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Triangular Advancement Flap versus Fish-tail Plasty to Avoid Dog Ear Deformity at the Lateral End of Mastectomy Scar

Rabie Ramadan[1,*], Moustafa R. Abo Elsoud[2], Mohamed Alhashash[2]

[1]Department of Surgery, Medical Research Institute, Alexandria University, Alexandria, Egypt
[2]Department of Surgery, Medical Research Institute, Alexandria University, Egypt
*Corresponding author: rr_mri.surg@yahoo.com

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Abstract **BACKGROUND:** Breast cancer is the most frequent cancer among women. Different surgical techniques are being used for management of breast cancer whether CBS or mastectomy. More than half of women diagnosed with breast cancer undergo mastectomy whether as a primary surgical procedure or as a completion mastectomy Dog ear at the lateral end of mastectomy scar can cause poor cosmetic results, and discomfort so; there are many techniques to prevent its formation as the best method for treatment of dog ear after mastectomy is avoidance of its occurrence. This study aimed to compare the triangular advancement flap technique with the fish-tail plasty technique regarding the feasibility of the technique, avoidance of dog ear deformity formation at the lateral end of mastectomy scar, surgeons' satisfaction and patient's satisfaction and comfrtability. **PATIENTS AND METHODS:** This study included sixty obese and/or large- breasted female patients with breast cancer scheduled for MRM. Patients were randomly allocated into two groups: Group I included thirty patients underwent fish-tail plasty technique and Group II included thirty patients who underwent triangular advancement flap technique. Patients were followed up for the incidence of dog ear deformity, surgeon satisfaction and patient's satisfaction and comfortability. **RESULTS:** Both techniques were feasible in performance with good exposure of axilla and good achievement of patient's comfortability. The triangular advancement flap technique was associated with lower incidence of dog ear, fewer wound complications and shorter operative time but it had a longer scar length. Patients and surgeons satisfaction were significantly more satisfied in G II in comparison to G I (P= 0.001 and 0.015 respectively). **CONCLUSION:** Triangular advancement flap technique is effective, feasible technique for prevention of dog ear at the lateral end of mastectomy scar with lower incidence rate of dog ear formation, shorter operative time, lower incidence of flap necrosis and wound dehiscence and better patients and surgeons satisfaction when compared with fish-tail plasty technique.

Keywords: *breast cancer surgery, modified radical mastectomy, dog ear, fish- tail plasty, triangular advancement flap*

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1. Introduction

Breast cancer is the most common cancer among women with an incidence rate 25.1%. [1] Different techniques are being used for surgical management of breast cancer whether Conservative Breast Surgery (CBS) or mastectomy. [2,3] Breast conservative surgery and radiotherapy are now accepted as an excellent alternative to the mastectomy operation in early breast cancer but more than half of all women diagnosed with breast cancer undergo mastectomy in their life time whether as a primary surgical procedure or as a completion mastectomy following unfavorable pathology or recurrence after initial CBS. [3,4] the presence of dog ear at the lateral end of mastectomy scar is a common problem especially in obese and/or large sized breast patients; however its actual incidence is unclear. [4,5] This deformity causes poor cosmetic results, interference with wearing external breast prosthesis and can cause pain, discomfort and difficulty in fitting a brassiere or clothing necessitating surgical correction. [5] Owing to the high prevalence of obesity among the Egyptian females; the problem of dog ears appears to be challenging. [6] The basic issue underlying dog ear deformity is uneven lengths of the wound sides so adjusting the longer side to match the shorter one limits that deformity; this includes removal of some tissue to adjust the contour at the expense of increased scar length. [7] The best method for treatment of dog ear after

mastectomy is avoidance of its occurrence by proper preoperative planning and incision marking. [8] There are many techniques to prevent the formation of dog ear deformity during mastectomy like fish-tail plasty technique (Y-closure), Triangular advancement flap technique, tear drop incision, modified incision suturing and L-shaped technique but few prospective studies were conducted to assess those techniques. [8,9] There is no single "best" standardized surgical technique that functionally and aesthetically avoids dog ear without significantly increasing the length of the wound. [10] Fish-tail plasty technique (Y- closure) is the most commonly prospectively studied technique; [9] it results in a Y-shaped scar end. However, the drawbacks of this maneuver are that it includes extensive scarring, potentially leaves two smaller dog ears and may be complicated by skin necrosis at the Y confluence. [11] The triangular advancement flap technique usually gives good cosmetic and functional results; the triangular component of the technique may be regarded as a modified Burow's triangle excision. [12] This study aimed to compare the triangular advancement flap technique with the most commonly used fish-tail plasty technique (Y-closure) regarding the feasibility of the technique, avoidance of dog ear deformity formation at the lateral end of mastectomy scar, surgeons satisfaction and patients satisfaction and comfrtability.

2. Patients and Methods

2.1. Patients Selection

This prospective study included sixty obese (body mass index BMI>35) and/or large- breasted (cup C or more) female patients with breast cancer who were admitted to the department of Surgery, Medical Research Institute, University of Alexandria, Egypt, and scheduled for Modified Radical Mastectomy (MRM). All patients were randomly allocated (using sealed envelopes) pre-operatively into two groups: Group I (G I) included thirty patients who underwent fish-tail plasty technique and Group II (G II) included thirty patients who underwent triangular advancement flap technique. Diabetic Patients and those who received neoadjuvant chemotherapy (NAC) were excluded from the current study.

2.2. Ethical Considerations

Institutional Research Committee approved the protocol before the study started. The study was explained to prospective patients and written informed consent was obtained before study entry.

2.3. Study Protocol

All studied patients in both groups were subjected to complete history taking, full clinical examination (general examination, BMI and local breast examination), laboratory investigations, radiological investigations (breast imaging, ultrasound mammogram both breasts, ultrasound abdomen and pelvis, plain X-ray chest and CT if needed, plain X-ray spine and bone scan if indicated) and design marking of the flaps according to the planned technique.

G I: underwent fish-tail plasty; after completion of MRM performed via a transverse elliptical incision; we started closing the wound from the the medial aspect then the skin at the lateral end of the mastectomy wound is sutured to the lateral of the anterior axillary line. The stay suture converts the redundant skin fold into two areas which can be excised separately as two ellipses. After excising the redundant skin, the wound is closed as a Y or fish-tail plasty as shown in Figure 1. [5]

G II: underwent triangular advancement flap technique; after completion of MRM performed via a modified D-shaped incision, skewed laterally and the excision of an additional triangular area at the base of the lateral angle. The defect is closed starting from the lateral end and the superior flap is intentionally disproportionately advanced across the lateral part of the inferior flap, so that lateral and superior skin is displaced medially. Multiple simple interrupted subcutaneous sutures are placed, followed by continuous subcuticular sutures of the skin. The end result is a scar that gradually slopes downwards at its lateral part but with removal of the dog ear deformity as shown in Figure 2. [12]

All patients in both groups were followed up and evaluated immediately after surgery, one month and three months post-operatively for the incidence of dog ear deformity at lateral end of mastectomy scar, the length of scar and the need for any revision surgery. Also surgeons and patients satisfaction regarding cosmetic outcome; both were categorized as: very satisfied, satisfied, neutral and unsatisfied and patients comfortability which was categorized as: very good. Good, fair and poor.

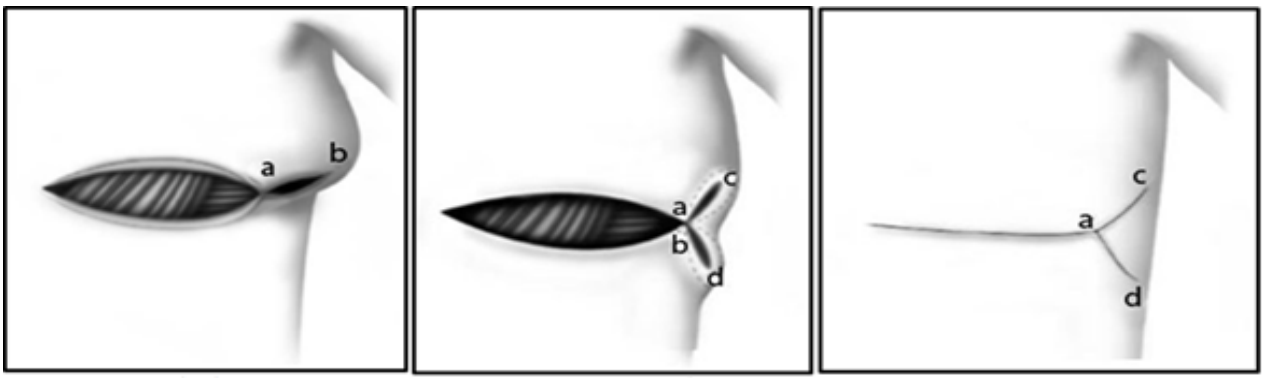

Figure 1. Fish-tail Plasty technique ((Y-closure) [5]

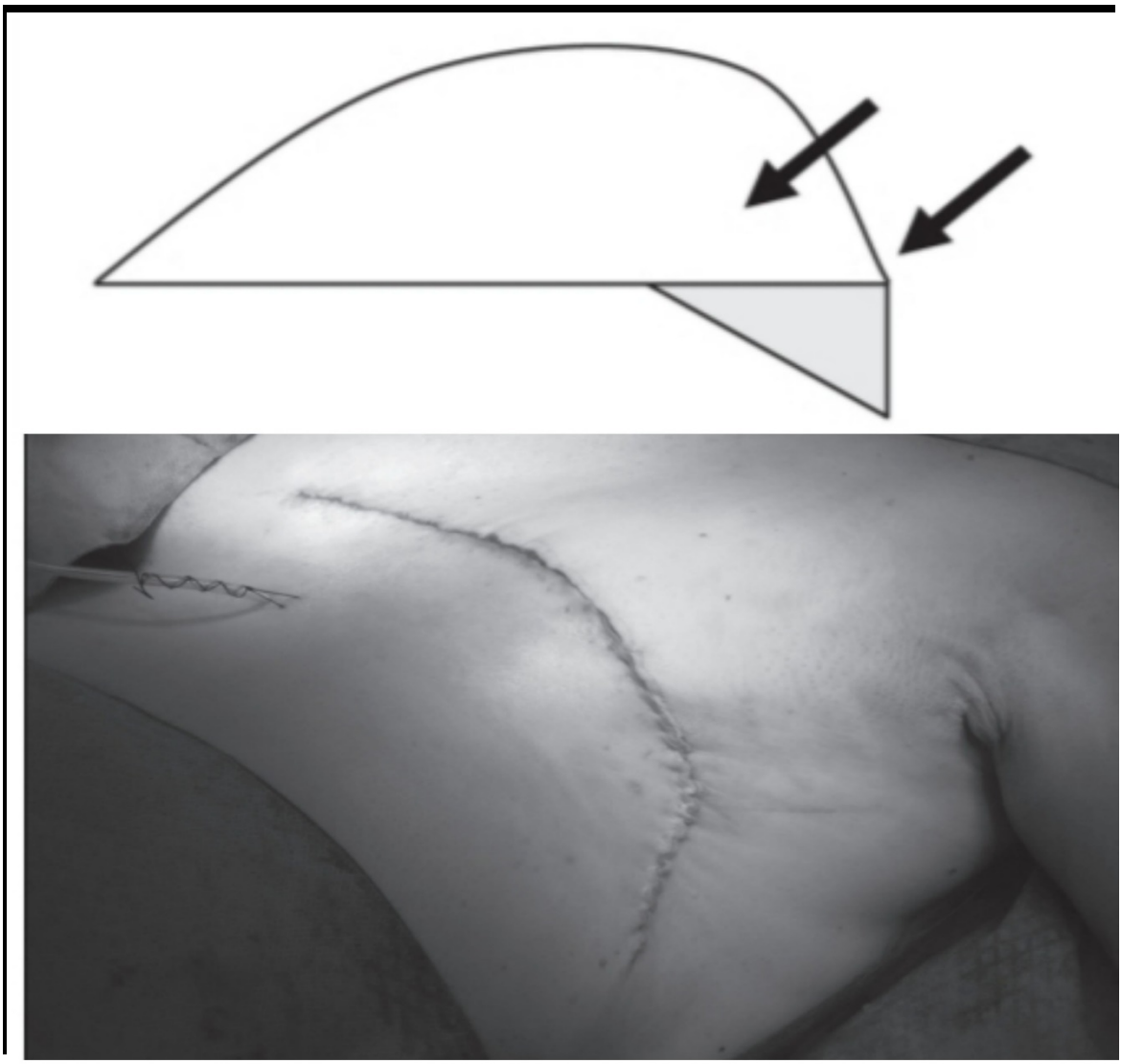

Figure 2. Triangular advancement flap technique [12]

2.4. Statistical Analysis

Data were fed to the computer and analyzed using IBM SPSS software package version 20.0. Qualitative data were described using number and percent. Quantitative data were described using range (minimum and maximum), mean, standard deviation and median. Significance of the obtained results was judged at the 5% level. The used tests were chi-square test: for categorical variables to compare between different groups, Fisher's Exact or Monte Carlo correction: correction for chi square when more than 20% of the cells have expected count less than 5 and ANOVA test (F test): for normally quantitative variables, to compare between more than two studied groups.

3. Results

The current study included sixty obese (body mass index BMI>35) and/or large- breasted (cup C or more) female patients with breast cancer who were admitted to the department of Surgery, Medical Research Institute, University of Alexandria, Egypt, during the period from January 2020 till December 2021, and scheduled for MRM. All patients were randomly allocated pre-operatively into two groups: G I included thirty patients who underwent fish-tail plasty technique and G II included thirty patients who underwent triangular advancement flap technique. The studied preoperative data as shown in Table 1 included age, BMI, breast size and tumor location. There were no statistical significant differences regarding preoperative data between the two studied groups (P= 0.992, 0.176, 0.636 and 0.997 respectively). As regard the operative and postoperative findings; the triangular advancement flap technique was associated with lower incidence of dog ear (however, the difference was not significant (P= 0.526), and significantly shorter operative time (P= <0.001) but it had a significantly longer scar length (P= <0.001). Regarding the postoperative wound complications; fish-tail plasty technique was associated with a higher incidence of flap necrosis and wound dehiscence at the Y confluence however the difference was not significant (P= 0.412). The operative and postoperative findings were grouped in Table 2. Regarding the feasibility of performance and exposure of axilla; both techniques were feasible in performance with good exposure of axilla. As regard patients and surgeons satisfaction; they were significantly more satisfied in G II in comparison to G I (P= 0.001

and 0.015 respectively) but regarding patients comfortability; there was no significant difference between both groups (P=0.321). The distribution of the studied patients according to surgeons and patient satisfaction and comfotability were shown in Table 3. Patients who had dog ear deformity after surgery in both groups were submitted to revision surgery to correct the deformity.

Table 1. Comparison between both studied groups according to demographics, and preoperative data

	Group I (n=30)	Group II (n=30)	Test of Sig.	p
Age (years)				
Mean ± SD.	58.73 ± 14.14	58.47 ± 13.46	F= 0.033	0.992
Median (Min. –Max.)	56.50(36.0–79.0)	56.50(38.0–84.0)		
BMI (kg/m^2)				
Mean ± SD.	39.33 ± 3.01	38.17 ± 1.75	H= 4.940	0.176
Median (Min. –Max.)	38.50(35.50–47.50)	37.75(35.50–41.50)		
Breast size				
C	14(46.7%)	12(40%)	χ^2= 1.704	0.636
>C	16(53.3%)	18(60%)		
Tumor location				
LIQ	3(10%)	5(16.7%)		
UIQ	4(13.3%)	4(13.3%)		
Central	5(16.7%)	6(20%)	χ^2= 3.237	^{MC}p=0.997
LOQ	8(26.7%)	8(26.7%)		
UOQ	10(33.3%)	7(23.3%)		

χ^2: **Chi square test**; MC**: Monte Carlo;** F: F for **ANOVA** test.
H: H for Kruskal Wallis test, Pairwise comparison between each 2 groups was done using Post Hoc Test (Dunn's for multiple comparisons test), p: p value for comparing between the four groups, **Group I**: Fish tail plasty, Group **II**: Triangular advancement flap technique, *: Statistically significant at $p \leq 0.05$.

Table 2. Comparison between the different studied groups according to operative and post-operative parameters

	Group I (n=30)	Group II (n=30)	Test of sig.	p
Operative time(min)				
Mean ± SD.	110.1±16.48	101.0 ± 12.34	F=14.907*	<0.001*
Median (Min-Max.)	103.5(90.0-140.0)	99.0(85.0–120.0)		
Length of scar (cm)				
Mean ± SD	15.77 ± 1.92	22.10 ± 4.69	F= 61.055*	<0.001*
Median (Min-Max.)	16.0 (12.0–19.0)	20.0 (16.0–24.0)		
Presence of dog ear	3(10%)	1(3.3%)	χ^2= 2.722	^{MC}p= 0.526
Postoperative wound complications				
Flap necrosis	2(6.7%)	0(0%)	χ2= 11.392	^{MC}p= 0.412
Dehiscence	3(10%)	1(3.3%)		
Wound infection	1(3.3%)	1(3.3%)		

χ^2: Chi square test; MC: Monte Carlo; F: F for ANOVA test.
H: H for Kruskal Wallis test, Pairwise comparison between each 2 groups was done using Post Hoc Test (Dunn's for multiple comparisons test), p: p value for comparing between the four groups, Group I: Fish tail plasty, Group II: Triangular advancement flap technique, *: Statistically significant at $p \leq 0.05$.

Table 3. Distribution of the studied patients according to surgeon satisfaction and patient satisfaction and comfotability

	Group I (n=30)	Group II (n=30)	Test of sig.	p
Patients satisfaction				
Very satisfied	3^a (10%)	8^b (26.7%)		
Satisfied	7^{abc} (23.3%)	13^c (43.3%)	χ^2= 25.629*	0.001*
Neutral	11^a (36.7%)	7^a (23.3%)		
Unsatisfied	9^a (30%)	2^b (6.7%)		
Surgeon satisfaction				
Very satisfied	4^b (13.3%)	10^a (70%)		
Satisfied	6^a (20.0%)	9^a (10%)	χ^2= 27.136	0.015*
Neutral	8^b (26.7%)	6^a (6.7%)		
Unsatisfied	12^b (40%)	5^a (13.3%)		
Patients comfortability				
Very good	7^a (23.3%)	9^a (30%)		
Good	12^a (40%)	13^a (43.3%)	χ^2= 28.612*	^{MC}p 0.321
Fair	7^a (23.3%)	5^a (16.7%))		
Poor	4^a (13.4%)	3^b (10%)		

χ^2: Chi square test; MC: Monte Carlo; F: F for ANOVA test
H: H for Kruskal Wallis test, Pairwise comparison between each 2 groups was done using Post Hoc Test (Dunn's for multiple comparisons test), p: p value for comparing between the four groups, Group I: Fish tail plasty, Group II: Triangular advancement flap technique, *: Statistically significant at $p \leq 0.05$.

Figure 3. 65 years old ♀ patient with left breast cancer, BMI= 39, cup size D, submitted for MRM, fish tail plasty: preoperative photo, intraoperative photo, immediate postoperative photo, one month follow up photo, three months follow up photo.

Figure 4. 47 years old ♀ patient with left breast cancer, BMI= 37, cup size D, submitted for MRM, Triangular advancement flap technique: Preoperative photo, immediate postoperative photo.

4. Discussion

Dog ear deformity at the lateral end of mastectomy scar is not uncommon especially in obese and/or large sized breast patients; this deformity can cause discomfort and poor cosmetic results. It may interfere with wearing external prosthesis and can cause difficulty in fitting a brassiere or clothing necessitating surgical correction; [4,5] so the best method for its treatment is avoidance of its occurrence by proper preoperative incision marking. [8] There is no single best surgical technique that avoids dog ear so multiple surgical techniques were developed to deal with this problem. [10] To our knowledge; the fish tail technique is the only technique that has been extensively studied and described most often but there are no many randomized studies comparing different techniques used to prevent lateral dog ear of mastectomy scar. [9,10,13-17]

The current study compared the triangular advancement flap technique with the most extensively studied and commonly used fish-tail plasty technique (Y-closure) regarding the feasibility of the technique, avoidance of dog ear deformity formation at the lateral end of mastectomy scar, surgeons satisfaction and patients satisfaction and comfortability and concluded that both fish-tail plasty technique and triangular advancement flap technique are effective, feasible techniques for prevention of dog ear deformity formation at the lateral end of mastectomy in obese and/or large breasted females with good exposure of the axilla and achievement of patients comfortability with the superiority of the triangular advancement flap technique regarding the lower incidence rate of dog ear formation, shorter operative time, lower incidence of flap necrosis and wound dehiscence and better patients and surgeon satisfaction when compared

with fish-tail plasty technique. The triangular advancement flap technique had a significantly longer scar length (P= <0.001) when compared with fish-tail plasty technique; however the Y closure leaves two scars which may be complicated by skin necrosis at the Y confluence. [11] After reviewing the literature; there were no many publications regarding the use of the triangular advancement flap technique to avoid dog ear deformity formation at the lateral end of mastectomy scar so we evaluated the efficacy of that technique by comparing it with the widely used and extensively studied fish-tail plasty technique. In our work; we excluded diabetic patients and those who received NAC to eliminate any confounding factors which may interfere with our results. Szynglarewicz B et al [14] reported zero incidence of lateral dog ear deformity in all his studied cases but we reported three cases with dog ear deformity in fish tail group and only one case in the triangular advancement group (however; the difference was not significant: P= 0.526) which should be confirmed and widely studied on a larger sample of studied patients and also should be compared with other techniques used for preventing the dog ear formation. Fish-tail plasty technique was associated with a higher incidence of flap necrosis and wound dehiscence at the Y confluence however the difference was not significant (P= 0.412); this is the finding of Nowacki MP et al who concluded that this maneuver may be complicated by skin necrosis at the Y confluence. [11] Vilar-Compte et al [18] documented that wound dehiscence occurred in 10.8 % of cases after fish-tail plasty technique which is mostly the same in G I in our study (10%) and both carry a higher incidence rate when compared with G II (3.3%). This observation supported our findings regarding the superiority of the triangular advancement flap technique regarding lower incidence of flap necrosis and wound dehiscence but still further confirmatory studies are recommended. Both techniques have achieved good patients comfotability with no significant difference between both groups; this may be due to the success of both techniques in avoidance of dog ear formation (with slight superiority of the triangular advancement flap technique) and subsequently better cosmetic results, less interference with wearing external prosthesis and less pain, discomfort with less difficulty in fitting a brassiere or clothing. Regarding patients and surgeon satisfaction; they were significantly more satisfied with the triangular advancement flap technique in comparison to the fish-tail plasty technique (P= 0.001 and 0.015 respectively) as a single scar is better than two and better cosmetic outcome as reported by the patients and a feasible triangular advancement flap technique that was associated with shorter operative time with lower incidence of skin necrosis or dehiscence as reported by the surgeons. Lim et al [13] discussed these two disadvantages associated with the fish-plasty technique: the addition of a second scar and the necrosis at the Y confluence and concluded that the additional scar can be concealed under the arm if the apex of Y closure is placed at or lateral to the anterior axillary line and the necrosis can be avoided by maintaining a broad base between the two Y limbs. On the other hand; some studies [7,13,19-24] concluded that on closure of the triangular advancement flap; the superior flap is advanced disproportionately in an inferior and medial manner to avoid dog ear formation which may result in puckering of the of the wound laterally if the wound is not approximated with care also the wound may extend to the upper abdomen if not properly planned. These drawbacks have not occurred in our study but we still recommend further larger studies to discuss these points as the puckering of the wound, increased its length and its extension to the upper abdomen may cause cosmetic insult.

5. Conclusion

Triangular advancement flap technique is effective, feasible technique for prevention of dog ear deformity formation at the lateral end of mastectomy in obese and/or large breasted females with good exposure of axilla and good achievement of patient's comfortability. It has a lower incidence rate of dog ear formation, shorter operative time, lower incidence of flap necrosis and wound dehiscence and better patients and surgeons satisfaction when compared with fish-tail plasty technique.

Conflict of Interest

The authors declare no conflict of interest or financial ties to conclude.

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