosis, other methods were introduced to prevent such results. Surgeons focused on disrupting the continuous circular shape of the incision. Saldanha et al. [6] recommended a cruciform incision that provided a star shaped defect and 4 V-shaped flaps. Juri et al. [7] suggested a V-shaped incision with a corresponding vertical or wedge excision in the umbilicus. Inverted V-shaped, U-shaped or Y-shaped incisions have also been described [8-11]. Double Y-shaped incisions can correspond with an M-shaped umbilicus [12].

While interrupting the circular incision with angles was found to be effective in preventing cicatricial contracture, skin tension remained a contributing factor to hypertrophic scarring. Tension between the abdominal flap and the umbilicus may also cause the plication sutures fixing the umbilical stalk to the abdominal fascia to loosen. Because these sutures contribute to a deeper periumbilical concavity, loosening will result in a flat central abdomen with an unattractive, shallow umbilicus.

Prior to the three dermal flap technique, we used a method without dermal flaps, as described [3]. A cross-shape incision was made in the abdominal flap, the adipose layer defatted, and the umbili-

Fig. 10. Preoperative and 2-month postoperative views of a patient who underwent umbilical transposition in the previous technique without dermal flaps. Note the absence of the periumbilical crater, and the shallow depth of the everted umbilicus.

cus, after having been plicated at 3, 9 o'clock and either the 6 o'clock or 12 o'clock direction to the abdominal fascia with absorbable sutures, was pulled through the cross-shaped opening. While the cross shaped incision helped prevent cicatricial contractures, skin approximation was done against tensile forces, causing difficulty to the surgeon and resulting in a less satisfactory central abdomen. An example of a case is seen in Fig. 10. This suboptimal morphology was the main reason the authors decided on using the technique introduced here, with which we have experienced aesthetically satisfactory results.

De-epithelialized flaps have previously been reported with differing designs. In 2007, Rozen and Redett [13] described an oval shaped incision after which the de-epithelialized dermal flap was incised along the midline, creating two symmetrical flaps. In the same year, Castillo et al. [14] used a Y design, de-epithelializing two bilateral triangular flaps and leaving a superior triangular skin flap to coincide with a triangular superior cut made in the navel. While both methods reported successful results, we did not wish to perform an incision in the umbilical skin as in the method by Castillo et al. [14], and decided on an oval incision. We also noted that the two symmetrical flaps pulled down by Rozen and Redett [13] resulted in a relatively round navel. In their design, the opening for the umbilicus was drawn with a width no wider than 1.5 cm and length no longer than 2.5 cm. We decided to narrow this shape down by 0.5 cm each, this is the reason an oval incision with 1 cm width and 2 cm length was used. The resulting shape, as seen in figures was a slim, relatively narrow oval umbilical depression. We also wished to enhance the superior hooding, and integrated a superior dermal flap. The superior hood is not strictly defined, but usually consists of a slight prominence of tissue from the 11 to 1 o'clock direction, which sharply curves inwards toward the abdominal wall. The superior dermal flap contributes to the fullness of volume, and is fixed to the abdominal wall at the 12 o'clock direction to simulate this natural curvature. The umbilical stalk at the 6 o'clock direction was not fixed to the abdominal fascia to facilitate a smooth slope and concavity. Postoperative photographs reveal a clear volume of tissue hovering above the umbilical crater (Fig. 4 and 5). The dermal flaps serve as anchors, holding the abdominal flap to the abdominal fascia and pull the surrounding skin inward, placing the periumbilical scar just inside the crater. Although not as inconspicuous as the "Scarless" umbilicoplasty introduced by Bruekers et al. [15], the resulting scar is less obvious than when placed on the edge of the concavity. With the dermal anchors approximating the abdominal flap with the umbilical stalk, subcutaneous and skin sutures can be performed under minimal tension, further minimizing the risk of hypertrophic scarring. Compared to previously introduced dermal flap methods, the method introduced here allows the surgeon to construct an umbilicus with a superior hood and lateral slopes, without requiring any additional incisions in the surrounding abdominal tissue. The method introduced here is rel-

atively easy to learn, and simple to perform.

There are some limitations. The length of the dermal flap may not provide enough depth to reach the abdominal fascia in patients with a thick adipose layer. This may surface as a problem for the lateral flaps, which are shorter than the superior flap in length. Trimming the surrounding flap will help but adds to operative time and will result in a wider periumbilical crater. Therefore, we do not recommend this technique in patients with a thick abdominal pannus. Congestion is also a problem that the surgeon must be aware of, care must be taken to keep the umbilical stalk sutures at the lower one third of the stalk, and to take minimal bites to prevent venous compromise. However, when care is taken at this step, this incomplete, clear method creates a satisfying umbilical shape with ample superior hooding, surrounded by a smooth periumbilical concavity. This method is also advantageous in that it is reversible: at the end of umbilical inseting, if the surgeon is not satisfied, the dermal flaps can be detached, and a different classic method may be used.

CONCLUSIONS

Despite the plethora of techniques developed to reinsert the umbilicus into the abdominal flap, there is no one perfect method. The three dermal flaps in our technique act as anchors to pull the abdominal flap inward, therefore decreasing tension, and also contribute to enhanced superior hooding. This simple and safe method is easy to perform and creates an aesthetically satisfactory umbilicus.

PATIENT CONSENT

Patients provided written consent for the use of their images.

REFERENCES

1. Craig SB, Faller MS, Puckett CL. In search of the ideal female umbilicus. *Plast Reconstr Surg* 2000;105:389-92.
2. Lee SJ, Garg S, Lee HP. Computer-aided analysis of the "Beautiful" umbilicus. *Aesthet Surg J* 2014;34:748-56.
3. Richter DF, Stoff A. Abdominoplasty procedures. In: Neligan PC, editor. *Plastic surgery*. 3rd ed. London, UK: Saunders; 2013. p. 530-58.
4. Southwell-Keely JP, Berry MG. Umbilical reconstruction: a review of techniques. *J Plast Reconstr Aesthet Surg* 2011;64:803-8.
5. Vernon S. Umbilical transplantation upward and abdominal contouring in lipectomy. *Am J Surg* 1957;94:490-2.
6. Saldanha OR, Federico R, Daher PF, et al. Lipoabdominoplasty. *Plast Reconstr Surg* 2009;124:934-42.
7. Juri J, Juri C, Raiden G. Reconstruction of the umbilicus in abdominoplasty. *Plast Reconstr Surg* 1979;63:580-2.
8. Ramirez OM. Abdominoplasty and abdominal wall rehabilitation: a comprehensive approach. *Plast Reconstr Surg* 2000;105:425-35.

9. Malic CC, Spyrou GE, Hough M, et al. Patient satisfaction with two different methods of umbilicoplasty. *Plast Reconstr Surg* 2007;119:357-61.
10. Massiha H, Montegut W, Phillips R. A method of reconstructing a natural-looking umbilicus in abdominoplasty. *Ann Plast Surg* 1997;38:228-31.
11. Lesavoy MA, Fan K, Guenther DA, et al. The inverted-v chevron umbilicoplasty for breast reconstruction and abdominoplasty. *Aesthet Surg J* 2012;32:110-6.
12. Cannistrà C, Pecorelli E. Umbilical restoration in abdominal dermolipectomy: A simple double-Y, double-M technique. *Aesthetic Plast Surg* 1999;23:364-6.
13. Rozen SM, Redett R. The two-dermal-flap umbilical transposition: a natural and aesthetic umbilicus after abdominoplasty. *Plast Reconstr Surg* 2007;119:2255-62.
14. Castillo PF, Sepúlveda CA, Prado AC, et al. Umbilical reinsertion in abdominoplasty: technique using deepithelialized skin flaps. *Aesthetic Plast Surg* 2007;31:519-20.
15. Bruekers SE, van der Lei B, Tan TL, et al. "Scarless" umbilicoplasty: a new umbilicoplasty technique and a review of the English language literature. *Ann Plast Surg* 2009;63:15-20.