

RECENT TRENDS IN BREAST RECONSTRUCTION

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SUMMARY: An overview of the current concepts in breast reconstruction with the practical considerations for each reconstructive option is presented. The various methods in vogue should be tailored to the patients' needs and expectations. The newer techniques like free TRAM (Transverse Rectus Abdominis Myocutaneous flap) breast reconstruction are becoming more popular due to their superior aesthetic result.

INTRODUCTION

The presence of a normal looking pair of breasts is essential for the psychological and social well-being of a woman. Most modalities of treatment of breast cancer, involve mastectomy. Although the impact of breast cancer on a woman's life is highly complex and individual, for younger women, body image may be a more critical component, and mastectomy may therefore be disruptive¹. In a Swedish study, involving questionnaires to 75 patients who had breast reconstruction, 90% of patients reported that a breast reconstruction changed their lives and that they felt more "whole".²

Breast reconstruction has evolved and advanced so that a realistic reconstructed breast can be offered reliably to suitable patients. Immediate breast reconstruction (after mastectomy) reduces the psychological trauma associated with mastectomy and does not interfere with post-operative radiotherapy or chemotherapy. The presence of a prosthesis provides no particular problem once wound healing has occurred³.

Most breast reconstructions in the United Kingdom are done in a delayed fashion. This allows the patient to carefully consider each reconstructive option and to come to terms with the loss of a breast. The results of the reconstruction are more acceptable, as there is adequate time for the patient to carefully consider each option and be prepared for the reconstructive procedure. The modern methods of reconstructing the breast can be broadly classified into two categories:

RECONSTRUCTIONS INVOLVING THE USE OF A PROSTHESIS

1. Tissue expansion followed by prosthesis insertion.
2. One stage tissue expander/prosthesis insertion.
3. A muscle (latissimus dorsi) flap followed by prosthesis insertion.
4. A myocutaneous latissimus dorsi flap with a prosthesis in one stage.

RECONSTRUCTIONS NOT INVOLVING A PROSTHESIS

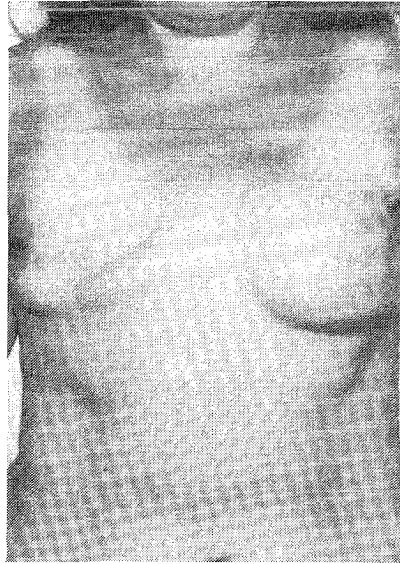
1. A latissimus dorsi myocutaneous flap.
2. TRAM Flap (pedicled or free).
3. Other free flaps e.g. gluteal and tensor fascia lata flaps.

Regardless of the method chosen, reconstruction of the breast should not prejudice the treatment of the malignancy for which mastectomy was done.

RECONSTRUCTIONS INVOLVING THE USE OF PROSTHESIS

Tissue Expansion

This is technically a simple operation involving the placement of an expander deep to the pectoralis major muscle, through the lateral aspect of the mastectomy scar and gradual inflation to expand the skin flaps, so that an appropriately sized permanent prosthesis can be inserted.^{4,5} Patients who have not received irradiation to the chest wall and who have thick post-mastectomy skin flaps are suitable



(Fig-1) Post bilateral mastectomy patient:
An expander had been used, before a
prosthesis was inserted on the left side.
Note the lax chestwall skin on the right side

candidates for this method. When autogenous flaps are either unavailable due to previous surgery or are contra-indicated as in extreme obesity, the tissue expansion method is a viable option. Tissue expansion and prosthesis insertion are done in two separate stages. The skin and soft tissue are slightly over-expanded so that when the definitive prosthesis is inserted, there is a better contour to the breast (Fig.1). The lateral part of the scar of mastectomy is preferred to a new incision. If the pectoralis major muscle is present, then the prosthesis is inserted sub-pectorally, to act as an additional safe guard against extrusion of the implant. The port of the expander is placed laterally or parasternally, and it should be readily palpable for injection of saline. The newer bio-dimensional expanders⁶ have the port in the expander itself, and this is identified post-operatively, by means of a magnet that is provided by the manufacturer. The expansion can be done in weekly intervals and the amount injected depends on how much tension the patient can tolerate, and also on the soft tissue envelope. If the skin does not blanch on pressure, then some fluid should be withdrawn, until blanching returns. That would be the end-point of expansion. The expansion procedure should be done in an aseptic fashion to prevent infection, though it could be done as an outpatient procedure.

When the expander is being removed, a cutting diathermy probe is better than the knife for dividing the tissues as the diathermy does not

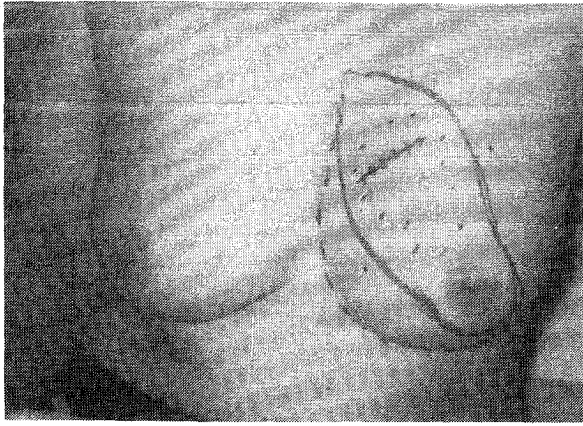
damage the capsule of the expander. The definitive prosthesis is inserted with or without a "betadine dip". Complications of using a tissue expander and prosthesis include infection, expander or implant exposure and expander failure. These complications occur in about 5% of patients. In patients with severe post-mastectomy scars or those who have had irradiation, the complications reach upto 30 to 40%. In these patients autogenous flap reconstruction would be a better option.

One Stage Expander Prosthesis Insertion

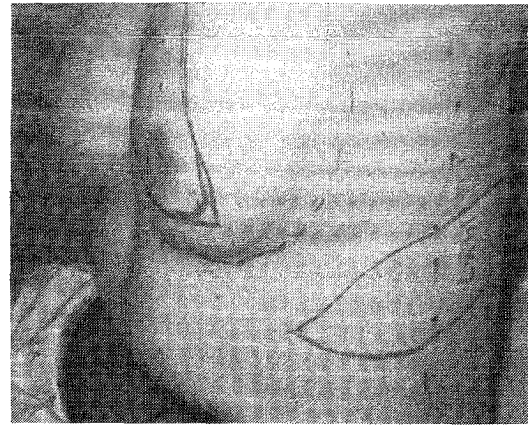
The Becker Prosthesis⁷ is a tissue expander that can be left as permanent prosthesis after expansion to an adequate level. The injection port is removed easily as a minor procedure in a separate sitting. There have been problems like leakage from the connecting tube, difficulty in palpating the port in an obese patient. The latter problem is less when the port is placed in the para-xiphoid area.

Muscle Flap in Association with A Prosthesis

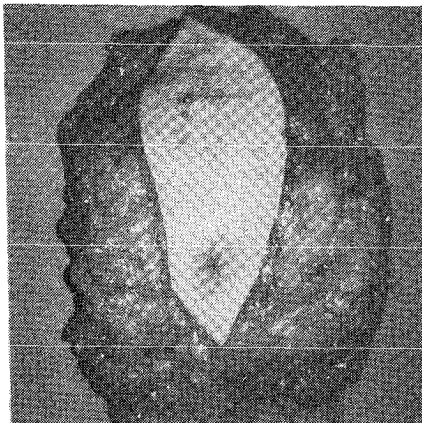
Most post-mastectomy patients are likely to have tight skin flaps. When an expander alone is inserted in these patients, there is a great risk of extrusion of the implant. It is prudent in these cases to cover the expander with a muscle flap, so as to augment the scar to be expanded. The latissimus dorsi muscle flap is most suitable for this. This muscle can be dissected using an incision in the posterior axillary fold. The same incision can be used to insert the expander. The scar can be decreased by using the endoscopic technique⁸. We have used the endoscopic technique to harvest the latissimus dorsi muscle. The incision is placed on the posterior axillary fold and the vascular pedicle to the latissimus dorsi is identified and then the muscle dissection is begun. Initially it is possible to dissect the muscle under direct vision. A stage is reached when this is impossible. Then the endoscope is used to dissect superficial and deep to the muscle. The tumescent technique wherein saline with dilute adrenaline is injected in the subcutaneous plane, makes the dissection easier, as the tissue is lifted up, and minor bleeding is minimized. Thus the objective lens is obscured less frequently. The vessels are easily visualized and coagulated using long bipolar diathermy forceps. Scissors and forceps should also be of sufficient length to reach the distal end of the flap. The muscle is cut from its distal attachments with the same technique.



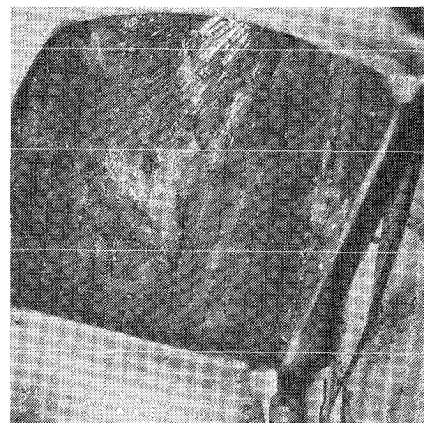
(Fig-2a) Recurrent breast cancer in the upper quadrant of left breast. Anterior view shows the extent of skin excision



(Fig-2b) Lateral view shows the markings for the proposed latissimus dorsi myocutaneous flap. Note that the skin paddle lies along the flank fold



(Fig-2c) The resected breast specimen

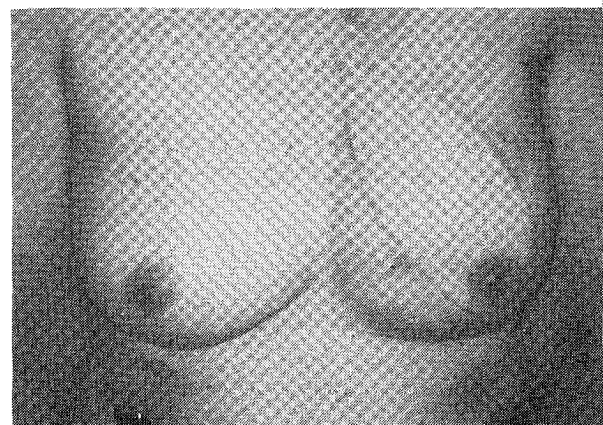


(Fig-2d) The post-mastectomy defect

Recently, some manufacturers supply the cutting diathermy scissors that coagulates as it cuts. We have found this instrument very useful in dissecting under endoscopic guidance. The dissection under the muscle is easier than the superficial dissection. After the muscle is delivered out of the incision, attached only by its pedicle, the post-mastectomy skin is dissected in the subcutaneous plane. Here again the endoscope will aid in dissecting the medial areas, upto the parasternal region. Then the muscle is attached to the chest wall skin by means of bolster sutures passed with long needles along the periphery of the subcutaneous pocket.

The tissue expander is then inserted under the muscle flap. It is inflated to some extent, after insertion. Inflation is stopped if there is likely to be tension on the suture line. Drains are placed under the expander and in muscle donor area in the back.

Patients have less postoperative pain due to a smaller incision wound. The complications of



(Fig-2e) The post-operative result after one stage breast, nipple/areola complex reconstruction with latissimus dorsi myocutaneous flap and a silicone implant. (Immediate breast reconstruction)

seroma are significantly less with this technique. The only disadvantage with this technique is the initial costs of acquiring an endoscope and a monitor. With practice the duration of the procedure significantly decreases.

A Myocutaneous Flap in association with a Prosthesis

A myo-cutaneous flap, usually a latissimus dorsi flap, is useful in patients who have tight irradiated chest wall skin that would be unsuitable for tissue expansion.

It is harvested using an elliptical incision circumscribing the skin island. This incision is placed in the flank fold, i.e., the upper pole is posteriorly placed, while the inferior pole is anteriorly placed, in an oblique direction. The scar is thus less conspicuous. The dissected muscle and the skin island are delivered into the mastectomy-scar incision, through a subcutaneous tunnel. The thoracodorsal nerve is divided so as to avoid troublesome contractions and distortions of the reconstructed breast. There may not be any need to expand the chest-wall skin, if a myocutaneous flap is used. A prosthesis could be inserted under the flap straight away. This type of reconstruction could be done immediately after mastectomy (Fig. 2a-e).

Recently there have been controversies in both the medical and popular press, about the safety of silicone prostheses. In Britain a special advisory group, set up by the Department of Health concluded that there is no convincing evidence of adverse effects on health due to silicone prostheses. Further studies are in progress. There is a search going on for other suitable alternatives for the silicone filler. Prostheses containing triglycerides⁹ and polysaccharide fillers are being used increasingly in the United Kingdom, as they are more radiolucent than silicone prosthesis, and allow easier radiologic detection of recurrence. The results of the studies on their long term usage are awaited. Further, the design and structure of the implant jackets is under constant review. The present generation are low bleed types. This indicates that the permeability of the silastic jackets to the silicone filler is lesser, and therefore the amount of silicone that permeates into the surrounding tissues without the capsule rupturing, is minimized. The thickness of the jackets have been increased as well to limit their rupture. The surface of some types implants have a rough texture to limit capsule problems. More recently, the implants have a tear drop shape with a narrow upper pole and a projecting lower pole. This is to provide a naturally ptotic breast. The shape of the prosthesis has a significant influence on the aesthetic result. Aesthetic results of expansion and prosthesis vary and can be poor, especially

in patients who have had radiotherapy to the chest-wall.

RECONSTRUCTION WITH AUTOGENOUS TISSUES ONLY

Autogenous myocutaneous flaps give a more life like outcome to the breast reconstruction. There are fewer long term complications with this method. Large ptotic breasts can only be reconstructed with bulky flaps.

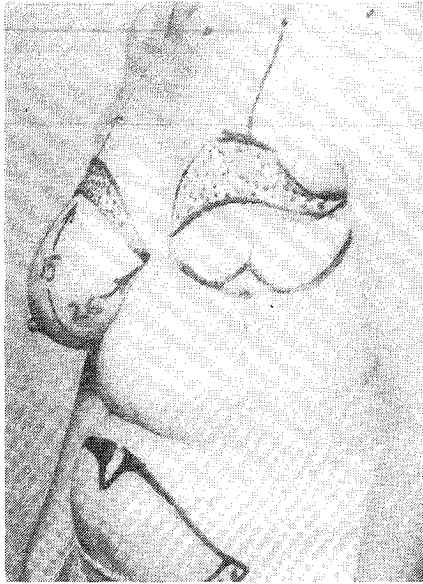
The latissimus dorsi myocutaneous flap

This has been used for chest-wall reconstruction since 1906, when it was first described by Tanzini. It was in 1978 that it was used to recreate a breast¹⁰. This flap can be raised with a skin paddle to substitute the skin lost during mastectomy. As previously described, the skin paddle can be oriented such that the redundant skin in the flank folds can be utilized. The skin paddle and the muscle could be brought through a subcutaneous tunnel, into the mastectomy incision. The muscle insertion as well as the thoracodorsal nerve are divided. This prevents the formation of a lateral ridge, leen, where the pedicle lies, in the infra-axillary region¹¹. The skin paddle can be based on only one or two perforators, and dissected along the margins, so that the paddle can be oriented slightly differently compared to the muscle, which lies almost horizontally, across the chest wall. In patients for whom immediate breast reconstruction is being done, it may be possible to reconstruct the nipple-areola complex also. The latissimus dorsi flap alone, is suitable for reconstructing small breasts only, as the bulk of the dissected muscle would be inadequate to fill the cavity left after mastectomy of a large, ptotic breast.

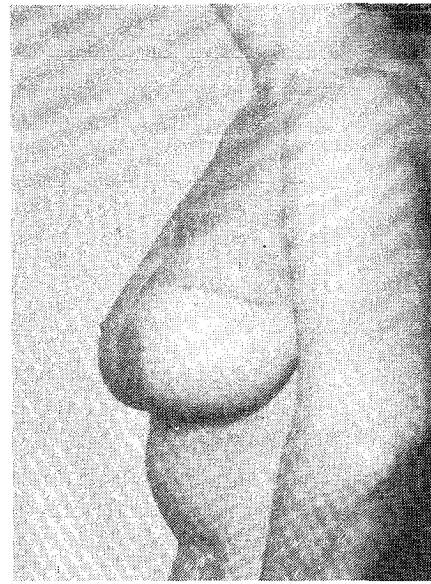
The TRAM flap

The TRAM flap, whether pedicled or free, is an excellent means by which a large breast can be created out of redundant abdominal tissue^{12,13} (Fig. 3a-b). The main drawback is the weakening of the abdominal wall that may occur if closure is not done properly.

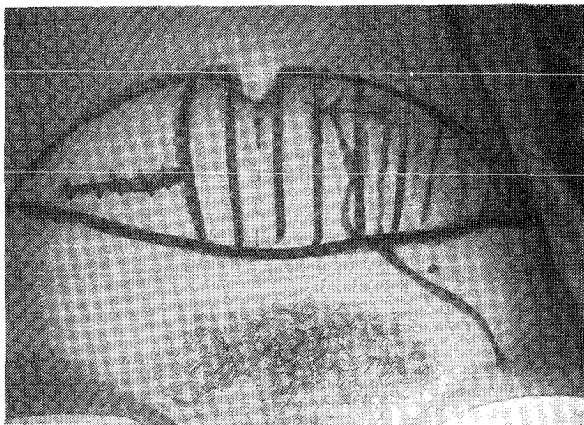
The amount of flap tissue needed is calculated using the opposite breast as a model, and noting its horizontal and vertical circumference. Usually the skin ellipse for the TRAM flap includes all the four 'zones'. The fourth zone is the least vascular area, therefore the flap can be fashioned so that only a small part of this zone is included in the reconstruction.(Fig. 4a-b).



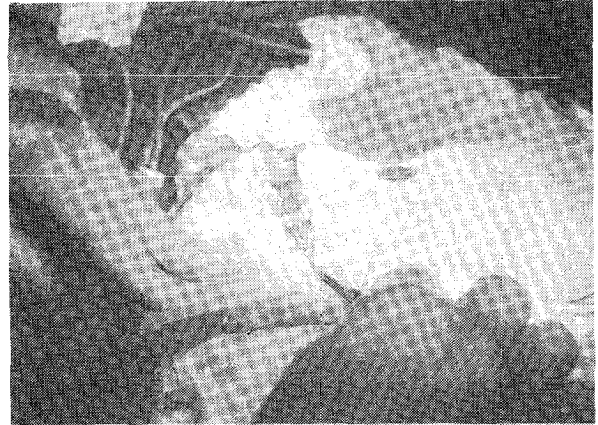
(Fig-3a) Preoperative view showing the post mastectomy defect with markings to measure the dimensions of breast. Note the TRAM flap markings inferiorly



(Fig-3b) Post free TRAM flap reconstruction showing the excellent cosmetic result that can be achieved

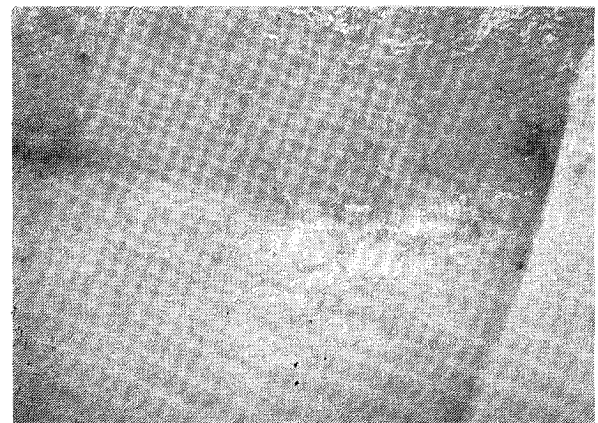


(Fig-4a) Abdominal markings for a free TRAM flap. Note that there is an appendectomy scar in zone 4

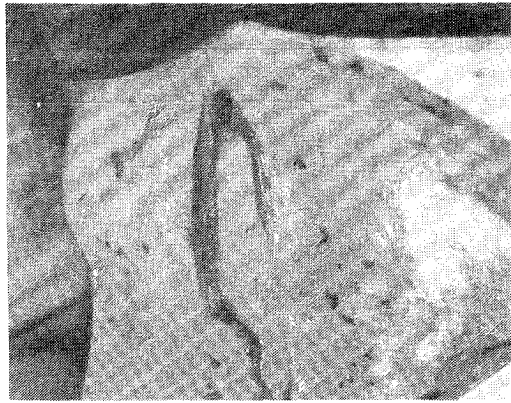


(Fig-4b) The harvested free TRAM flap is shown with the zone 4 being resected

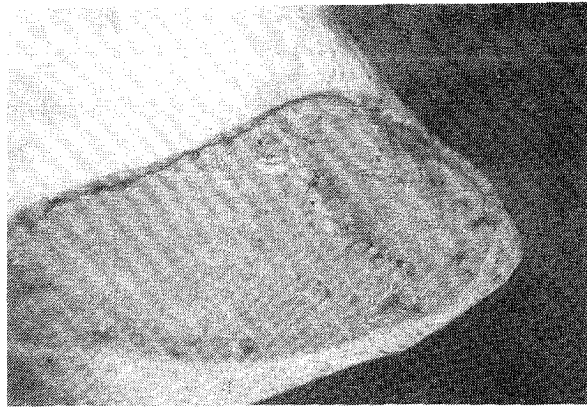
The skin of this area could be de-epithelialised and then this part could be 'tucked' under the rest of the zones, to provide bulk. While dissecting the flap, care should be taken to include only a small portion of the anterior rectus sheath with the flap. In fact, the whole flap can survive on one or two peri-umbilical perforators (Fig.5). Therefore, it is possible to preserve the sheath in its entirety (Fig.6a-b). If these perforators are dissected from the muscle, upto the inferior epigastric artery, then the muscle also could be spared. This becomes the basis of the 'DIEP.' (Deep Inferior Epigastric artery Perforator) flap¹⁴. The free flap utilizes the ipsilateral deep inferior epigastric pedicle. Bilateral TRAM flap reconstructions can be done by dividing the TRAM territory into two



(Fig-5) Large periumbilical perforators during the flap elevation



(Fig-6a) The defect in the left rectus muscle. Minimal muscle and sheath have been removed with the flap

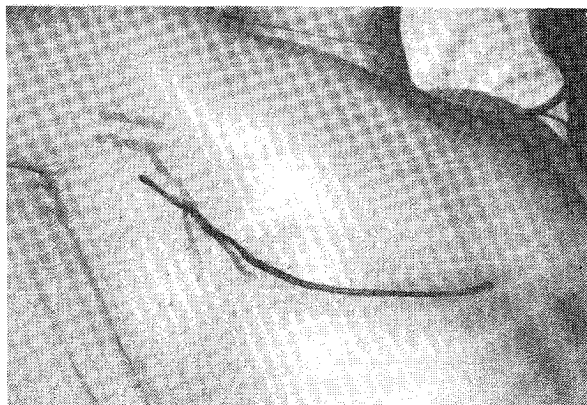


(Fig-6b) Large periumbilical perforators during the flap elevation

and utilizing both the inferior epigastric pedicles on either side for microvascular anastomosis to recipient vessels on either side. The resulting reconstructions are smaller than that for a single breast reconstruction, but it is possible to achieve a good cosmetic result and symmetry (Fig.7). The pedicled flap makes use of the anastomoses between the superior and inferior epigastric vessels. Free TRAM flaps can be anastomosed to the circumflex scapular vessels (Fig.8). or the internal mammary vessels. Arnez et al have shown good results with the use of internal mammary vessels¹⁵. Some authors have shown that vascular augmentation of the pedicled TRAM flaps by anastomosing the inferior epigastric vessels to vessels of the scapular axis in the axilla, decreases the incidence of complications like partial flap necrosis, fat necrosis etc.¹⁶. The cost of a free TRAM flap is only marginally higher than the pedicled TRAM flap if the number of days in hospital and the complication rates are taken into consideration¹⁷. We have found that it is easier to 'sculpt' the breast in a second stage, and concentrate on good anastomosis in the first stage. Therefore, after harvesting the TRAM flap, it is stitched on to the chest-wall defect, and then, the inferior epigastric vessels are sutured without tension, to the circumflex scapular vessels. If the breast is primarily sculpted by folding the flap in the middle to create a projection, then there is likely to be tension on the vascular anastomosis. In a second stage, the lateral part of the flap is de-epithelialised and folded under the infra-clavicular skin, to create a fullness that is 'natural' looking. At the same time, contra-lateral breast reduction, and nipple-areola reconstruction can be done.



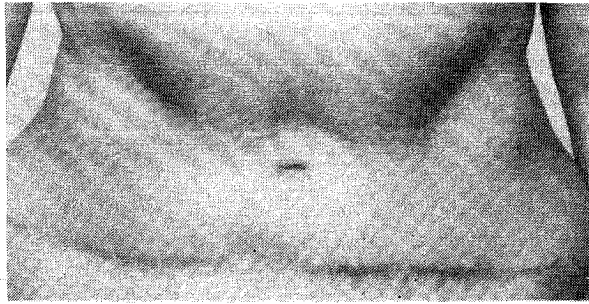
(Fig-7) Post-operative result of bilateral free TRAM breast reconstruction



(Fig-8) Skin markings on a mastectomised patient, showing the inframammary crease, axillary and subscapular vessels

When closing the abdominal wall, a synthetic mesh may or may not be used, depending on the amount of anterior rectus sheath present. The transverse abdominal scar usually heals

well and patients get the added advantage of an abdominoplasty (Fig.9).



(Fig-9) Late result of donor site closure

Complications like abdominal weakness and hernia are more common in the conventional pedicled TRAM flap, than the free TRAM flap because less of the rectus fascia needs to be sacrificed in the free TRAM FLAP and therefore a more secure closure can be achieved¹⁸.

CONCLUSION

Breast reconstruction should be individualized to suit a particular patient. The simpler options of tissue expansion and prosthesis insertion may suffice for the patient who has adequate non-irradiated skin in the chest-wall. However those who have had irradiation and have tight chest-walls may need a muscle to augment the scar during expansion. This is best done using a pedicled latissimus dorsi muscle flap. The autogenous tissue breast reconstructions like the TRAM flap or the latissimus dorsi flap give better cosmetic results but are technically more demanding. Free TRAM flaps are very popular because they can be used to reconstruct bulky, natural looking breasts. Complications in breast reconstruction can be minimized if the patient selection is good.

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