

## Quadrantectomy and Nipple Saving Mastectomy in Treatment of Early Breast Cancer: Feasibility and Aesthetic Results of Adjunctive Latissimus Dorsi Breast Reconstruction

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### ABSTRACT

**Background and Purpose:** Breast conserving surgery has been a recognised method of treatment of early breast cancer. The treatment methods include quadrantectomy or skin sparing mastectomy combined with ipsilateral axillary nodal dissection followed by radiotherapy. In the current study we evaluate the feasibility and oncologic safety of the quadrantectomy and SSM operations with preservation of the nipple and areola, and the cosmetic results of immediate reconstruction by using the latissimus dorsi flap.

**Materials and Methods:** A breast conservative surgery (quadrantectomy or nipple sparing mastectomy) was carried out in a group of 55 patients with invasive breast cancer treated at the Department of Surgical Oncology, NCI, between January 2001 and April 2004. The selection criteria included those patients who presented with T1 or T2 breast cancer and were located at least 2cm from the nipple as the centre for the nipple areola complex.

**Results:** The age of the patients ranged from 32 years to 65 years. The follow up period ranged from 2 to 33 months with an average of 21 months. Pathological assessment of the specimens showed a negative safety margin in all cases. Most of our cases were invasive duct carcinoma grade 1-2 (42) (75%). The complications of the flap reconstruction included one major sloughing of the latissimus dorsi flap, 4 partial flap sloughing, 4 sloughing of the nipple and fat necrosis in 6 patients. The donor site healed normally in all of our cases except for one patient who suffered from a hypertrophic scar which settled down during the follow up period. The aesthetic assessment of the patients, showed an excellent to good results in the majority of cases (42) (75%) while in 6 (12%) results were fair and in 7 (13%) results were poor.

**Conclusion:** Breast conservative surgery with quadrantectomy or skin sparing technique with preservation of the nipple and areola combined with immediate LD flap reconstruction is a valid procedure for treatment of early breast cancer. Immediate reconstruction by using the extended latissimus dorsi is as safe, relatively easy proce-

dure which can provide an adequate volume replacement for small to moderate sized breasts.

**Key Words:** Breast conservative surgery - Skin sparing mastectomy - Immediate reconstruction - LD myocut flap.

### INTRODUCTION

Skin sparing mastectomy (SSM) removes the breast, nipple and areola complex, previous biopsy incision and the skin overlying superficial tumors [1]. On the other hand subcutaneous mastectomy preserves the skin envelope including the nipple and areola. Both procedures have been shown to be as safe as a radical mastectomy in the management of carcinoma in situ as well as early invasive breast cancer [2,3].

The technique of breast conservative surgery has gained enormous popularity over the last 2 decades. The aim of such treatment is to eradicate the breast cancer while preserving the maximum amount of breast tissue without increasing the risk of local recurrence. Early randomised trials have shown that there was no difference in terms of local recurrence and distant metastasis and the overall survival between such treatment and the conventional modified radical mastectomy operation [4]. Other studies have also confirmed the feasibility of the skin sparing mastectomy operation in the treatment of early breast cancer. Kroll and his colleagues (1991) [5] reported only one case of local recurrence in a series of 100 patients who underwent such procedure. Other studies [6] compared the local recurrence rate between a group of SSM and conventional modified radical

mastectomy and found no significant difference between both.

Pathological assessment of the nipple and the areola have shown only 1% involvement in a large series of selected patients with early breast cancer patients [7,8]. Others [9] proposed intra operative electron beam radiation therapy delivered to the nipple and areola while leaving at least 5mm of the glandular tissues behind the nipple and areola complex to preserve its blood supply.

On the other hand thinning out of the nipple and areola and its use as a free graft on top of an autologous tissue reconstruction, has been safely used in order to maximise the oncologic safety of the procedure [9]. This was supported by other recent studies where the nipple and areola were cryo preserved after histological examination and then re grafted to the autologously reconstructed breast [10].

The absolute contraindications to the breast conserving surgery include multifocal disease, diffuse malignant micro-calcifications, history of previous irradiation to the breast region and the presence of positive surgical margin after reasonable surgical attempts [11].

The tumor size within the limits of the T2 stage is not a contraindication; however, a large T2 tumor i.e. 4cm is a relative contraindication in those with small breast size [12]. Pregnancy was thought to be a contraindication; however, breast conservative surgery can be justified in the third trimester while delaying the radiotherapy till the end of the pregnancy [13]. The strategy of using radiotherapy after surgery is to eradicate any residual disease that might have been left in the excision bed [4].

We will assess the cosmetic results of the operation after reconstruction by using the extended latissimus dorsi flap to supplement the lost breast volume.

## **MATERIAL AND METHODS**

A breast conservative surgery was carried out in a group of 55 patients with invasive breast cancer treated at the Department of Surgical Oncology, NCI, between January 2001 and April 2004. The selection criteria included those patients who presented with T1 or T2 breast cancer and were located at least 2cm from the

nipple as the centre for the nipple areola complex.

Preoperative breast ultrasonography and bilateral mammography, including the recent digital mammography technique was done in all cases to exclude a multifocal disease, and to assess tumor location, size, skin changes, and distance of the tumor from the nipple and any other characteristics of the tumor. Coned compression magnification views to elucidate the presence or absence of associated micro calcifications were also taken.

Patients presented with subareolar tumors less than 2cm from the nipple were excluded from the study. Also patients with more than 25% diffuse calcifications were abandoned from the technique and were subjected to the routine modified radical mastectomy operation. Routine metastatic work up including chest X ray, bone scan, and abdominal sonar was routinely undertaken to exclude the presence of micrometastasis. All patients were fit for surgery with no previous major medical problem.

The choice of the procedure was made by the surgeon who performed the operation taking into account the previous biopsy scars and the distance of the lesion from the nipple and areola.

Quadrantectomy operation was done for patients presented with a superficial lump confined to a one quadrant of the breast and at least 2cm from the areola (Fig. 1). The technique includes making a radial elliptical incision encompassing the tumor and then raising a skin flap in the superficial plane. The overlying skin, subcutaneous fat and the pre muscular fascia were resected en block to allow the removal of the subareolar major duct system of the quadrant.

Nipple Sparing Mastectomy (NSM) was performed for those who presented with central deeply seated lesions yet with minimal distance of 2cm from the nipple (Fig. 2). The techniques involved making a lateral skin incision to the nipple. The incision was then adjusted to include the biopsy scar if it was present. A skin flap thickness equal to that of the radical mastectomy operation was elevated superficial to the enveloping fascia of the breast. The resection included all the breast glandular tissues but saving the nipple and areola. The excision extended to the

second rib superiorly, medially to the sternal edge, laterally to the breast edge and inferiorly to the sixth rib.



Fig. (1): The final results after a quadrantectomy and LD breast reconstruction.



Fig. (2): The final results after a NSM and extended LD breast reconstruction.

Frozen section was used routinely for all cases to examine the safety of the excision margin of the underlying glandular tissues. Also a separate frozen section from the under surface of the skeletonised nipple was examined. Cases with proved positive safety margin on frozen section examination (15 cases) were abandoned from the procedure and were subjected to the conventional modified radical mastectomy operation.

Small defects which needed primary closure or use of local flaps were excluded from the study. Breast reconstruction by using the latissimus dorsi flap was carried out routinely in all cases with moderate sized defects. For large sized defects such as after breast conservative surgery we used the extended latissimus dorsi flap.

The technique involved harvesting the muscle with an oblique skin paddle and the flap was raised by using a sharp dissection of the skin, subcutaneous fat and the underlying muscle (Fig. 3).

Inferiorly the supra iliac fat was recruited and the muscular origin of the latissimus dorsi from the iliac crest was divided. The dissection then followed the lateral border of the muscle separating it from the external oblique muscle. Superiorly the muscle was separated from the serratus muscle and the para scapular fat was utilised (Fig. 4). Subtotal resection of the tendon of the latissimus muscle was used to lengthen the vascular pedicle and to facilitate the mobilisation of the muscle anteriorly and the thoraco-dorsal nerve was preserved in all cases. The flap was then rotated anteriorly to cover the defect created by the resection of the breast tissues. De-epitheliasation of part of the skin island of the flap was carried out to provide the projection of the infra clavicular fold and the symmetry as compared to the contra lateral breast (Fig. 5). The medial projection was also enhanced by folding of the distal part of the flap. Both the donor site and breast mound were closed in 2 layers. The subcutaneous layer was closed by using 3/0 vicryl interrupted stitches and then the skin was closed by using 3/0 continuous monocryl subcuticular stitches.

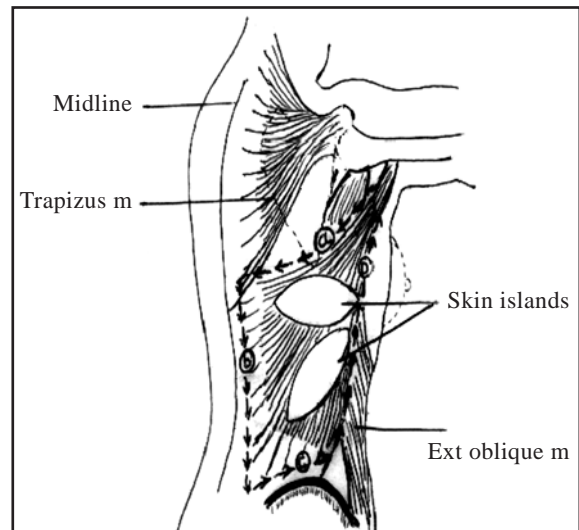


Fig. (3): Shows the lines of dissection of the extended latissimus muscle.

The dissection starts at the upper border of the muscle (a), then goes down along the medial border (b), the dissection proceeds by cutting through the lumbar fascia and the insertion of the muscle is divided (c). Finally the lateral border of the muscle is separated from the external oblique muscle and the serratus muscle (d).



Fig. (4): The extended latissimus flap showing the excessive par scapular and supriliac fat that have been used to reconstruct a major NSM defect.



Fig. (5): Left extended latissimus dorsi breast reconstruction. The skin island of the flap was completely de-epithelialised.

All patients were followed up routinely in the outpatient clinic to assess the late complications such as fat necrosis, and aesthetic results of reconstruction as well as the local recurrence. Patients' satisfaction was studied by using a self-evaluation questionnaire where they were questioned about their satisfaction with the aesthetic results with subscale (excellent, good, fair, poor). Meanwhile another 2 independent observers were asked to evaluate the cosmetic results after reconstruction. Photographs of three views were taken of each patient. All photographs were evaluated by the members of

the assessment group. The scoring was based on the popular criteria adopted by Harris et al. (1996) [14]. Excellent results meant no visible differences between both breasts, while good results meant slight non obvious difference. On the other hand fair results were judged when there were obvious differences and poor results indicated a major distortion.

Statistical analysis was carried out by using the 2 table analysis (chi square and fisher exact test). The chi square test was used when all the groups of analysis were more than 5 while the fisher exact test was used when any of groups of analysis was over 5. A  $p$  value of less than 0.05 meant a significant difference between the groups of analysis.

## RESULTS

A group of 55 patients with T1, T2 breast cancer were treated with breast conserving surgery at the Department of Surgical Oncology, National Cancer Institute. Twenty seven patients underwent quadrantectomy operations while 28 have undergone SSM with preservation of the nipple and the areola complex.

The age of the patients ranged from 32 years to 65 years and the average was 45 years (43.5 for the quadrantectomy group and 46 for the SSM group). The average body mass index (BMI) was 28 (29 for the quadrantectomy group and 27 for the SSM group) and the range was from 22-33. None of our patients has had a major general medical problem neither any received a preoperative radiotherapy or chemotherapy.

All patients were investigated by a mammography preoperatively and in 33 (59 percent) cases the lesion was localised to the upper outer quadrant while in 18 (32 percent) patients had a lesion at the junction of the outer quadrant and the inner quadrant. Another 4 patients presented with a lower outer quadrant lesion. The size of lesions by the mammography ranged from 1.1cm by 1.5cm to 4.5cm by 4cm and the average was 3.5cm by 2.7cm.

Tumor staging showed that the majority of patients were T2N0 (24) (43%), followed by T2 N1 (20) (36%), while the rest were either T1N1 (3) or T1 N0 (2). In 6 patients we were unable to assess the tumor size (Tx) because of

the previous excision of the breast lump outside the Department (Table 1). The metastatic work up i.e. chest X ray, bone scan and abdominal ultrasound was free in the entire patient group.

The incision of the operation was adjusted depending on the site of lesion, scar of the previous biopsy, and the proximity to the ipsilateral axilla. The ipsilateral axilla was opened and the axillary lymph nodes were removed through the same incision in the majority of cases (35 patients) (62%). However, the incision of the axillary dissection was separate from the incision of the quadrantectomy in the rest of the cases 20 (36%).

Table (1): Tumor site and stage. P=NS (non specific) means that the *p* value was more then 0.05 in all the groups of analysis.

Tumor stage & site	Quadrantectomy patients	SSM patients	<i>p</i> value
<i>Tumor stage:</i>			
Txn0	1	1	NS
Txn1	1	3	
T1n0	2	0	
T1n1	1	2	
T2n0	12	12	
T2n1	10	10	
<i>Tumor site:</i>			
UOQ	13	20	
Junctional	10	8	
LOQ	4	0	

Pathological assessment of the specimens showed a negative safety margin in all cases. Most of our cases were invasive duct carcinoma grade 1-2 (42) (75%), the rest were invasive lobular carcinoma (7) (13%), cystosarcoma phylloides (3) (5%), 2 medullary carcinoma and one papillary carcinoma.

The pathological involvement of the axillary lymph nodes was found in 29 (52%) cases, while in 26 (48%) patients there were no lymph node metastases. Pathological correlation of the involved lymph nodes with the pre operative clinical staging showed that 8 pathologically confirmed lymph node metastasis were staged as clinically negative nodes while 6 of the clinically positive nodes were found to be not involved with metastasis on pathological assessment (Table 2).

The extended latissimus dorsi flap was used in reconstruction in all patients. The complications of the flap reconstruction included 12

seroma, and 4 wound infection. There was only one major sloughing of the latissimus dorsi flap, where the patient refused any further reconstruction. Four patients suffered from partial flap sloughing while sloughing of the nipple was observed in 4 patients (Table 3). Fat necrosis was reported in 6 patients during the late follow up period; all were excised under local anaesthesia. The donor site healed normally in all of our cases except one patient who suffered from a hypertrophic scar which settled down during the follow up period. Fig. (6) showed late postoperative changes with total glandular excision. There were no micro calcifications or focal lesions and clearly, there was no evidence of recurrence. postoperatively, showed no residual parenchymal tissue, fat necrosis, micro calcifications or focal lesions.

Table (2): Lymph node involvement with the metastasis.

Lymph node	Quadrantectomy	SSM	<i>P</i> value
Clinically positive (28)	9	13	NS
Clinically negative (27)	18	15	
Pathologically positive (30)	11	19	
Pathologically negative (25)	16	9	

Table (3): Complications after latissimus dorsi breast reconstruction.

Complications	Quadrantectomy	SSM	<i>P</i> value
Wound infection	2	2	NS
Seroma at the donor site	8	4	
Haematoma	1	0	
Partial necrosis	1	3	
Total necrosis	0	1	
Fat necrosis	3	3	
Hypertrophic scarring	0	1	
Nipple and areola sloughing	2	2	

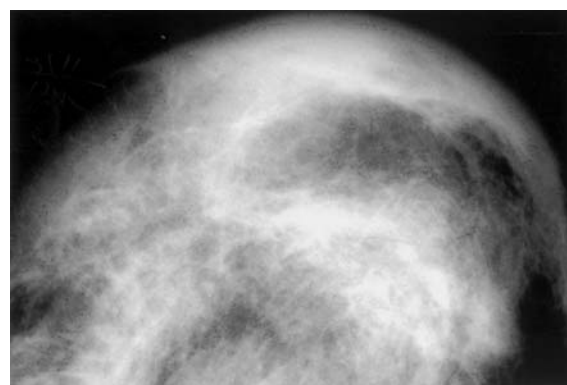


Fig. (6): Craniocaudal mammographic view, of a reconstructed breast, taken 6 months.

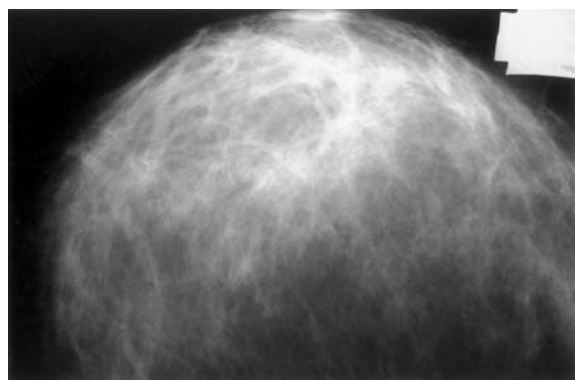


Fig. (7): Craniocaudal mammographic view showing normal other side of the same case.

The follow up period ranged from 2 to 33 months with an average of 21 months. There were no single case of local recurrence; however there were only one patient who developed a bilateral ovarian metastasis a year after the initial surgery of the breast cancer.

The aesthetic assessment of the patients (breast volume, contour, symmetry, projection) and nipple and areola (colour, symmetry); showed an excellent to good results in the majority of cases (42) (75%) while 6 (12%) results were fair and 7 (13%) were poor results. Patient satisfaction with overall results showed that the majority were generally satisfied 45 (82%) where only 10 (18%) of patients were not pleased with the results (Table 4).

Table (4): The final results.

Final results	Quadrantectomy	SSM	<i>P</i> value
<i>Breast volume and contour:</i>			
Excellent	17	16	NS
Good	7	8	
Fair	3	3	
Poor	0	1	
<i>Nipple and areola:</i>			
Excellent	15	15	
Good	7	8	
Fair	3	3	
Poor	2	2	

## DISCUSSION

The aim of the breast conserving surgery is to preserve a considerable volume of the breast tissues without compromising the adequacy of the excision of the tumors. However, it was realised that this often leads to severe deformity

especially with small breasts [15]. This effect is often aggravated with the subsequent use of adjuvant radiotherapy [16].

Skin sparing mastectomy has been shown to give comparable results to the radical mastectomy for treatment of early breast cancer with similar incidence of local recurrence and distant metastasis [22]. It is clear that other factors such as the stage of the tumor and the nodal status are more responsible for predicting local recurrence than the type of surgery whether modified radical or skin sparing mastectomy [28,29,30]. However, the severe deformity left after the procedure meant that it is mandatory for this procedure to be supplemented by an adjunctive immediate breast reconstruction procedure.

The preservation of the skin envelope in skin sparing mastectomy operation facilitates the immediate breast reconstruction, while the substitution of the mammary gland can be achieved preferably by autologous tissues from the abdominal wall (TRAM flap) or the back (latissimus dorsi flap) [19]. However, the most important advantages of the SSM are the preservation of the infra-mammary fold, and the breast contour [14].

The practice of including the nipple areola complex (NAC) in the SSM resection reflects the belief of the high frequency of occult tumors in this area. A literature survey showed that the nipple involvement in the mastectomy operation correlates with the tumor size, distance from the areola, lymph node status and the clinical suspicion. With T2 lesions the incidence of nipple involvement could reach 33%, so the best candidates for breast conservative surgery with NAC preservation are those with small tumors T1 at a large distance 4-5cm from the nipple [17]. However, pathological assessment of the nipple and the areola have shown only 1% involvement in a large series of selected patients with early breast cancer patients [5,6]. Others [18] stated that the NAC can be adequately preserved in patients with free margins.

In our study the inclusion criteria for the nipple sparing mastectomy (NSM) was the peripherally situated lesions and the clinically normal NAC with T1, T2 central tumors with at least 2cm distance from the NAC. With the quadrantectomy operations we routinely ensured

an adequate safety margin of at least 2.5cm all around that was proved free histologically of cancer by frozen section examination.

One of the main vascular problems regarding the NSM is the native skin flap necrosis [26]. This is defined as an epidermolysis or skin necrosis that requires debridement or at least local conservative wound care. We routinely used the lateral incision to the nipple in order to reduce the incidence of native skin necrosis while not compromising the vascularity of the nipple. Since we adopted this technique we did not face this problem.

Because of the reported incidence of occult metastasis at the under surface of the nipple we routinely adopted the technique of complete skeletonisation of the nipple. For more precautions we also took a separate frozen section biopsy from the under surface of the skeletonised nipple that was confirmed to be a free histologically from cancer in all cases.

Grisotti 1998 [33] found that the rate of local recurrence after tumorectomy operation was more than double the rate of local recurrence after quadrantectomy operation. For that reason we excluded any case of tumorectomy from our study. Further more and in order to ensure the adequacy of operation we removed all the glandular tissues of the breast and thinned out the skin flap in a similar way to the simple mastectomy skin flap.

The reported 10 year local recurrence of the SSM showed acceptable results between 14% and 19% [20,21,22]. In our previous work we reported similar incidence [23]. In the current study there was no single case of local recurrence over the follow up period. These preliminary results are encouraging, however, a longer follow up period and a larger series of patients is recommended. Interestingly the results of the quadrantectomy in comparison with the SSM were not statistically different in term of the local recurrence rate, the complications rate or the aesthetic outcome.

The advantages of an immediate breast reconstruction are better aesthetic results, minimal scars, lower costs, and the avoidance of the psychological trauma of the mastectomy.

The results of the prosthesis reconstruction following subcutaneous mastectomy shows an

early failure between 10 and 13% [24]. On assessment of the cosmetic results of the implant reconstruction there was only 70% of moderately satisfied patients. However, the major criticism of the implants reconstruction is the problem of capsular contracture especially when radiotherapy was administered postoperatively [24]. Millard et al., 1987 [26] indicated that the procedure is only suitable for small sized breasts with minimal ptosis. In the current study we did not use any prosthetic implants as the extended latissimus flap was adequate to reconstruct such small or medium sized defects.

Rainsbury 2002 [30] used the LD miniflap for immediate reconstruction of central and upper quadrant defects. Flierl and Hanken 2001 [31] have used local dermoglandular flaps to cover small central defects while Clough et al., 1999 [32] indicated that these central lesions require breast reshaping by technique similar to a reduction mammoplasty. In our study we immediately replaced the volume loss created by the quadrantectomy defects by the LD flap reconstruction while we used the extended latissimus flap to replace larger defects of the SSM. This has overcome the problem of volume loss from the quadrantectomy operation and the total volume loss created by the SSM. Meanwhile it evaded the problems associated with the implants reconstruction.

The complication rate of the LDF breast reconstruction was acceptable in comparison to the studies which reported an overall rate of 53% [26]. In spite of having an overall early complication rate in 48% of our patients, nearly half of this complication was due to the development of seroma at the donor site. We also reported an incidence of 11% minimal fat necrosis that was excised under local anaesthesia and resolved over the period of follow up with no significant effect on the breast size, shape or contour.

Fat necrosis of the breast is a benign condition that commonly occurs as the result of minor surgical trauma and usually softens gradually [34]. The radiographic and clinical significance of fat necrosis of the breast is that it may mimic a breast malignancy, requiring biopsy for diagnosis. Fine needle aspiration cytology (FNAC) and sometimes a core biopsy or excision biopsy rather than FNAC is required, if imaging findings are suspicious for malignancy [34].

The mammographic appearance ranges from a round opacity with lucent centre, called a lipid cyst (oil cyst), findings suspicious for malignancy, including clustered micro calcifications, a spiculated area of increased opacity, or a focal mass [35]. At MR mammography, fat necrosis is seen as a well circumscribed non enhancing mass with characteristic fat isointense signal on different pulse sequences, sometimes, delineated by a rim of low signal intensity [36].

The differential diagnosis for architectural distortion includes parenchymal scarring, fat necrosis, and recurrent cancer. Post surgical scarring usually manifests on mammograms, as a speculated, poorly marginated soft-tissue density characterized by interspersed radiolucent areas that represent entrapped fat. Mammographic findings suggestive of recurrent cancer include a mass with no central radiolucent areas, fine, straight speculations, skin retraction, and an increase in size or nodularity of the scar. Calcifications in recurrent cancer are usually seen as pleomorphic and granular (heterogeneous) or fine linear and/or branching micro calcifications [37].

The aesthetic results of the reconstruction based on patient's evaluations matched the surgeon assessment in most of our cases. Our aesthetic results were satisfactory in over three quarters of patients who were pleased with the breast shape, contour and the nipple and areola symmetry and colour. This was in agreement with the observers views that were aided by the photographic study in the assessment of the LDF reconstruction. However, an objective assessment of the results especially the degree of regaining a normal nipple sensation is recommended. Also the long term psychological evaluation could be useful in determining the psychological advantages and the degree of satisfaction after such procedure.

Comparing the oncologic safety of the 2 procedures (quadrantectomy and NSM) we found no statistical differences with regard to the development of local recurrence. There was also no statistical difference between both in terms of the rate of complications neither the degree of patient satisfaction nor the assessment score indicated by the 2 independent observers. However, the nipple and areola recurrences rate have to be studied over a longer period of follow up.

### Conclusion:

The breast conservative surgery with either quadrantectomy or NSM procedure is a viable option in treatment of early invasive breast cancer. However, wider resection margin of the glandular breast tissues and the major duct system in relation to the nipple should be examined by frozen section in order to ensure the safety of such surgery. We recommend the immediate reconstruction by using the latissimus dorsi as a safe, relatively easy procedure which can provide an adequate volume replacement for small to moderate sized breast. The bulk of tissues can be increased by including the overlying subcutaneous fat in the parascapular region and in the suprailiac fat in order to replace larger defects created by NSM.

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