

MANAGEMENT OF POST RADIOTHERAPY RADIONECROTIC ULCER IN CARCINOMA BREAST PATIENTS USING TRAM FLAP

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SUMMARY : Radiation as a modality of management in malignancy, especially for carcinoma of breast is well established. However, the deleterious effect of radiation on normal tissue, is still witnessed. Four patients of advanced breast malignancy, who underwent radical mastectomy followed by adjuvant radiotherapy presented with radiation ulcers of the chest, between 1993-1994. Soft tissue break down over the irradiated site occurred as late as two to three years following irradiation. All patients were tumour negative.

Excision of involved irradiated tissue was followed by reconstruction using the pedicled Transverse Rectus Abdominis Myocutaneous Flap (TRAM). This fulfilled the twin goals of well vascularized flap coverage and restoration of form in a single stage.

INTRODUCTION

Breast cancer is the most common reason for radiation to the chest. Radiation alone, or as an adjuvant to surgery, is the mainstay in the treatment of locally advanced, or recurrent breast cancer.

The price paid for radiation may include significant morbidity to chest-wall tissues. Problems of loss of healing capacity, skin fibrosis, and potential necrosis are encountered and may be life threatening.

In radiation ulcers of the chest, the aim of treatment is to rid the patient of the disease process, maintain chest wall and pleural integrity, with a single stage reconstruction with minimum donor morbidity and early rehabilitation of the patient.¹ The latissimus dorsi flap, rectus abdominis flap and omentum have been described, either as pedicled or free tissue transfers^{1,2,3,4,5}, to reconstruct chest wall defects. Among the available options, we find the Rectus Abdominis myocutaneous flap with a Transverse skin island (TRAM flap) fulfils the treatment aim admirably, and our experience with it is being discussed.

PATIENTS AND METHOD

Four patients of carcinoma breast who underwent radical mastectomy followed by radiotherapy presented with pain and non-healing ulcers overlying the chest. The onset of ulceration was 2 to 3 years following completion of radiation. All patients had received 5000 rads of external

radiation in five weeks. Two patients presented 6 weeks following the appearance of the ulcer, after unsuccessful conservative treatment. The other two patients presented soon after appearance of their ulcers (Table-1).

TABLE - 1

PRESENTATION OF ULCERS AND COMPLICATIONS IN PATIENTS TREATED WITH TRAM FLAP

Age (Yrs)	Radiation to Ulceration interval (Months)	Ulceration to Presentation interval (Weeks)	Dimensions of defect (Cms)	Tram Flap Dimensions (Cms)	Complications
48	23	2	16 x 12	21 x 17	Fat Necrosis
54	30	6	14 x 12	24 x 19	Fat Necrosis Donor site infection, Abdominal hernia.
56	24	4	12 x 8	20 x 17	Wound infection
46	28	6	14 x 10	26 x 20	—

All patients on presentation had multiple sites of tissue breakdown, with a surrounding atrophic, hyperpigmented area, with evidence of costochondritis.

All patients underwent a biopsy of the lesion, as well as radiological and ultrasound examination, to rule out local recurrence of tumour and distant metastasis. Reconstruction was planned only after they were documented to be tumor negative.

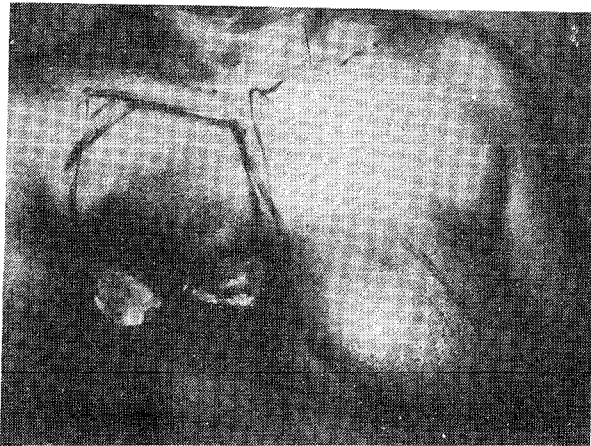
Excision of all the ulcers including a margin of irradiated, hyperpigmented atrophic skin resulted in a defect ranging from a minimum of 12 x 8cms. to a maximum of 16 x 12cms. (Table-1). In two of the patients, involved segments of ribs were removed.

The resultant defect was reconstructed using a unipedicled, contralateral TRAM flap. (Fig 1 & 2). Horizontally the skin island extended from one anterior superior iliac spine to the other. Vertically it extended 2cm. above the umbilicus to just above the symphysis pubis (Fig.3). Flaps were elevated from lateral to medial side noting the location of the perforators, which were preserved on the side of the pedicle. The lateral most skin segment (segment IV) was discarded (Fig 3). The large skin island based on the contralateral superior epigastric vessels was tunnelled under a wide abdominal flap into the defect (Fig 4). Inset of the flap was then performed, resurfacing the defect and providing

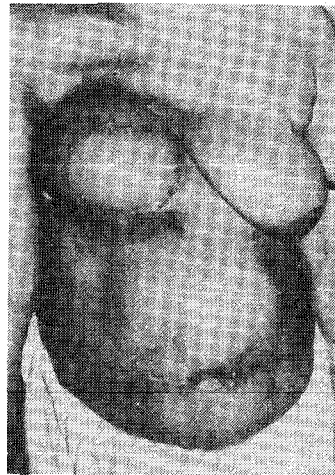
contour. The extended portion of the flap was deepithelialized and infolded to give projection. (Fig 4). Nipple-areola reconstruction was not performed as none of the patients wanted this.

DISCUSSION

Radiation is an established modality in the treatment of various malignancies. The crux of the problem is that radiation is not tumour specific. It has an effect on normal tissue which has been described as "deleterious, permanent, and progressive"⁶. Late effects (after six months), are characterised by increased or decreased pigmentation of the skin, thickening, fibrosis, telangiectasia, skin-necrosis and tumorigenesis.⁷ The potential of normal tissue to heal is altered. The fibroblasts are incapable of producing normal collagen. Decreased vascularity, and tissue hypoxia are the other features. Hypoxia depresses the basic mechanism involved in collagen synthesis.



(Fig-1a) Post mastectomy irradiated patient with radionecrotic lesion.



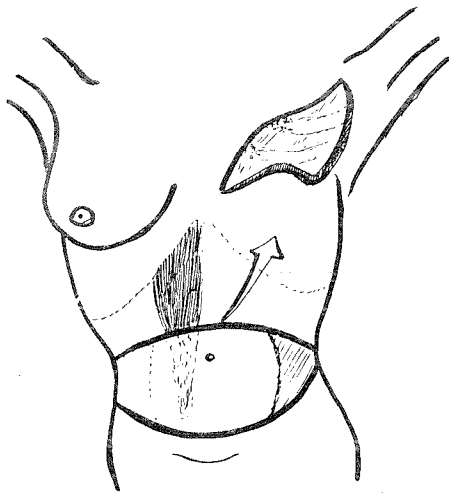
(Fig-1b) One year post operative. Note volume mismatch in comparison to the opposite Breast.



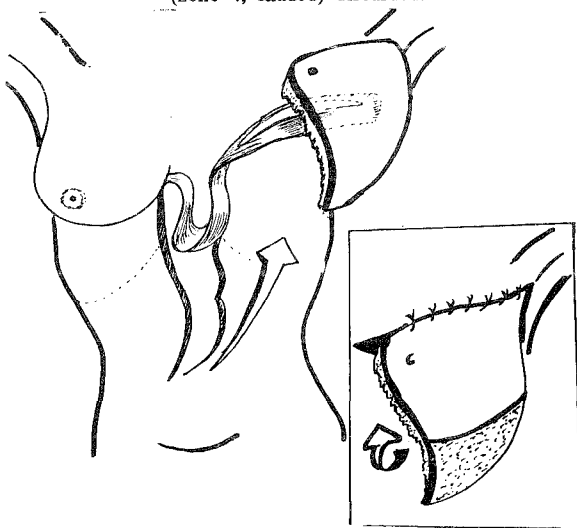
(Fig-2a) Radionecrotic ulcer chest.



(Fig-2b) Four months post operative.



(Fig-3) Design of TRAM flap, showing the area (zone 4, shaded) discarded.



(Fig-4) Contralateral, unipedicled TRAM flap rotated 90 degrees, to reach the defect. Inset of the well vascularized portion forms the Breast mound. The extended segment is deepithelized and infolded to give projection.

Decreased tissue pO_2 increases the incidence of infection. Angiogenesis, a critical phase in wound healing, also depends on tissue oxygen level. Oxygen tension in irradiated tissue has been found to be as low as 5 to 10 mmHg. at its centre, gradually increasing in increments towards the periphery, till it reaches its normal value of 55 to 60mm Hg. Wound breakdown occurs at a pO_2 of 3 mm Hg.⁸

Radiation induced wounds frequently persist and enlarge because of progressive occlusion of the microvascular tree. Failure of formation of granulation tissue, reduced wound contraction, and poor graft "take" frustrate efforts in management. Unyielding fibrotic tissue prevents primary closure

of even small wounds, and the use of local flaps. The ideal option is to completely excise the involved tissue, and replace it with a tissue having its own blood supply.⁹ Complete excision however proves difficult as there is no visual demarcation between the irradiated and non-irradiated areas. Further, as the effect of radiation on normal tissues decreases as we proceed towards the periphery with improved pO_2 levels, removal of only the severely ischemic tissue suffices. The atrophic, hyperpigmented, dry skin surrounding the ulcers is removed. Excision of tissues in the depth is also necessary. Underlying involved ribs should be removed, as was necessary in two patients in this series. No pleural involvement or breach was witnessed in this group. Tumour recurrence should always be ruled out in all postradiation ulcers. A local recurrence of 30% was observed in radionecrotic ulcers in Rouanet et al series.¹⁰

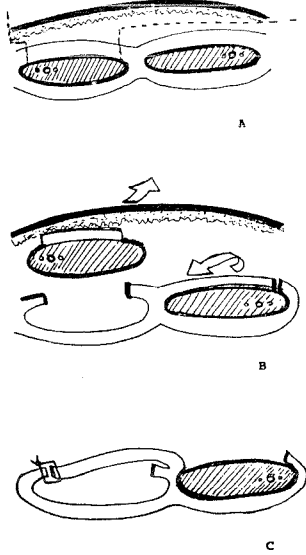
Reconstruction of the rib cage, following removal of ribs (maximum three), was not attempted, as the surrounding fibrosis and rigidity of transferred tissue provided sufficient support. This has been supported by other authors.^{3,6} None of the patients developed pulmonary compromise, and post operative pulmonary support was not required.

The use of latissimus dorsi to cover post mastectomy skin defects was proposed almost a century ago by Tansini (1905). Bostwick & Oliveri rekindled interest in its use for breast reconstruction and radionecrotic ulcers of the chest.^{11,12} Though by far the most commonly used flap it has the disadvantage of

- (a) change of posture during surgery
- (b) difficulty in primary closure of the donor site, if a large skin island is taken.
- (c) damage to its vascular pedicle during radical mastectomy compromises the use of this flap.

The omentum is a useful second choice, specially when the extent of excision has been under estimated, resulting in wound break down. The omentum can be pedicled into the defect, and covered with a split skin graft. The added abdominal laparotomy, with the possibility of infection and tumour seeding is a disadvantage.

The rectus abdominis myocutaneous flap has been described with either a vertical or a horizontal skin paddle for chest wall reconstruction. The Transverse Rectus Abdominis Myocutaneous flap (TRAM), popularized by Hartrampf Jr. is at present the flap of choice in post mastectomy breast reconstruction.² A large volume of skin can be carried on a single pedicle, from the lax



(Fig-5) Procedure of anterior abdominal wall repair, hinging contralateral anterior Rectus sheath.

infraumbilical portion of the abdomen. The donor site can be closed primarily, leaving a linear transverse scar. No change of posture is necessary during flap harvesting. Even though a large volume of skin can be transferred, the size of the defect limits use of this tissue to reconstruct the chest wall, as well as provide an adequate volume to shape it to match the contralateral breast. Mismatch in shape with the contralateral breast is often present (Fig 1).

In the unipedicled TRAM flap, the part of the skin most distant from the pedicle (zone 4), needs to be discarded. This area is the most poorly perfused, hence valuable tissue is lost. Extra vascularization procedures, by "supercharging" the flap, by anastomosing the distal pedicle to an axillary vessel by microvascular procedure, or using double vascular pedicles, extends the flap's reliable territory. More tissue may be available to give the breast a better "form". This would also reduce the fat necrosis observed in two of the patients.

The use of vessels (internal mammary), falling within the field of radiation, has in no way jeopardized the use of these flaps. Perivascular fibrosis may however limit the arc of rotation.

Abdominal wall herniation (observed in one of our patients), previously a frequent complication of this procedure, has been practically eliminated by closing the rectus sheath using a medially based, hinged flap from the opposite rectus sheath, and closing the abdominal wall in layers (Fig 5).

Hartrampf has also shown that muscle sparing procedures during TRAM flap elevation reduce the incidence of abdominal wall herniation.⁴

CONCLUSION

In the treatment of radiodystrophic lesions of the chest, 'wide excision' and a well vascularised cover using the TRAM flap, not only provides integrity to the chest wall with a single stage procedure, but also provides a satisfactory cosmetic result.

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