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## ORIGINAL ARTICLE

# SKIN SPARING MASTECTOMY WITH IMMEDIATE RECONSTRUCTION UTILIZING MID-TRAM FLAP MODIFIED BY INCLUSION OF THE UMBLICUS: AESTHETIC AND THERAPEUTIC OPTIMISATION

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**Aim:** *Is to evaluate skin sparing mastectomy (SSM) with immediate breast reconstruction (IBR) by the use of mid- TRAM (Transverse Rectus Abdominis Myocutaneous) flap (instead of conventional lower TRAM flap) with its added novel modification of inclusion and evertion of the umbilicus,as this is hypothesized to optimize aesthetic and therapeutic outcome.*
**Methods:** *15selected patients with early stage breast cancer with a mean age of 43.8 years operated from jan.2003 through feb.2004 by SSMwithIBR by the use of mid-TRAM flap with inclusion of the umbilicus which is everted to simulate the lost nipple.patients were followed up for 6-12 months and data regarding operative time ,blood transfusion,time of hospital stay,local wound problems,flap necrosis,fat necrosis,abdomenal herniation,local recurrence and cosmetic outcome were reported*
**Results:** *there were no mortalities or life threatening morbidities,an average of 4hours operative time,with only 1unit blood transfusion and10days hospital stay. Only 1case of partial flap necrosis and 1with minimal fat necrosis.No cases of local or distant recurrences or abdominal herniation.good to excellent cosmetic results with longstanding protruding nipples were obtained and in no case remedial surgery on contralateral side done to achieve symmetry.*
**Conclusion:** *This approach is safe,reliable,emotionally less traumatizing with excellent cosmetic and therapeutic outcomes and should be considered an alternative approach for insitu and early breast cancers.*

**Keywords:** *Necrosis, nipple, breast.*

## INTRODUCTION

Despite breast conservation worldwide acceptance,some patients with early stage breast cancer including those with noninvsive tumors such as DCIS may not be suitable candidates for conservative surgery.[1]

Progress in understanding of tumor biology, the evolution of surgical techniques and finally the importance of not mutilating woman anatomically and psychologically have guided the task of surgical oncologist, mastologist and plastic surgeon. This therapeutic and aesthetic approach is based on these principles. SSM has been proven as an oncologically safe approach for early breast cancer,[1-4]it improves cosmesis through preservation of skin envelope of the breast and the inframammary fold (IMF), thus facilitating reconstruction giving a near normal looking breast with reduced need for contralateral surgery to achieve symmetry and the periareolar incision is more inconspicuous.[1,3,4-6]

Immediate autogenous reconstruction is an integral part of complete SSM approach with its proven medical and psychological benefits[1,5-7] and TRAM flap since its introduction by Hartrmpf and others has proven itself over the years as the standard for autogenous breast

reconstruction worldwide,[8-11] it enables for simulation of a breast of almost any size and shape with simultaneous abdominoplasty.[8,9]

The conventional lower TRAM flap has the problem of uncertain vascularity, its blood supply is more tenuous than the upper and mid-abdomenal islands, the reported rate of partial and total flap loss using the lower island ranges from 60%to20%,it has also the problem of increased incidence donner site abdominal hernia formation due to harvesting the rectus abdominis muscle below the level of arcuate line.[8,10-14] The advantages of mid-abdominal TRAM flap over conventional lower TRAM flap are; superior vascularity (only2%partial flab loss),[14,15] less incidence of abdominal wall herniation (Harvesting the rectus abdominis muscle above the level of the arcuate line), greater volume of replacement and technically more simple.[15,16]

To further add for such advantages here in this study, a modification was suggested to include the umbilicus within the flap instead of being circumcised as usual, then to be everted to mimic the lost nipple in the newly reconstructed breast this idea was based on a personal observation that the circumference of the nipple approximates the circumference of the umbilicus of the same female in most of the case (Fig. 1). Besides this aesthetic advantage, this also is hypothesized to have something to do for the safety of the flap and this work is aiming at evaluation of SSM with IBR by the use of mid-TRAM flap (instead of conventional lower TRAM flap) and its added novel modification of including the umbilicus and its evertion, as this technique with its novel modification is hypothesized to optimize the therapeutic and aesthetic outcome.

*Fig 1. The circumference of the nipple approximates that of the umblilicus of the same patient.*

## PATIENTS AND METHODS

15 selected patients with early stage breast cancer were operated upon by this technique, from Jan. 2003 through Feb. 2004 in EL-Salam Oncology Center , El-Salam city,Cairo,Egypt.

***Inclusion criteria:***

1. Patients with early stage breast cancer preferring SSM/IBR.
2. T1&T2tumors not eligible for BCT:
   - Small breast: tumor ratio.
   - Central (retroareolar) location.
   - Multicentricity.
   - Radiation intolerance.
3. Patients scheduled for prophylactic mastectomy.
4. DCIS necessitating mastectomy.
5. Paget's disease of the nipple.

***Exclusion criteria:***

1. Locally advanced tumors i.e. stage III.
2. Inframammary fold tumors.
3. Neoadjuvant therapy.
4. Medical contraindication to prolonged anaesthesia and major surgery.
5. Bleeding diathesis.
6. Thin patients with flat abdomen.

Clinicopathological charachteristics of the patients of the study are shown in. Table1.

**Table 1. Clinico–pathological criteria of the patients.**

| | |
|---|---|
| **Age** | |
| Mean | 43.8 Y |
| Range | 36 – 52 Y |
| **Clinical stage** | |
| Stage 0 | 1 |
| Stage I | 4 |
| Stage II | 10 |
| Stage III | 0 |
| **Histopath. Type.** | |
| IDC | 12 |
| DCIS | 1 |
| Medullary | 1 |
| Paget | 1 |
| **Grade** | |
| I | 3 |
| II | 11 |
| III | 1 |
| **Preop. Biopsy.** | |
| FNAB | 12 |
| Open | 3 |

***Surgical technique:***[1,6,5,15,16] Preoperative marking of the mastectomy and the mid-abdomenal TRAM flap incisions is performed (Fig. 2).

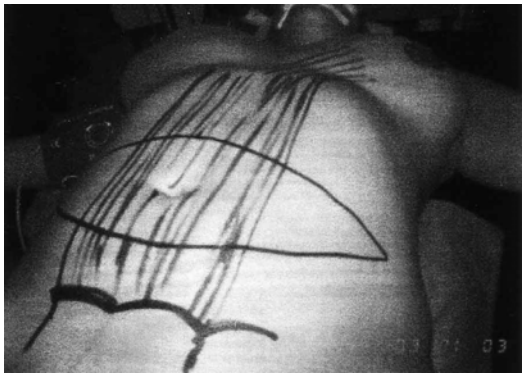

*Fig 2. Preoperative marking of patient.*

***Skin sparing mastectomy:***

***Incision:*** A circumferential areolar incision is planned 5mm just outside the areolar edge or just outside a pre-existing near biopsy scar. Small areolae (<3.5cm) are relative contraindications to this technique, particularly if the breast is large. Although dissection could be performed in these patients using a larger diameter incision or by lateral extension of the periareolar incision, the final cosmetic result in regard to areolar position and breast shape might be affected. In no case in this series a separate axillary incision was performed and the whole of the procedure (the mastectomy and the axillary dissection) has been performed successfully through the periareolar aperture. (Fig. 3a).

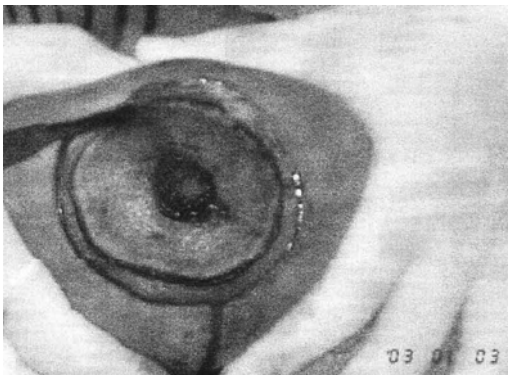

*Fig 3a. Circumareolar.*

***Glandular excision and axillary dissection:*** SSM is defined as en bloc resection of the nipple areola complex, the glandular elements of the breast, previous biopsy scars and skin overlying superficial tumors with preservation of the IMF and native breast skin envelope, it is an actual modified radical mastectomy through a periareolar incision. (Fig. 3b).

*Fig 3b. Complete SSM with up to level III axillary dissection preserving breast skin envelope and IMF*

Skin flap elevation is performed by centripetal dissection above the plane of the enveloping superficial fascia of the breast, this must be precise; thin enough to remove all breast tissue yet thick enough to preserve flap circulation. Dissected flaps that exhibit patches of exposed dermis on the undersurface may result in periareolar skin loss postoperatively. Skin flap elevation, therefore must be performed in a meticulous fashion despite the more limited exposure inherent of this technique. This portion of the procedure is particularly demanding of the ablative surgeon. During flap dissection the following anatomic limits should be respected: a. anterior margin of the latissimus dorsi muscle, b. IMF, c. the external margin of the breast, d. the upper pole of the breast.

In all of the cases, axillary lymph nodal dissection was performed up to level III preserving the thoracodorsal bundle,the nerve to serratus and the intercostobrachial nerves.

The resulting empty space left after removal of the surgical specimen adapts well when TRAM flap is placed in the preserved skin envelope with preserved IMF.

***Fashioning of the mid-TRAM flab and its transfer:***

With the patient supine the mid-abdominal flap centered on the umbilicus is planned and precise measurements of the flap are determined by requirements of recipient size and dimensions of the opposite breast.

The arcuate lines can be accurately located, being at the level of the interspinous line between the two anterior

superior iliac spines. Incisions are carried down through the skin and subcutaneous tissues until the anterior rectus sheath is identified , the flap is elevated on both sides from lateral to medial till encountering the first lateral musclocutanous perforator. In this series I preferred to use the double pedicle whole muscle technique, where the anterior rectus sheath is incised at the inferior border of the flap on both sides at or above the level of the arcuate lines then the rectus abdominis muscles are trans-sected with ligation and division of the inferior epigastric vessels. The whole width of the muscle is harvested with an overlying strip of the anterior rectus sheath and it is dissected from distal to proximal in the plane just superficial to the posterior rectus sheath till reaching the costal margin .The collateral vessels and nerves of the subcostal and intercostals type are sought and divided laterally,especially the 7th and 8th intercostals nerves, this not only lead to unteathering of the flap facilitating its transport to the chest region, but also completes surgical denervation of the rectus muscle, thus preventing its spontaneous contraction at the chest site. Also division of the lateral vessels seals the potential steal phenomenon to such vessels, thus funnelling all of the arterial supply into the complex vascular system of the flap itself.

The umbilicus is not circumcised as usual but it is retained within the flap and detached from the anterior abdominal wall during flap elevation. Depithelialisation of the flap is then performed, leaving only about 3cm disc of skin centered on the umbilicus, this skin disc left represents the future areola. The retained umbilicus within the flap is then everted and its void is filled by a piece of propyl propylene mesh which is kept in place by purse string fine prolene suture at the base of the umbilicus to maintain the contour and protrusion of the resulting simulated nipple (Fig. 4).

*Fig 4. Inclusion and evertion of the umbilicus to simulate the lost nipple.*

The upper abdominal flap is elevated above the level of the costal margin, and a tunnel is created to communicate the abdominal wound with the mastectomy wound, this tunnel should be done at the peri-xyphoid area in order not to disrupt the IMF and should admit the surgeon's fist.

The mid-abdominal TRAM flap is then transferred on both pedicles under the upper abdominal flap through the peri-xyphoid tunnel to fill the empty breast skin envelope, it should be properly oriented(to avoid hazardous kinking of the vascular pedicles) and sutured to the pectoralis muscle superiorly and laterally filling the infraclavicular hollow and maintaining optimal configuration of the pedicle. The periareolar skin edge of the breast skin envelope is then sutured to the edge of the skin disc left on the centre of the mid-abdominal flap by subcuticular burse string suturing. A vacuum suction drain is left with one limb draining the chest wound and the other limb draining the axilla. (Fig. 5).

*Fig 5. Final outcome with purse-string suture between the breast skin and the mid-TRAM flap.*

***Abdominal closure:***

The abdominal wall defect left after TRAM flap elevation is closed by using an onlay propyl propylene mesh sutured to the remaining lateral fringes of the anterior rectus sheath on both sides after being pulled under tension across the mid-line narrowing the abdominal girth as desired. Umbilical reconstruction in the upper abdominal flab and finally subcuticular closure of the transverse abdominal wound after leaving vacuum drain are done.

## RESULTS

Table 2. shows the details of 15 patients included in the study. Operative time was 4hours on average with only one unit blood transfusion needed and an average of 10 days hospital stay. During the period of follow up which ranged from 6months to 1year,there were no mortalities (either operative or postoperative) or life threatening morbidities. Only some local problems which was classified as early and late problems, have been reported.

As regards early problems; there were no cases with total flap loss, however, there was only one case with partial flap necrosis and another one with partial skin necrosis of the native breast skin, such cases were treated with debridment and resuturing. 2cases with superficial wound infections were noticed in the recipient site and treated with local wound care. There were no cases with wound dehiscence or seroma formation either in the reconstructed region in the donor site.

**Table 2. Details of the 15 patients included in the study.**

| | |
|---|---|
| • OP. Time (average) | 4 hours |
| • Bl. transfusion | 1 unit |
| • Time of hospital stay (average) | 10 days |
| • Mortality | NIL |
| • Major complications | NIL |
| • Local problems. | |
| **Early** | |
| Flap necrosis → Total | NIL |
| Flap necrosis → Partial | 1 |
| Native breast skin necrosis (partial) | 1 |
| Hematona | 1 |
| Seroma | NIL |
| Infection | 2 |
| Dehiscence | NIL |
| **Late** | |
| Fat necrosis(minimal) | 1 |
| Hernia | NIL |
| Hypertophic scar | 1 |
| Abd. Discomfort | 1 |
| • Cosmetic outcome | Good to Excellent |
| • Duration of follow up | 6M - 1Y |
| • Local recurrence | NIL |

As regards late local problems, there were only 1cases with minimal fat necrosis in the reconstructed breast proved by FNAB and treated by excision biopsy. No cases with abdominal wall herniation were noticed but there were only one case with abdominal discomfort and one case with hypertrophic scar in the donor site.

The cosmetic results were rated as good to excellent both by the patient and the surgeon regarding the shape, the natural aspect of the breast and durability of nipple protrusion(A longstanding protruding nipple is obtained in all of the cases)and in no case remedial surgery on the contralateral breast to achieve symmetry was required (Figs. 6a,b,c,d,e,f). During this short period of follow up (6months-1year) there were no cases with either local or regional recurrences.

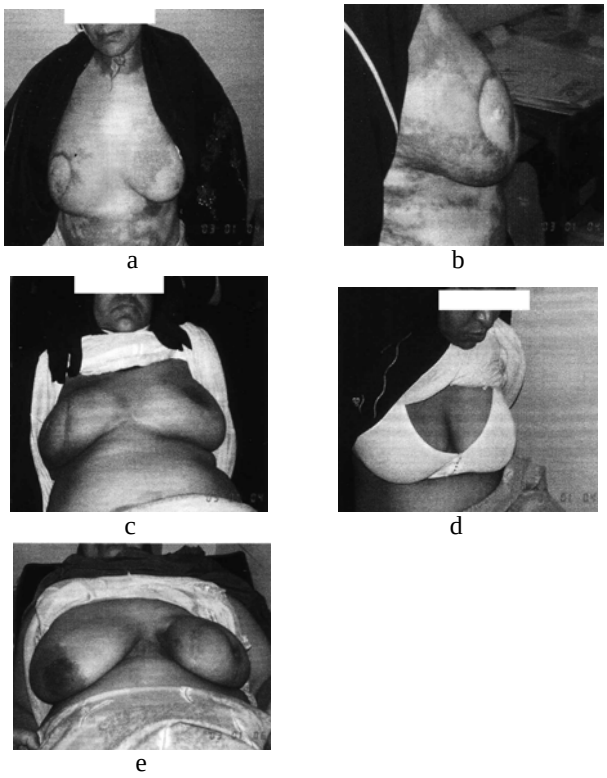


*Fig 6. a. 3 months post operative.*
*b. Side view of the same patient*
*c. 6 months post operative.*
*d. Same patient with her brassieres.*
*e. 6 months post operative with protruding simulated left nipple.*

## DISCUSSION

Immediate autogenous breast reconstruction is an integral part of SSM approach, its medical and psychological benefits have been proven.[1,4,6,7,17-19]Recent studies have demonstrated non-significant difference between IBR and delayed breast reconstruction in terms of patient survival and local control[19-24] with the added psychological advantage of IBR.[17-19]

Most plastic surgeons use the technique of conventional TRAM flap in which they design the flap over the lower (infraumbilical) abdominal skin, unfortunately this standard lower abdominal flap has dual inherent flaws; the uncertain vascularity of its distal part due to random pattern of its blood supply and the weakened abdominal wall after transposition of the flap, due to harvesting the

rectus abdominis muscle below the arcuate line.[8,10-14] A number of modifications have been proposed to improve vascularity of the conventional TRAM flap, but they usually lead to an increase in both the duration and complexity of the operative procedure, such modifications include; supercharging[25] and staged delay,[26] both are not always successful in improving vascularity of the contralteral part of the flap, and there is an added second operative procedure to the reconstruction in case of staged delay. Another modification is the microvascular free TRAM flap transfer, this technique is time consuming, technically demanding and may not be a practical choice without microvascular experience or microvascular equipments[27,28] and there is always a fear the possibility of subsequent thrombosis and total flap loss which is an unacceptable price to pay for a purely elective procedure.[27,28]

The mid-abdominal location has not received the special attention it merits. The mid-abdominal TRAM flap has dual advantage of extremely well vascularity (it maximizes the inclusion of the rich periumbilical network of perforators) and also lesser incidence of abdominal wall weakness because of harvesting the rectus abdomins muscle above the arcuate line, besides this, its technique is more simple, quicker with greater volume of available tissue but the only drawback is the mid-abdominal scar left, which is a small price to pay In face of a safe and reliable reconstruction[15].Because of these concerns the mid-abdominal TRAM flap was devised and owing to its outstanding vascularity, it obviates the need for procedures aiming at augmenting flap vascularity.

Besides, the demonstrated superior vascularity of the Mid-TRAM flap over the standard lower TRAM flap in the contrast study of the vascular anatomy of the rectus abdominis myocutaneous flap by Moon and Tylor, the have also demonstrated the primacy of the subdermal vascular plexus as the main vascular crossover along the midline, so it is imperative to preserve it without damage.[14]

To further add for the advantages of mid-TRAM flap, the modification of retaining the umbilicus within the flap and its evertion to simulate the lost nipple was suggested and it is hypothesized to add the following advantages:

- Non-interruption of the subdermal vascular plexus.
- Obviating the risk of jeopardizing the network of periumbilical vessels during traditional circumcision of the umbilicus in the flap.
- Overcoming the main problem of various methods of nipple reconstruction which is the gradual fading and absorption of the nipple.[38] In this series a longstanding protruding nipple. (Fig. 6).

For more safety and reliability of the flap I used to transfer the flap on double pedicle, Ishii and Bostwick have demonstrated its safety if the abdominal wall is correctly reconstructed,[30,31]also it seems that non-violation of the arcuate lines is a very important factor in this respect.[15] there were no cases of total flap loss and there is low incidence of partial flap necrosis (only one of 15patients showed partial flap necrosis), also there were no cases of abdominal herniation and low incidence of fat necrosis in the flap (only one case in this series). such results are comparable with the results of Slavin and Goldwen who reported an incidence of 2%of partial flap necrosis, 2% abdominal herniation and only1% of fat necrosis on utilizing mid-TRAM flap[15] and better than the results of using the conventional lower TRAM flap where there are 20%-60%incidence of partial and total flap loss, up to 40% incidence of abdominal weakness and herniation and higher incidence of fat necrosis with its impact of increasing patient's anxiety and confusion with malignancy.[8,11-13] These results can be interpreted in view of remarkably outstanding vascularity of the mid-TRAM flap in addition to the concept of non-violating the arcuate lines on harvesting the rectus abdominis muscles.[12] It is noteworthy to mention that the absence of seroma formation at the reconstructed area or in the axilla might be interpreted by the presence of the deepithelialised flap under the breast skin flap and reaching to the axilla aids in the absorption of seroma that forms, along dermal and subdermal lymphatics of the deepithelialized TRAM flap .

No determental effect on tumour behaviour was observed during this short period of follow up (6months to 1year), this goes in accordance with the results of Kroll etal who reported only one local recurrence in their 100 patients undergone SSM/IBR after an average follow up of 23.1 month,[17] furthermore, Hidalgo etal found no local recurrence in their 28 patients with SSM/IBR followed up for 27 months,[21] also Bensimon & Bengmyer reported no local recurrence in 20 patients followed up for a mean of 19 months.[23]

A good to excellent cosmetic results regarding the size, shape, natural aspect of the breast and durability of nipple protrusion were achieved. (Figs. 6a,b,c,d,e).

Clearly a longer term effect (regarding, recurrences, abdominal wall weakness and cosmetic outcome) requires continuing evaluation of our patients (a study in progress now).

If radiation after mastectomy and IBR done there are concerns regarding cosmesis, firming and fat necrosis, and possible obscuring of recurrences, however, data exist to show that most recurrences are not obscured by the myocutaneous flaps and in general a good to excellent cosmesis is being achieved in most women who have

radiation to the reconstructed breast,[32,33] in this series most of the patients have received postoperative radiotherapy and a good to excellent cosmesis with only one case of minimal fat necrosis were obtained.

Although, these results need to be confirmed with greater number of patients and longer term follow up, they support the conclusion that this approach with its added modification is safe, reliable emotionally less traumatizing with excellent cosmetic and therapeutic outcomes and I believe it may be considered an alternative approach for insitu and early breast cancers.

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