Aesth Plast Surg
https://doi.org/10.1007/s00266-024-04405-3

Comparison of Aesthetic Results of Mercedes-Y Versus Inverted-V Incision for Umbilical Reconstruction: A Randomized Clinical Trial

Abolfazl Abbaszadeh[1] · Siamak Farokh Forghani[2] · Fatemeh Ziaeifar[3] · Vahab Rezaee[1] · Siavash Mahdigholizad[2] · Reza Vaghardoost[1] · Rana Irilouzadian[1,2]

Received: 24 July 2024 / Accepted: 11 September 2024

Abstract

Background The appearance and position of navel which are considered as a marker for overall abdominal aesthetics, are important for the final results of abdominal surgeries. However, reconstructing and improving its appearance have been a challenge in plastic surgery.

Hypothesis In this study, we aimed to compare satisfaction of the patients and the plastic surgery professors with the aesthetic results of the two methods of umbilical reconstruction: Mercedes (Y) incision versus inverted-V incision.

Methods This is a randomized clinical trial performed on umbilicoplasty patients following abdominoplasty, breast reconstruction, or abdominal flap surgery whom referred to our center. They were divided into two equal groups of twenty patients with Mercedes (Y) incision and patients with inverted-V incision. The results of surgery were compared three months after the surgery by the opinions of patients, plastic surgery professors, and unbiased observers.

Results The average scores of patients, professors, and observers showed that Mercedes (Y) had significantly higher scores compared to inverted-V incision in terms of position, size, shape, natural appearance, and the overall satisfaction. Surgical complications including stenosis, necrosis, and wound dehiscence were not statistically different in our small sample size.

Conclusion In this study, Mercedes (Y) incision was preferred by all of the groups in all five parameters that were assessed including size, shape, position, natural appearance, and overall satisfaction. The simplicity of the Y incision with less visible scar makes it a suitable method for further investigations with a larger sample size.

Level of Evidence I This journal requires that authors assign a level of evidence to each article. For a full description of these Evidence-Based Medicine ratings, please refer to the Table of Contents or the online Instructions to Authors www.springer.com/00266.

Keywords Abdominal surgery · Umbilicoplasty · Inverted-V · Y incision · Aesthetics

✉ Reza Vaghardoost
rezavaghardoost@gmail.com

✉ Rana Irilouzadian
ranairilouzadian@gmail.com

Abolfazl Abbaszadeh
Abbaszadeh.a@iums.ac.ir

Siamak Farokh Forghani
siamakfarokh@yahoo.com

Fatemeh Ziaeifar
fatemehziaeifar@gmail.com

Vahab Rezaee
Vahab_rezaee@yahoo.com

Siavash Mahdigholizad
Siavashm76@gmail.com

[1] Department of Plastic and Reconstructive Surgery, Hazrat Fatemeh Plastic and Reconstructive Surgery Hospital, School of Medicine, Iran University of Medical Sciences, Tehran, Iran

[2] Burn Research Center, Iran University of Medical Sciences, Tehran, Iran

[3] Department of General Medicine, Iran University of Medical Sciences, Tehran, Iran

Published online: 01 October 2024

Introduction

Among all aesthetic surgical treatments, abdominoplasty is one of the most popular worldwide, which is the sixth most popular cosmetic treatment and is performed on over 800,000 people annually. This is highly due to trending beauty standards which result in quality of life and self-esteem of people, especially women [1–7].

While everyone has a different definition of beauty, the appearance of an aesthetically attractive umbilicus is not really defined by any standards [8–10]. However, there are a number of objective aesthetic standards for the umbilicus including the umbilicus position, size, depth, and appearance [11]. Navel is often a round to oval, depressed structure with an average diameter of 1.5–2 centimeters that significantly enhances the abdominal wall's visual appeal [12]. The size, shape, and position of the umbilicus within the abdomen are the physical attributes that make it appealing [9, 12].

Umbilical displacement can occur in abdominoplasty or abdominal wall donor site closure in autologous breast reconstruction. Reconstructive procedures must consider the anatomical position to ensure a natural appearance after treatment. For the success of umbilical reconstruction, the final cut plan on the residual umbilical stump and also the incision in the abdominal flap are significant factors. Many abdominal flap incision designs including round, Mercedes (Y), U-shaped, inverted-V, vertical line incisions are now being used by surgeons to obtain the best results with minimal visible scarring around the navel [1, 5, 7, 13–16].

The purpose of umbilicoplasty is to create a permanent natural umbilical depression without conspicuous scars [9]. The number and variety of articles in the literature on the repair of this condition ascertain the fact that there is no single ideal approach to its surgical management [17]. It can be challenging to get the ideal outcome in neoumbilicoplasty, as well [10]. In the 1960s and 1970s, the foundational elements of contemporary abdominoplasty were established by Vernon, Pitanguy, and Grazer [4]. Among the listed techniques, many surgeons use the old improved Mercedes (Y) and inverted-V incision techniques as neoumbilicoplasty for minimal complications and maximum satisfaction in their surgeries [5–7, 15, 18]. Mercedes (Y) incision was first reported by Juarez in 1976 by severing the navel, and creating three flaps that were subsequently sutured to the umbilical stump. V incision was first described by Juri in 1979, in which he made a V-shaped incision in the abdominal flap to suture it around the umbilicus [7, 19, 20].

In this article, we aim to compare the satisfaction of patients and plastic surgeons with the aesthetic results of the two methods of umbilical reconstruction in abdominal operations: Mercedes (Y) incision versus inverted-V incision, which according to past studies have been more satisfactory than other methods.

Methods

Patient Selection

This study is a randomized clinical trial on patients whom were candidates for umbilicoplasty following abdominoplasty and breast reconstruction with abdominal flap surgery which was performed in our hospitals in 2023. The exclusion criteria to our study included uncontrolled diabetes mellitus, severe underlying diseases, BMI of more than 30, smoking, and history of keloid and hypertrophic scars.

The sample size was calculated as 40 by comparison of two proportions and the study of Chung et al. [6]. Patients were randomized into two groups of Mercedes (Y) and inverted-V incisions that were used for umbilicoplasty.

Surgical Procedures

After putting the patients under general anesthesia, the abdominal flap was dissected and elevated. In Mercedes (Y) incision group, the neoumbilicus was designed as Y-shaped with two upper arms being one centimeter and one lower arm being two centimeters in length. The three flaps were sutured to the remaining umbilicus stump with simple separated sutures by 4/0 polydioxanone (PDS) threads. In inverted-V incision group, the neoumbilicus was designed as inverted-V which each arm was two centimeters and the distance between the ends of the arms was 2–3 centimeters. The two flaps were sutured to the remaining umbilicus stump similar to the previous group. Sutures were removed one week after surgery. The representatives of performing Mercedes (Y) and inverted-V incisions in our center are presented in Videos 1 and 2, respectively.

Follow-Up and Evaluation

Patients were photographed before and 3 months after umbilicoplasty. They were followed for 3 months regarding tissue necrosis, wound dehiscence, umbilicus stenosis, and other adverse effects of surgery. After 3 months, a questionnaire including overall satisfaction and appearance, size, being natural-looking, and the positioning of the umbilicus was used to evaluate the results of each method.

The questionnaire was provided to the patients, 10 different plastic surgery professors, and 10 non-surgeon healthcare staff as unbiased observers. The scores in the questionnaire were compared between the two groups.

Ethical Considerations

The study protocol and the consent forms of the study were reviewed and approved by the ethics committee of the institutional board of our center. Patients were consulted and provided with a written informed consent for participating in this study. Eligible patients were included after the consent. Patient confidentiality was strictly maintained throughout the study by using anonymized data and securely storing all patient information in compliance with institutional and national guidelines.

Statistical Analysis

The statistical analysis was performed using SPSS v.26. The normal distribution of variables was assessed using Shapiro Wilk test. Due to non-normal distribution of the variables, Mann-Whitney U test was used for comparing the variables of questionnaire including overall satisfaction and shape, size, natural appearance, and position of the umbilicus between the two groups.

Results

The demographic characteristics of the patients and the complications of surgery after 3 months are presented in Table 1. Age, BMI, and gender were similar between the two groups. Moreover, each of wound dehiscence and tissue necrosis was seen in only 1 patient of both groups. Umbilicus stenosis was seen in 3 patients in Mercedes (Y) group and in no patient in inverted-V group; however, this was not a statistically significant difference (p=0.429).

The umbilicus position, shape, and size were significantly better in Mercedes (Y) group in the questionnaires of the patients, the professors, and the healthcare observers. Also, the scores of all of these three groups revealed that Mercedes (Y) group had a more natural-looking umbilicus compared to inverted-V group ($p<0.001$). Overall satisfaction of all of these three groups was better in Mercedes (Y) group as well ($p<0.001$) (Table 2).

Accumulating all of the scores of the questionnaires yielded the same results. Umbilicus position, shape, size, natural appearance, and overall satisfaction were significantly better in Mercedes (Y) group ($p<0.001$) (Table 3).

The representatives of the patients who underwent umbilicoplasty via inverted-V incision or Mercedes (Y) incision are presented in Figs. 1 and 2.

Discussion

Since navel is originally a scar, it is easier to replace it with another natural and appealing navel during the abdominal surgeries that distorts its shape and position. An umbilical reconstruction is one of the most critical steps in abdominoplasty, free transverse rectus abdominus myocutaneous (TRAM) procedure, and deep inferior epigastric perforator (DIEP) flap operation. The postoperative results of the umbilicoplasty are highly important because this is a procedure that mainly concerns the abdominal wall's visual appearance, and its results are compared by the level of satisfaction of the patients of surgeons. In this era of technology development, artificial intelligence (AI) has made its way into different aspects of medicine including visualization of the results of aesthetic procedures which is very helpful in order to achieve patient satisfaction. AI uses large databases of before and after surgery to predict the postoperative results of a surgery and help the patients and the surgeons choose the favorable outcomes per se. Moreover, evaluating the postoperative results is a major limitation in the current literature and our study as well because it is based on subjective satisfaction scores; an AI model to evaluate the results objectively is a need in plastic and reconstructive surgery [21, 22]. Currently, this AI models is being used in different areas of plastic surgery including hand and craniomaxillofacial surgery, and wound

Table 1 The demographic characteristics of the patients and complications of surgery in each group

Variables	Mercedes (Y) group (n=20)	Inverted-V group (n=20)	P-value
Age, years, mean (SD)	35.85 (7.15)	31.45 (5.89)	0.166
Gender, Male, n (%)	2 (10%)	1 (5%)	0.548
BMI, mean (SD)	29.80 (1.70)	28.45 (1.67)	0.699
Prior abdominoplasty, n (%)	17 (85%)	19 (95%)	0.292
Prior breast reconstruction, n (%)	3 (15%)	1 (5%)	0.292
Umbilicus stenosis, n (%)	3 (15%)	0 (0%)	0.429
Wound dehiscence, n (%)	1 (5%)	1 (5%)	1
Tissue necrosis, n (%)	1 (5%)	1 (5%)	1

Table 2 The scores in the questionnaires of the patients, plastic surgery professors, and healthcare observers

Variables	Patients' scores			Professors' scores			Observers' scores		
	Mercedes (Y)	Inverted-V	*P*-value	Mercedes (Y)	Inverted-V	*P*-value	Mercedes (Y)	Inverted-V	*P*-value
Umbilicus position	8.95 ± 0.22 (8–9)	7.9 ± 1.07 (5-9)	<0.001	9.11 ± 0.34 (4–10)	7.98 ± 0.46 (5–9)	<0.001	8.80 ± 0.36 (5–10)	7.93 ± 0.45 (5–9)	<0.001
Umbilicus shape	7.50 ± 1.60 (1–9)	6.10 ± 1.37 (1–7)	0.005	7.97 ± 0.75 (4–10)	6.31 ± 0.57 (3–8)	<0.001	7.52 ± 0.92 (3–9)	6.11 ± 0.65 (3–9)	<0.001
Umbilicus size	7.15 ± 1.66 (1–9)	5.75 ± 1.37 (1–8)	0.006	7.68 ± 0.94 (3–10)	6.13 ± 0.53 (3–7)	<0.001	7.13 ± 1.08 (3–9)	5.82 ± 0.71 (2–8)	<0.001
Natural appearance	7.70 ± 1.72 (1–9)	5.55 ± 1.23 (1–7)	<0.001	8.0 ± 0.90 (4–9)	5.91 ± 0.57 (2–8)	<0.001	7.39 ± 1.08 (2–9)	5.85 ± 0.71 (2–8)	<0.001
Overall satisfaction	7.75 ± 1.77 (1–9)	5.55 ± 1.19 (1–7)	<0.001	8.14 ± 1.00 (4–9)	6.02 ± 0.59 (3–8)	<0.001	8.00 ± 2.37 (3–9)	5.81 ± 0.72 (2–8)	<0.001

The variables are presented as mean ± SD (minimum–maximum) of the scores

and scar assessment [23–25]; however, the aesthetic results of the abdominal surgery are still being evaluated by subjective scoring by patients and surgeons.

Several incision techniques have been reported for umbilical reconstruction, among which the most common are diamond, oval, inverted-V, and Mercedes (Y) incisions [11, 26–28]. In this paper, we compared the level of satisfaction of patients and plastic surgeons of the different aspects of the aesthetic results of two umbilical reconstruction methods; Mercedes (Y) incisions and inverted-V incisions. The results showed that the position, size, look, natural appearance, and overall satisfaction level of the umbilicus were all considerably higher in the group of patients using the Mercedes (Y) incisions than in the group using the inverted-V method. Moreover, both methods had statistically similar complications of surgery.

Several studies investigated and compared different incisions for umbilicoplasty; the oval incisions performed by Vernon resulted in high rates of stenosis or visible scars, despite maintained shape. This resulted in different modifications in the incision technique made by surgeons and presented in different literature [7, 29].

The Alvarez technique consisting of an X-shaped incision which results in four mini flaps, reconstruction of the umbilical roll, and anchoring the new navel to the deeper planes is presented in a case series of 94 patients undergoing classical abdominoplasty. It yielded great aesthetic results with only five cases of dehiscence and four cases of displeasing umbilicus [7]. Similar to our results, his technique resulted in high or medium level of satisfaction in all of the patients.

Henderson et al. reported that the inverted-V incision in the abdominoplasty flap reduces tension on the lower transverse wound closure. In none of the patients who underwent this procedure, neither the lower part of the abdominoplasty flap nor the base of the umbilical cord was necrotic. Also, the natural look of the umbilicus was commented as "untouched" appearance by most of their patients [30]. Folg et al showed that the diamond-shaped incision has a higher risk of cicatricial ring formation compared to the inverted-V incision. Also, the inverted-V incision has better histological results than the diamond incision [31]. Hespe et al. performed inverted-V incision for umbilicoplasty and inserting the flap of the umbilicus to the rectus fascia, resulting in a better-defined and less visible navel [32]. However, in the study by van Veldhuys et al., who compared three umbilicus reconstruction methods after DIEP flap breast reconstruction, including 7 diamond, 7 oval, and 9 inverted-V incisions by a questionnaire from six plastic surgeons and more than 300 people; general population preferred oval incisions over other incisions, while plastic surgeons showed no preference [28]. Takasu et al. performed umbilicoplasty in 149

Table 3 The overall results of the scores in all questionnaires

Variables	Mercedes-Y group (n=20)	Inverted-V group (n=20)	P-value
Umbilicus position	8.95 ± 0.21 (4–10)	7.94 ± 0.55 (5–9)	<0.001
Umbilicus shape	7.66 ± 1.04 (1–10)	6.17 ± 0.79 (1–9)	<0.001
Umbilicus size	7.31 ± 1.14 (1–10)	5.90 ± 0.81 (1–8)	<0.001
Natural appearance	7.70 ± 1.18 (1–9)	5.77 ± 0.79 (1–8)	<0.001
Overall satisfaction	7.96 ± 1.44 (1–9)	5.79 ± 0.79 (1–8)	<0.001

The variables are presented as mean ± SD (minimum–maximum) of the scores

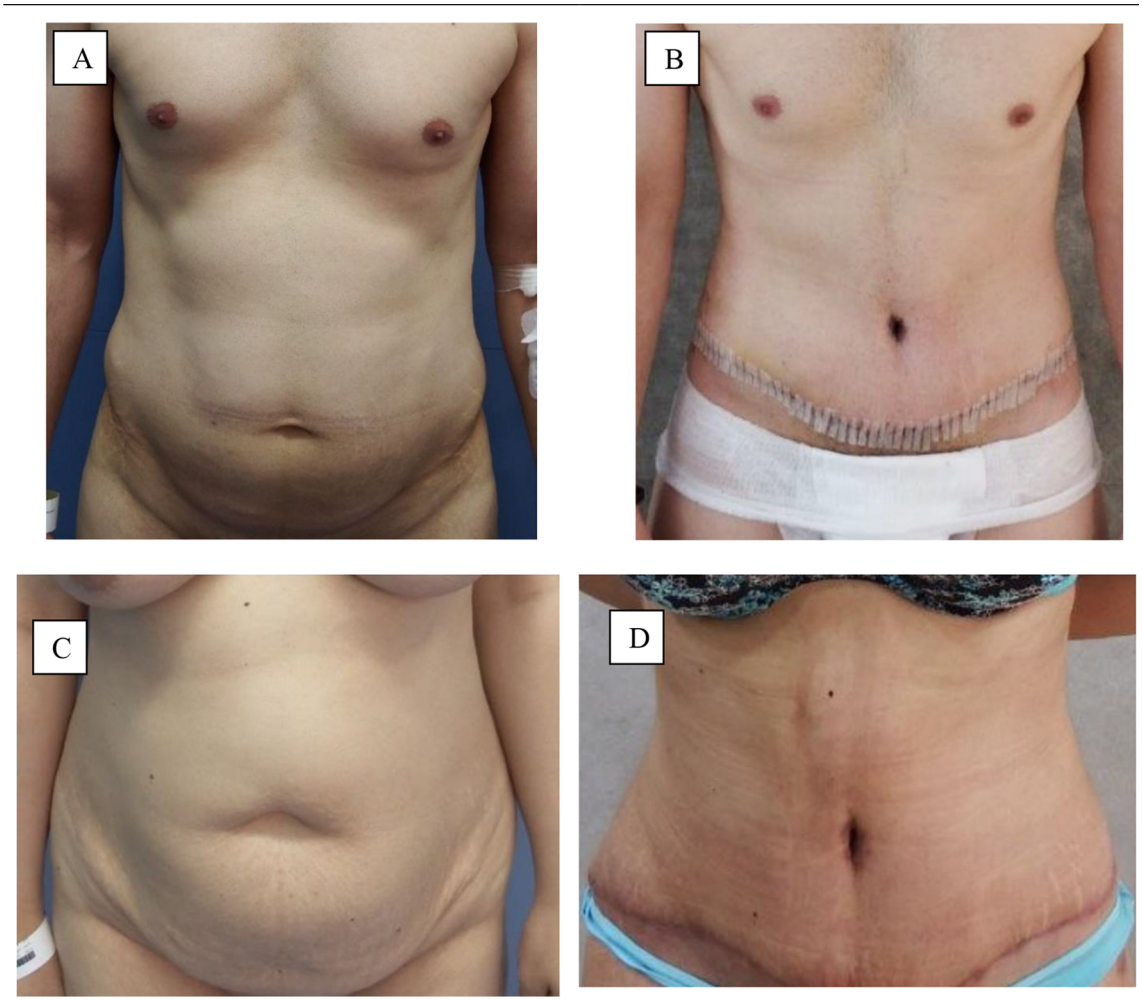

Fig. 1 Representative photographs of preoperative (**A** and **C** panels) and third month post-operative photographs of inverted-V (**B** and **D** panels) incisions

children following abdominal hernia surgeries. They incised four skin flaps in a diamond shape but after closing the fascial defect, they first sutured the cranial part of the diamond vertically until there remained only three flaps, forming a three-triangular flap, and anchored to the fascia in the end. They reported satisfaction of the appearance in all of the cases and no recurrent hernias [33]. In another method using double opposing Y incision on the abdominal flap, the final look of the umbilicus was transverse, natural, and with an adequate depth that ensured no occurrence of stenosis after one year [34].

Avelar first presented the three-armed star method with abdominal Y incision and a triangular umbilicus incision [35]. Yazar et al. in 2019 used three-armed star flap and compared it to the round technique with patient and independent surgeon scores which were significantly higher in the star group. They produced a shallow and oval umbilicus with reduced rate of stenosis [11]. Amano et al. performed

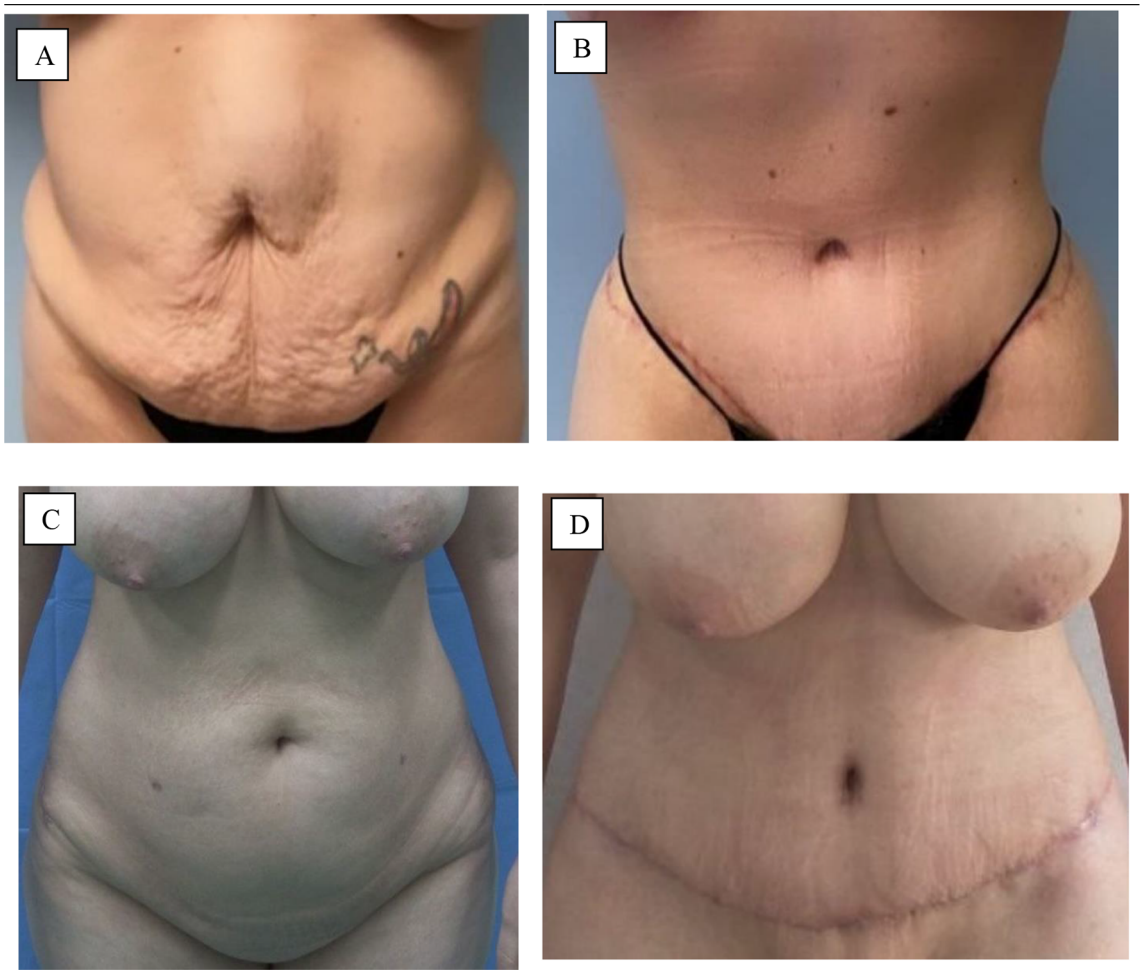

Fig. 2 Representative photographs of preoperative (**A** and **C** panels) and third month post-operative photographs of Mercedes-Y (**B** and **D** panels) incisions

Y incision on 75 patients as part of a study and the reported results showed that all patients had successful treatment without serious complications or a significant increase in operation time [36].

This study has some limitations as well; the sample size in this study is relatively small which makes it unreliable to evaluate the complications of this method accurately and limits the generalizability of our findings. Future studies with larger cohorts are necessary to confirm these results and to provide a more comprehensive understanding of the comparative effectiveness of umbilicoplasty techniques. Moreover, future studies should aim to compare a broader range of umbilical reconstruction techniques, including diamond, oval, and other emerging methods, to provide a more comprehensive evaluation of their aesthetic outcomes and complication rates; the simplicity of the Y incision with less visible scar makes it a suitable method for further investigations with a larger sample size. Last but not least, the three-month follow-up period in our study is relatively short for evaluating long-term outcomes. Future studies should extend the follow-up period to at least 12 months to assess the durability of aesthetic results and the possible incidence of late-onset complications.

Conclusion

Navel surgery or umbilicoplasty is a procedure for reconstruction of the navel after abdominal surgeries. In this study, Mercedes (Y) and inverted-V incisions for umbilicoplasty were evaluated by plastic surgeons, patients, and unbiased observers. Although both methods did not have

significantly different complications, the Y-shaped incision was preferred by all of the groups in all five parameters that were assessed including size, shape, position, natural appearance, and overall satisfaction.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s00266-024-04405-3.

Funding There is no funding to this study.

Declarations

Conflict of interest The authors declare that they have no conflicts of interest to disclose.

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. Patient confidentiality was strictly maintained throughout the study by using anonymized data and securely storing all patient information in compliance with institutional and national guidelines.

Informed Consent All of the participants have given written informed consent for gathering, using, and publishing their data and photographs.

References

1. Rubin JP, Neligan PC (2023) Plastic surgery: volume 2. Elsevier
2. Marcos Quispe JL (2021) A new simple technique for neoumbilicoplasty: vertical incision and partial skin graft. Adv Plast Reconstr Surg 5(1):372–376
3. Mizukami A, Ribeiro B, Renó B, Calaes I, Calderoni D, Basso R et al (2014) Retrospective analysis of 70 patients who underwent post-bariatric abdominoplasty with neo-omphaloplasty. Revista Brasileira de Cirurgia Plástica (RBCP) – Brazilian J Plast Surg 29:89–93
4. Vidal P, Berner JE, Will PA (2017) Managing complications in abdominoplasty: a literature review. Arch Plast Surg 44(05):457–468
5. Gomes-Ferreira M, Olivas-Menayo J (2023) Post-maternity body changes: Obstetric fundamentals and surgical reshaping. Springer
6. Chung J-H, Kim K-J, Sohn S-M, Cheon J-H, Jung S-P, Park S-H et al (2021) A comparison of aesthetic outcomes of umbilicoplasty in breast reconstruction with abdominal flap: inverted-U versus vertical oval incision. Aesthet Plast Surg 45:135–142
7. Alvarez E, Alvarez D, Caldeira A (2021) Non-scarring minimal incision neo-omphaloplasty in abdominoplasty: the Alvarez technique. A new proposal. Plast Reconstr Surg-Global Open 9(11):e3956
8. Pallua N, Markowicz MP, Grosse F, Walter S (2010) Aesthetically pleasant umbilicoplasty. Ann Plast Surg 64(6):722–725
9. Kajikawa A, Ueda K, Katsuragi Y, Kimura S, Hasegawa A (2012) How to reconstruct a natural and deep umbilicus: three methods of umbilicoplasty for five types of umbilical deformities. Ann Plast Surg 68(6):610–615
10. Sisti A, Huayllani MT, Boczar D, Restrepo DJ, Cinotto G, Lu X et al (2021) Umbilical reconstruction techniques: a literature review. Aesthetic Plast Surg 45:1078–1096
11. Kurt Yazar S, Serin M, Diyarbakırlıoğlu M, Şirvan SS, Irmak F, Yazar M (2019) Comparison of aesthetic outcome with round and three-armed star flap umbilicoplasty. J Plast Surg Hand Surg 53(4):227–231
12. Karel BM, Kárel DM, Yoanna RF, editors. (2023) Neoumbilicoplasty with vertical island pedicle flap for a large pigmented umbilical nevus. Cibamanz-2023.
13. Pu LL, Firriolo JM (2023) Invited discussion on: modified diamond-shaped umbilicoplasty in abdominoplasty. Aesthet Plast Surg 47(5):1920–1921
14. Çelik V, Tuluy Y, Sır E (2023) Modified diamond-shaped umbilicoplasty in abdominoplasty. Aesthet Plast Surg 47(5):1911–1919
15 da Silva MO, Neves JS (2023) Post-maternity body changes. Obstetric fundamentals and surgical reshaping. Springer Cham, pp 3–5
16. Kurt S, Şirvan SS, Uğurlu AM, Karşıdağ S (2017) A new umbilicoplasty technique for forming an umbilical chalice with key and hole pattern flaps. Med Bull Sisli Etfal Hosp 51(1):76–81
17. Almetaher HA, Hashish MS, Elhalaby EA (2016) Y-to-V umbilicoplasty for proboscoid umbilical hernia. Ann Pediatr Surg. 12(4):133–136
18. Takaya K, Shido H, Yamazaki S (2022) New method for umbilicoplasty with bilateral square flap and caudal deep inferior epigastric artery perforator flap. Eplasty 22:e8
19. Avelar JM (2018) Creation of the umbilical region during full abdominoplasty: new concepts and techniques. Omphaloplasty: Surgical Guide Umbilicus 127–40
20. Juri J, Juri C, Raiden G (1979) Reconstruction of the umbilicus in abdominoplasty. Plast Reconstr Surg 63(4):580–582
21. Choi E, Leonard KW, Jassal JS, Levin AM, Ramachandra V, Jones LR (2023) Artificial intelligence in facial plastic surgery: a review of current applications, future applications, and ethical considerations. Fac Plast Surg 39(5):454–459
22. Atiyeh B, Emsieh S, Hakim C, Chalhoub R (2023) A narrative review of artificial intelligence (ai) for objective assessment of aesthetic endpoints in plastic surgery. Aesthet Plast Surg 47(6):2862–2873
23. Guarro G, Cozzani F, Rossini M, Bonati E, Del Rio P (2021) Wounds morphologic assessment: application and reproducibility of a virtual measuring system, pilot study. Acta Biomed 92(5):e2021227
24 Kaplan N, Marques M, Scharf I, Yang K, Alkureishi L, Purnell C et al (2023) Virtual reality and augmented reality in plastic and craniomaxillofacial surgery: a scoping review. Bioengineering (Basel) 10(4):480
25. Westley S, Mistry R, Dheansa B (2022) Accuracy of virtual assessment in hand trauma. JPRAS Open. 31:92–98
26. Cló TCT, Nogueira DSC (2012) A new umbilical reconstruction technique used for 306 consecutive abdominoplasties. Aesthet Plast Surg 36:1009–1014
27. Şentürk S, Özkan A, Gemici K, Efe D (2016) The dome procedure: a new technique for the reconstruction of the umbilicus. Hernia 20:505–508
28. van Veldhuisen CL, Kamali P, Wu W, Becherer BE, Sinno HH, Ashraf AA et al (2017) Prospective, double-blind evaluation of umbilicoplasty techniques using conventional and crowdsourcing methods. Plast Reconstr Surg 140(6):1151–1162
29. Vernon S (1957) Umbilical transplantation upward and abdominal contouring in lipectomy. Am J Surg 94(3):490–492
30. Henderson J, Quiroga L, Gelman J, editors (2023) Natural umbilicoplasty without visible scarring: an easily taught and reproducible technique. Aesthetic Surgery Journal Open Forum Oxford University Press US
31. Pfulg M, Van de Sijpe K, Blondeel P (2005) A simple new technique for neo-umbilicoplasty. Br J Plast Surg 58(5):688–691

32 Hespe GE, Stepien DM, Sherif RD, Gilman RH (2021) Umbilicoplasty in abdominoplasty: modifications for improved aesthetic results. Aesthet Surg J Open Forum. 3(3):ojab025
33. Takasu H, Watanabe Y (2010) Umbilicoplasty with 3 triangular skin flaps and excised diamond-shaped skin flap. J Pediatr Surg 45(10):2041–2044
34. Dessy LA, Mazzocchi M. (2017) The double-opposing "Y" technique for umbilicoplasty in abdominoplasty and for umbilical reconstruction after omphalectomy. Adult Umbilical Reconstruction: Principles and Techniques 289–97
35. Avelar J (1978) Abdominoplasty—systematization of a technique without external umbilical scar. Aesthet Plast Surg 2(1):141–151
36. Amano H, Uchida H, Kawashima H, Deie K, Murase N, Makita S et al (2015) The umbilical Benz incision for reduced port surgery in pediatric patients. JSLS: J Soc Laparoendosc Surg 19(1):e201400238