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A PROSPECTIVE STUDY OF FACTORS INFLUENCING THE AESTHETIC OUTCOME OF MODIFIED RADICAL MASTECTOMY SCAR

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Abstract:
Introduction and objectives: Historically, modified radical mastectomy was the primary method of breast cancer[1,2]**.** But now a days the treatment for breast cancer has evolved, the breast conservation has been widely used[3,4]**.**But mastectomy is still the viable option for women with breast cancer[5,6]. In case of mastectomy choosing the optimal mastectomy incision must take into consideration the oncologic, reconstructive and aesthetic factors like preservation of nipple, mastectomy skin margins, the potential for skin involvement, mastectomy skin perfusion and viability, mastectomy skin excess, previous scars over the breast, reconstructive plan, and inconspicuous new scar placement. In the current study we aim to study the breast reconstruction aesthetics influenced by the mastectomy incision design.
Methodology: The nine most commonly used mastectomy incisions were categorized into three groups: hidden scar, vertical scar, and transverse scar. Fifteen plastic surgeons blindly graded the before and after photographs of the breasts that had undergone reconstruction. The grades were given on the basis of scar visibility and position and their influence on breast aesthetics.
Results: Study groups had shown statistically significant results. The modified radical mastectomies and breast reconstruction done through hidden scars give the most aesthetic results. The vertical scars are better than transverse scars. In cases of bilateral breast reconstructions the placement of scars should be symmetrical to obtain the aesthetic results.
Conclusion: The mastectomy incisions play an important role in affecting the aesthetics of the breast reconstruction. The patterns take from the cosmetic breast surgery provide highly aesthetic results consistently. Every case is different thus the surgeon must consider the oncological factors and patient characteristics in choosing the ideal incision for the case.

Keywords: Mastectomy, Breast Reconstruction, Incision Design, Aesthetics, Surgical Outcome.

INTRODUCTION

A modified radical mastectomy is the procedure in which the entire breast is removed, which includes the skin, areola, nipple, and most of the axillary lymph nodes while pectoralis major muscle is spared. Earlier the modified radical mastectomy was the primary method of treatment for the breast cancer. It is mainly patient's choice to decide whether they opt for breast conservation or mastectomy with or without reconstruction. The European Organization for Research and Treatment of Cancer 10801 trail had found that there was not any considerable difference in the 20 year overall survival rate between the women who had undergone breast conserving surgery and radiation and to those who were treated with modified radical mastectomy, for the stage of 1 or 2 breast cancer. Overall survival at 20 years was 44 % in the breast reconstruction surgery group where as 39 % in the modified radical mastectomy.

To achieve optimal aesthetic outcome in the breast reconstruction surgery begins with pre-operative planning. To choose a mastectomy incision is always a critical decision point in the whole process and it also has major impact on final appearance of the reconstructed breast. To obtain the optimal results a collaborative approach between the breast surgeon and the plastic surgeon is important in achieving optimal results. The surgical plan must take into consideration the oncology surgeon's and reconstructive surgeon's goals and the limitations. The following factors like previous breast scars, nipple preservation, oncologicmargins and mastectomy skin involvement, tissue perfusion and viability,mastectomy skin excess and breast ptosis, new breast scars and potential for radiation therapy[7,8]**.**

In the current study it assessed that how mastectomy scars influence the aesthetic outcomes of breast reconstruction and also provide a treatment algorithm for the selection of incision for mastectomy. Nine of the commonly used mastectomy incision patterns were identified, and were grouped into 3 categories, they were:

I. **Hidden incision category**
   a. Infra-mammary fold incision[9]

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b. Scarlesscircum areola incision [10]

II. Vertical incision category

a. Vertical incision[11, 12,13]
b. Circum – vertical incision
c. Circum – vertical incision with skin excision
d. Wise pattern

The wise pattern is applied at first stage breast reduction or mastopexy in preparation for second stage nipple sparing mastectomy in patients who are undergoing prophylactic treatment or have low risk lesions[14,15]. If the cases are not for nipple preservation, the wise pattern can be applied during mastectomy[16].

III. Transverse incision category

a. Lateral incision
b. Circum – lateral incision
c. Transverse incision

All the mastectomy incision patterns can be reconstructed by using implant or autologous techniques. In cases where the nipple and areola are removed an autologous technique can be of great advantage as it can replace the missing breast surface area to avoid breast deformations.

METHODOLOGY

Study design

A prospective observational study was designed to compare the aesthetic outcomes of breast reconstructions performed with the nine most commonly used mastectomy incision patterns. All the reconstructions were performed by the single plastic surgeon. Fifteen practising plastic surgeons were asked to grade both before and after reconstruction photographs of the breasts, on the basis of aesthetic outcome influenced by the position of scar. Two types of wise pattern incision were analysed i.e. nipple sparing and non – nipple sparing. An absent breast and as aesthetic natural breast were used as the negative and positive controls to inspect the survey participant ratings.Data analysis was done to come to the conclusion and develop a treatment algorithm for the guidance of mastectomy incision selection.

Assessment

Each plastic surgeon recorded their assessment of pre-operative and post-operative photographs based on the influence of scar position on aesthetic outcomes on 5 point scale (1: Poor, 2: Fair, 3: Neutral, 4: Good, 5: Excellent). Only right breast images were used to create uniformity. Preoperative and postoperative photographs were got given in sequence and were presented in a random order. Additionally surgeons were asked to grade the aesthetic outcomes on the basis of scar patterns in 3 bilateral breast reconstructions using the same scale. The bilateral mastectomy incisions were either symmetric with vertical or transverse scar patterns on both the breasts or asymmetric with a different pattern on each breast.

Statistical analysis

A 2-tailed student t –test was done to compare the ratings between the groups. A value of $P<0.05$ was used to calculate statistical significance.

RESULTS

Mean aesthetic scores were calculated for each mastectomy incision pattern and was then combined into 3 general groups (Table 1). The mean aesthetic score for hidden, vertical and transverse incision groups were 4.27, 3.81 and 2.3 respectively. The hidden incision patterns were found superior to all the incision patterns ($P<0.00001$), and vertical incision patterns were superior to transverse patterns ($P<0.00001$). In Table 1, the first row shows the values of mean scores for individual mastectomy incision patterns. The second row of numbers shows mean scores for incision pattern categories. Amongst all the hidden scar incisions has the highest aesthetic rating. The vertical incisions have superior aesthetic ratings as compared to transverse incisions. The differences between all three categories are statistically significant. The third row has the mean post to pre-operative score ratios for the individual mastectomy patterns. Vertical scar patterns have considerably higher score ratios as compared to transverse scar patterns. The fourth row of numbers showcases the mean post to preoperative ratios that are categorized whether the excess mastectomy skin is removed to mitigate breast ptosis. In breast reconstruction the better aesthetic outcomes are achieved when the ptosis is corrected pre-operatively. The difference between the two categories is statistically significant.

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Table 1 - Mastectomy incision patterns scores

Aesthetic score										
Incision Patterns	**IMF**	**ScarlessCircum Areola**	**Vertical**	**Circum Vertical**	**Circum vertical Excision**	**Wise**	**Staged Nipple sparing wise**	**Lateral**	**Circum lateral**	**Transverse**
Mean score	4.56	4.2	4.02	3.17	3.78	4.16	3.76	2.2	3.1	1.7
Incision pattern categories	Hidden scar	Hidden scar	Vertical scar	Vertical scar	Vertical scar	Vertical scar	Vertical scar	Transverse	Transverse	Transverse
Mean Category score	4.27*	4.27*	3.81*	3.81*	3.81*	3.81*	3.81*	2.3*	2.3*	2.3*
Aesthetic score ratios										
Incision Patterns	**IMF**	**ScarlessCircum Areola**	**Vertical**	**Circum Vertical**	**Circum vertical Excision**	**Wise**	**Staged Nipple sparing wise**	**Lateral**	**Circum lateral**	**Transverse**
Mean post to pre-operative score ratio	0.87	0.93	0.84	1.3	1.47	1.6	2.15	0.75	0.84	1.19
Incision pattern categories	Hidden scar	Hidden scar	Vertical scar	Vertical scar	Vertical scar	Vertical scar	Vertical scar	Transverse	Transverse	Transverse
Mean category post to pre-operative score ratio	0.91*	0.91*	1.56*	1.56*	1.56*	1.56*	1.56*	0.94*	0.94*	0.94*
Score ratio categories	No mastectomy skin reduction	No mastectomy skin reduction	No mastectomy skin reduction	No mastectomy skin reduction	No mastectomy skin reduction	No mastectomy skin reduction		Mastectomy Skin Reduction	Mastectomy Skin Reduction	Mastectomy Skin Reduction
Mean category post to pre-operative score ratio	1.01*	1.01*	1.01*	1.01*	1.01*	1.01*		1.69*	1.69*	1.69*

*Statistically significant difference in the data across the row

When the scar patterns are compared in bilateral breast reconstruction cases i.e. symmetric vertical, symmetric transverse, and asymmetric the mean aesthetic score for vertical, transverse and asymmetric incisions were 4.1, 3.4, and 2.6 respectively. Symmetric breast scars either transverse or vertical were associated with improved breast aesthetics as compared to asymmetric scars where $P<0.001$ and $P<0.00001$). The vertical scars provide improved aesthetics as compared to transverse scars and $P<0.03$. The post-operative to preoperative scores were calculated by dividing the post-operative score for each breast to objectify the quality of reconstruction (Table 1). The values had shown that the vertical scar pattern was considerably superior over the transverse scar pattern, $P<0.00001$. The data showing the score ratios for the hidden scar patterns have no contributions to the conclusion because they are skewed by the high preoperative aesthetic rating of the non-ptotic patients. When the score ratios were grouped on the basis of whether additional mastectomy skin was removed because of pre-operative ptosis, thecases who did

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not require additional skin removal had the mean ratio of 1.01 and those who required removal of additional skin had a mean score of 1.69, P<0.00001.

DISCUSSION

After examining the results of breast reconstruction carefully it has demonstrated that the six mastectomy incision patterns consistently yield high aesthetic results. The incisions include inframammary fold incision, scarlessperi-aereoral incision[10], vertical incision, circum – vertical incision, circum –vertical excision and wise pattern. These patterns can be classified as either hidden scars or vertical patterns. It has shown that transverse scar patterns like lateral, circum lateral and transverse incision patterns leave more prominent centrally located scars and they also limit the options for second stage revisions. In cases when transverse incision is used the issues like lateral nipple drift secondary to lateral scar contraction and recurrent ptosis are very difficult to correct.

This study confirms that the patients with non-ptotic breasts are likely to be benefited from the nipple sparing mastectomy and are treated ideally using a hidden or vertical incision pattern such as infra-mammary fold incision or vertical incision, which depends upon the breast surgeon's preference. Both the patterns are compatible with implant or autologous reconstruction.

Cases that are non-ptotic but are not the candidates for nipple sparing surgery are ideally treated with a scarlesscircum- areola approach or circum-vertical approach. Both of these reconstructions are ideally fulfilled with autologous reconstruction.

Ptotic cases who are suitable for nipple sparing mastectomy can be treated with a first stage Wise pattern breast reduction or mastopexy which is followed by second mastectomy and reconstruction. This approach is is sound ontologically only in cases where they have opted for prophylactic mastectomy. And also with those with small breast cancers that could have been treated otherwise with segmental resection. This pattern can be theoretically used both in implant and autologous reconstructions.

The cases who are ptotic and are not candidates for nipple preservation are best treated with a circum –vertical excision or wise pattern incision which depends on the degree of ptosis. Autologous reconstruction best accomplishes to mitigate healing complications that may arise from the complex incision patterns.

All the above mentioned incision patterns provide adequate access for implant reconstruction, sentinel lymph node biopsy, internal mammary vessel preparation, microvascular anastomosis an flap inset and also allow for an inconspicuous skin island that can be monitored and followed by an easy way to remove or incorporate a future nipple and areola reconstruction. If any of the vertical incision patterns are used it facilitates correction of recurrent ptosis to improve the aesthetic outcome.

Transverse incision patterns i.e. lateral, circum- lateral and transverse result in lesser quality of aesthetic and used in cases where cases have pre-existing horizontal breast scars. In the study the transverse incisions were considered as the least favourable i.e. P<0.00001. The transverse and vertical incision patterns create equal burden on the scar and in-fact the lateral extension in more inconspicuous. The lateral extension can undergo scar contraction that causes lateralization of the nipple. It is shown that there is a significant risk of nipple malposition in nipple sparing mastectomy reconstruction [18]. The lateral scar also limits the second option to adjust the skin envelope for the correction of breast ptosis[12].

The results are also valid for bilateral breast reconstruction cases, breast scar symmetry has a greater effect on aesthetic outcome. Thus in bilateral reconstruction cases, where a transverse breast scar is already there on one of the breasts then the above stated principles should not be followed and ideal aesthetics will be achieved by mastectomy and reconstruction by the transverse incision on both the breasts.

This study mainly focuses on the influence of mastectomy incision design on the aesthetic outcomes following breast reconstruction. The plastic surgeon should contextualize the surgical plan with the individual patent's oncologic needs, treatment plan, general health, breast size and shape, body mass index, and the patient's preference and the priorities [19, 20]. There will always be obstacles in executing the ideal breast reconstruction, but the surgical plan should be modified as per the patient's health and should always promote uneventful healing.

CONCLUSION

Hidden incison scars provide best aesthetic results when used with mastectomy and breast reconstruction. Vertically oriented scars are always cosmetically favourable to the transvers scars in both nipple sparing and non-nipple sparing reconstructions. Transverse scars can be used in cases where a previous horizontal extension is present. Symmetric scars should be maintained in cases of bilateral reconstruction cases.

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