

Prevention of T Junction Dehiscence in Reduction Mammoplasty - A Prospective Two Method Comparative View

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ABSTRACT

Background: Post-operative wound healing plays a noteworthy part in facilitating a patient's recovery, rehabilitation and overall surgical experience. The aim of this study was to compare between 2 methods for prevention of T-junction dehiscence post reduction mammoplasty while using the inferior pedicle inverted T technique. The sample population was divided randomly into 2 equal groups, arranged by alternate sequential manner starting with group V.

Both groups were operated upon using the inverted T inferior pedicle reduction mammoplasty technique. In the first group an inverted V flap was used between the vertical and horizontal lines of the inverted T, whilst the second group was operated upon using a non-invasive zip line suture device applied after standard closure of the inverted T technique.

Material and Methods: Prospective review of 30 patients (60 breasts) with a confirmed diagnosis of breast hypertrophy who underwent inverted T inferior pedicle bilateral reduction mammoplasty. The patients operated upon between the periods of January 2019 to January 2020. The first group was comprised of fifteen patients in which an inverted V Flap in the infra-mammary fold (IMF) region was used. This group was named Group V. In the second group a non-invasive zip line suture device was used in the IMF region over the standard inverted T closure. This group was designated Group Z. Unpaired *t*-test was performed for both reduction populations using SPSS software package. Statistical significance was defined as $p < 0.05$.

Results: Wound dehiscence was divided into major dehiscence and minor dehiscence. Two cases performed with the inverted V flap technique showed major wound dehiscence, three cases showed minimal wound dehiscence and 10 cases had no wound dehiscence at all. In the zip line suture device group; no cases showed major wound dehiscence and only 2 cases showed minor wound dehiscence. Thirteen cases in group z showed no wound dehiscence at all. There was no statistical significance between wound dehiscence in both groups.

Conclusion: The compared methods herein have both demonstrated effectiveness in minimizing T junction dehiscence with inferior pedicle inverted T technique reduction mammoplasties.

Key Words: Reduction mammoplasty – Inverted T – Wound dehiscence – Inverted V flap – Zip line suture device.

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Ethical Committee of Surgery Kasr Al-Aini: Approved.

INTRODUCTION

The aesthetic appearance of female breasts is deemed displeasing when they become notably sizeable or ptotic and therefore symptomatic to the patient [1]. These symptoms include backache, neck and shoulder pain and shoulder grooving resulting from the bra straps. In addition hand neuropathies, headaches, and chronic intertrigo rash of the inframammary fold are also troubling sequelae. Last but not least psychological manifestations such as poor body image, low self-esteem and sexual harassment are also attributed to macromastia [2,3]. For all the previous reasons symptomatic macromastia is recognized as a medical condition for which surgical interference should be well advised [3]. However there is still no single technique in the armamentarium of reduction mammoplasties that can be applied to all kinds of breasts efficient enough for providing an esthetically pleasing result [1,4,5]. Nonetheless breast reduction still remains one of the most commonly performed plastic surgery procedures with several approaches described in literature [6].

Studies show that with the inverted T-scar technique wound dehiscence mostly occurred at the junction of the vertical and horizontal sutures as this is a weak point due to the increased tension in this area and ischemia at the time of closure causing skin necrosis [7-10]. This is a drawback in surgery as the patients' perception of postoperative scar quality directly influences patient approval of the procedure [11,12].

Herein we compare between two techniques to relate the outcomes for healing in the T zone with an inverted V flap technique at the IMF versus the

use of the zip line suture device post skin closure at the IMF.

MATERIAL AND METHODS

Prospective review of thirty patients of Middle Eastern origin with a mean Body Mass Index (BMI) of 28.74. These 30 cases had a confirmed diagnosis of macromastia after physical examination. They were operated upon between the periods of January 2019 to January 2020 using the inferior pedicle inverted T breast reduction technique. Diabetic patients, smokers and patients with bleeding tendencies were excluded from the study. The patients were randomly divided into two equal groups of 15 patients each arranged by alternate sequential manner. In the first group (Group V) an inverted V flap was used in the IMF region at the point of junction between the vertical and horizontal limbs of the inverted T. This is a flap shaped as an inverted V over the inframammary fold on the inferior pedicle that is not de-epithelialized.

In the second group (Group Z) a non-invasive zip line suture device was placed at the junction between the vertical and horizontal limbs of the inverted T design after skin closure. The zip line device is an adhesive hydrocolloid formed of two strips attached in the center by polyurethane straps which are pulled on to support tautness in a fashion not unlike that of closing a zipper. Both techniques took approximately 3 hours intra-operatively.

The operating surgeons have been using the V flap technique for several years, and due to wound dehiscence complications with the standard T technique it was not used as a control group [7-10].

Assessment parameters:

Patient age and whether in the childbearing period or post-menopausal and parity were all documented. BMI was calculated. Examination of breast skin for signs of striae, intertrigo or maceration was undertaken. Breast examinations were performed while the patient was upright, sitting, leaning forward and lying supine for detection of any mass or breast abnormalities. The location and length of the potential scars of the inverted T technique were described to all patients. Routine investigations were undertaken including full blood picture, coagulation profile, liver and kidney function tests, and fasting blood sugar. A pre-operative mammogram was implemented for all patients. Three views of the breast documenting the appearance of the breast from the front and from each side were obtained to adequately serve to record the patients' pre-operative condition.

Operative technique:

Pre-operative markings:

The patients were marked in the standing position. The midline was marked from the suprasternal notch (SSN) to the umbilicus. The breast meridian was then identified (from the midclavicular point to the midbreast bisecting the breast into two halves). The position of the infra-mammary fold (IMF) was identified and marked 2cm from the midline and 2cm from the anterior axillary line. Lastly the new nipple position was then marked; achieved by using a flexible ruler positioned under the breast to mark the anterior projection of the IMF. The point where this meets the breast meridian is the proposed nipple position.

Intraoperative:

All patients received an inferior pedicle inverted T reduction mammoplasty which was modified to include an 8cm wide inferior pedicle. A 4.5cm diameter circle was drawn within the areola using the cookie cutter. The new IMF was remarked when the patient was in supine position and the final step prior to commencing was comparing measurements on both sides. One gram of broad spectrum antibiotics was given to the patient on induction of anesthesia after testing for allergy. The procedure for either group took approximately 3 hours.

Surgical technique:

The procedures were performed under general anesthesia. A local anesthetic mixture of 20ml of 1% lidocaine and 1:500000 adrenaline was then injected into each breast targeting the planes of incision of the skin and the breast tissue. Reduction mammoplasty was carried out in standard fashion. De-epithelialization was done around and below the areola to the inferior mammary line in group Z and around the inverted v flap in group V. Suction drains were applied in all cases. Sterile adherent gauze pads were used over the vertical and horizontal limbs (including over the inverted V flap) at the end of the procedure.

Technique of inverted V flap:

Reduction mammoplasty was carried out in standard fashion and an inverted "V" flap centered on the breast meridian with its base situated on the IMF was included. The inverted V flap resembled an equilateral triangle with its limbs measuring approximately 4-5cm. The lateral limbs were incised full thickness down to the pectoralis major muscle fascia. De-epithelialization was done around and below the areola to the limbs of (and not including) the inverted V flap. This triangle of skin

was preserved at the inferior base to reduce tension at the triple point inverted T-closure (the meeting of the vertical and horizontal limbs) to reduce tension at the inverted T-closure.



Fig. (1): Intra operative image of the triangle of skin preserved at the inferior base to reduce tension at the triple point.

Zip line technique and application:

Reduction mammoplasty was carried out in standard fashion with de-epithelialization performed over the inferior pedicle down to the IMF. After skin closure the Zip line device was applied over the vertical limb of the inverted T down to the horizontal limb to include the T junction. The adhesive hydrocolloid strips were applied on either sides of the sutured vertical line down to the IMF. Pulling on the succession of modifiable polyurethane straps which engage into position to sustain tension was then performed. (see Video 1).



Fig. (2): Zipline suture device applied post skin closure in the vertical limb of the inverted T down to the suture line.



Video of zipline application.mp4

Video (1): This video demonstrates the application of the Zip-line suture device over the vertical limb of the inverted T down to the horizontal limb to include the T junction in reduction mammoplasty procedures.

Post-operative instructions and follow-up:

The patients were encouraged to ambulate as soon as possible to prevent the occurrence of DVT. Suction drains were removed when exudate volume was less than 30ml which usually occurred approximately 48 hours after surgery. Post-operative antibiotics were continued for 5 days based on Level II Evidence: Grade C that specifies that perioperative antibiotics may reduce the risk of infection associated with reduction mammoplasty [3]. The peri-areolar sutures and the sutures in the IMF were removed on the tenth post-operative day. The vertical sutures were removed 14 days post-operatively. Patients wore a surgical bra until the first post-operative appointment. This was later exchanged for a well-fitting, full-coverage wireless bra that provided good support for at least 4-6 weeks. The median follow-up period of all patients was 6 months.

RESULTS

Wound dehiscence was divided into major dehiscence; defined as wound separation more than 2cm and minor dehiscence; defined as wound separation of 2cm or less. This definition was obtained from a study performed by Roje, Zdravko, et al., in 2012 [14].

Data were coded and entered using the statistical package for the Social Sciences (SPSS) and summarized using mean and standard deviation for quantitative variables and frequencies (number of cases) and relative frequencies (percentages) for categorical variables. Comparisons between groups were done using unpaired *t*-test. *p*-values less than 0.05 were considered as statistically significant. Data was tested for normality using Shapiro Wilk test and proved to not be deviated from normal distribution.

Comparison between groups:

Patient demographics:

The average patient age for the inverted V flap technique group was 34.27 years old (range 27-36), and for the Zip line suture device group was 35.93 years old. The mean BMI for inverted V line group was 30.99, whereas the mean BMI for the Zip line suture group was 30.32. There was no statistical significance in *p*-value.

Pre-operative supra-sternal notch to nipple measurement on the right side was (32.27cm in Group V and 31.80cm in Group Z). Pre-operative sternal notch to nipple measurement on the left side was (32.03cm in Group V and 31.90cm in Group Z). There was no statistical significance in *p*-value.

Table (1): Comparison between Age and BMI, SSN-NAC right breast side and left breast side measurements, Nipple-IMF measurements on the right and left breasts, the weight of resected tissue of right and left breast in Group V and Group Z.

	Group V		Group Z		p-value
	Mean	Standard Deviation	Mean	Standard Deviation	
Age	34.27	10.06	35.93	6.90	0.601
BMI	30.99	3.09	30.32	1.55	0.457
SSN-NAC right side	32.27	2.14	31.80	1.82	0.525
SSN-NAC left side	32.03	2.52	31.90	1.87	0.871
Nipple-IMF right side	17.23	2.57	16.03	1.67	0.141
Nipple-IMF left side	16.93	2.01	16.17	1.78	0.278
Weight of resected breast tissue right side	536.33	76.47	496.67	146.12	0.360
Weight of resected breast tissue left side	529.20	91.91	499.33	141.70	0.499

BMI: Body Mass Index. SSN-NAC: Supra-sternal notch to nipple areola complex. Nipple-IMF: Measurements on the right and left breasts weight of resected breast tissue on either side.

Pre-operative nipple to IMF measurement on the right side was (17.23cm in Group V and 16.03cm in Group Z). Pre-operative nipple to IMF measurement on the left side was (16.93cm in Group V and 16.17cm in Group Z). There was no statistical significance in *p*-value.

Average tissue removed per breast was 1065.53g for Group V technique group and 996g for Group Z. No statistical significance in *p*-value was noted between both groups.

Table (2): Comparison between the occurrence of major, minimal, or no dehiscence between Group V and Group Z.

	Group V		Group Z		p-value
	Count	%	Count	%	
<i>Dehiscence:</i>					
Major	2	13.3	0	0.0	0.477
Minimal	3	20.0	2	13.3	

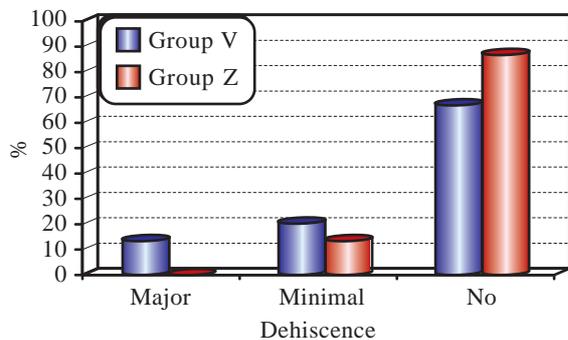


Fig. (3): Comparison between the occurrence of major, minimal, or no dehiscence between Group V and Group Z.

Two cases performed with the inverted V flap technique showed major wound dehiscence; three cases showed minimal wound dehiscence and 10 cases had no wound dehiscence at all accounting for 66.7% of the cases. On the other hand in the zip line suture device group no cases showed major

wound dehiscence and only 2 cases showed minor wound dehiscence, which ultimately meant that 13 cases (86.7%) of group 2 showed no wound dehiscence at all. No statistical significance was noted between both groups. Neither group reported any other complications like seroma, hematoma, or nipple-areolar complex necrosis. Neither group suffered from major complications that required readmission or reoperation postoperatively. Local wound care was sufficient to treat all cases of wound dehiscence and delayed wound healing. No dressing related complications occurred in either group. There were no skin complications encountered as a result of the hydrocolloid adhesive in the Zip line suture device application and it is not in our opinion possible to apply undue tension when closing the polyurethane straps as the incisions in our study were closed with dermal and a running subcuticular suture prior to applying the Zip line suture device as dressing as an adjunct to closure.



Fig. (4): Post-operative minimal wound dehiscence at the T junction in a patient operated upon using the inferior pedicle inverted T technique with the addition of an inverted V flap (Group V).

Case Examples:



Fig. (5): Pre-operative (A,B,C) and Postoperative (D,E,F) frontal, right lateral and left lateral views inverted V flap technique of a 49-year old patient that presented for Inverted T reduction mammoplasty and inverted V flap technique was performed. 650g were removed from the right breast and 630g were removed from the left breast.

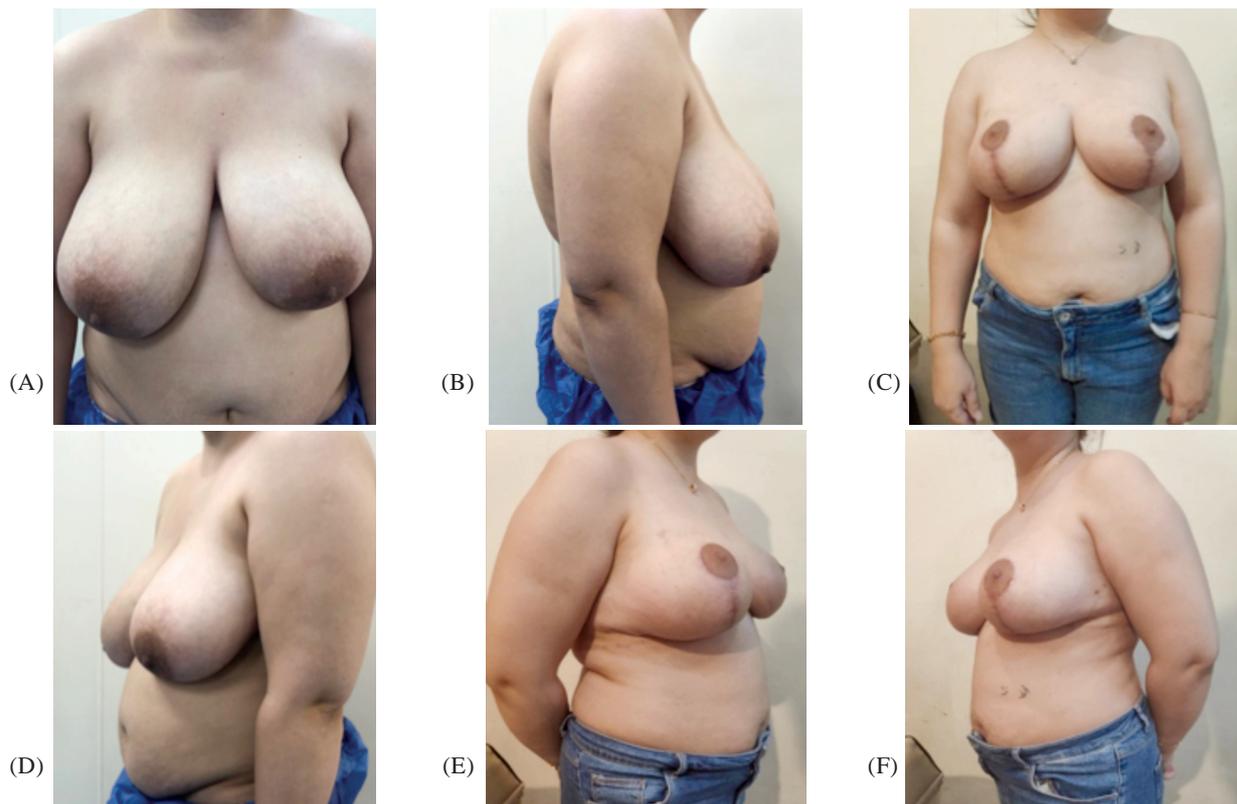


Fig. (6): Pre-operative (A,B,C) and Postoperative (D,E,F) frontal, right lateral and left lateral views Zipline suture device technique of a 40-year old patient that presented for Inverted T reduction mammoplasty and Zipline suture device was applied. 850g were removed from the right breast and 800g were removed from the left breast.



Fig. (7): Late post-operative image of T junction are in a case from Group Z.

DISCUSSION

Over the years the rising popularity of reduction mammoplasty has been accompanied by many adjustments and challenges in plastic surgery literature in an attempt to make the most out of the outcome of the procedure [8]. The junction between the infra-mammary and vertical suture line is a notable weak point to plastic surgeons and is famed to undergo breakdown or necrosis or both. This ultimately results in a prolonged course of treatment, ugly scar formation, and an overall unpleasant experience to the patient [9,13]. Many papers have stressed on the point that patient related variables such as an increased BMI have an impact on post-operative results with most of the complications occurring at the area of the inverted T junction [7,12]. Nevertheless proper incision closure still remains an integral step vital for optimal wound healing [14]. This makes the target of skin closure a potent and secure mechanism that results in a satisfactory cosmetic result [15] and an absence of wound complications [16].

A fundamentally important property of the healing wound is its tensile strength. A collagenous architecture of the healing skin wound responds to functional demands “tension” by development of a higher tensile strength and more mature better aligned collagen fibers [17]. Numerous modifications and challenges have been advocated for reducing T junction dehiscence with reduction mammoplasty. The controversy regarding whether lower pole support is achieved by the skin envelope or breast parenchyma continues to this day. However it is believed that the inverted T skin resection pattern makes use of a horizontal ellipse that may decrease breast projection yet contracts the lower

pole potentially providing it with some support [18].

In our study, we compared between two techniques in an attempt to recognize a more superior method in preventing T junction break down. The inverted V flap/triangular flap for reducing tension on the T junction is not a novel notion. It has been practiced with reduction mammoplasty for generations [9,12], and enhanced results as well as superior cosmetic results have been documented with its use [8]. This is precisely due to the method decreasing the vertical wound tension and providing infra-mammary support; therefore increasing flexibility during wound closure [19]. The inverted V flap also manages to avoid de-epithelializing the lower part of the inferior pedicle and the adjoining IMF. This area is known to have tighter epidermo-dermal junctions whose manipulation results in sloughing of the T junction [10].

Animal studies, as well as orthopedic and cardiovascular surgery wound closure studies, have shown the adjustable hydrocolloid adhesive-based tape wound closure devices to show better performance when compared to standard methods. This is because they protect from shear forces that result in scarring [20] and distribute pressure and mechanical strain with uniform force along the incision wound edge and therefore prevent dehiscence by minimizing wound tension [14,16,20].

Limitations:

Despite finding no statistical significance in wound dehiscence between the 2 groups, the authors recognize that limitations to this study exist as the sample population was small. However we think the result of the complication rate can be changed with a larger patient group therefore further evaluation with a larger sample size is recommended.

Conclusion:

The inverted V skin flap and the Zip line suture device are both valuable methods that aid in decreasing T junction dehiscence by offloading tension during incision closure in reduction mammoplasty. Over the years the use of the inverted V /triangular flap has been known to lessen the vertical wound tension and provide infra-mammary support. Integrating adhesive-based tape wound closure devices has correspondingly shown to protect from oppression forces that result in wound breakdown making it an adjunct to reduce T junction dehiscence by application to the standard T junction technique. Our study has shown that either of the aforementioned techniques supports the

plastic surgeon for a better outcome and less wound dehiscence manifestation and can be considered additional valuable modifications.

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