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Case Report

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Negative pressure wound therapy as an aid to coverage of irradiated chest wounds

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Introduction: Wounds over the irradiated chest present as a tough challenge for coverage to the reconstructive surgeon. This is due to the adverse effects of radiation on local tissue. The best option in such patients is flap coverage. Split thickness skin graft, though a simpler alternative, does not take well or breaks down easily.
Case report: A patient is presented in whom flap coverage was not sought and wound bed was prepared by negative pressure wound therapy to effectively take a skin graft.
Conclusions: This simple technique may be of immense value in aiding closure of problematic wounds over the irradiated chest.

Introduction

Challenge of soft tissue coverage for irradiated chest wounds is a formidable one for the reconstructive surgeon. Irradiated wounds have to be appropriately treated with full thickness cover, usually in the form of flaps, as the surrounding skin, under effects of radiation, cannot be mobilized and the wound closed. In these patients, the best form of treatment is flap coverage, usually a local one. Skin grafting is a much simpler alternative but usually it does not take well and if it does, it breaks down easily. Negative pressure wound therapy (NPWT) may be of tremendous value in such a setting where take of split thickness skin grafts (STSG) can be augmented. The authors present such a case of a problematic soft tissue defect on the irradiated chest where local flap coverage was not possible. NPWT was used to allow STSG coverage over the wound, thereby highlighting the effectiveness of the technique in coverage of such complicated wounds.

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Case report

A 37 year old lady, a case of advanced, breast cancer (TNM stage T4N1M0) had undergone

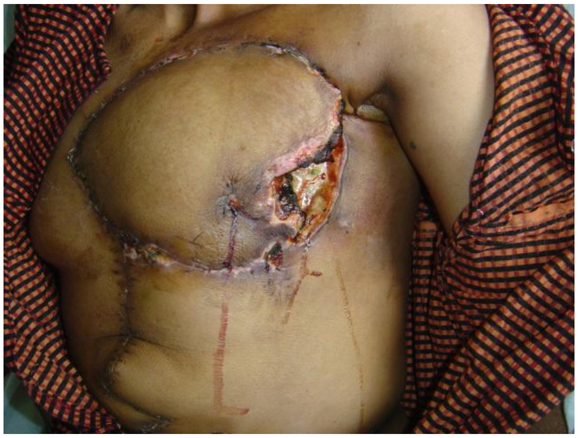

Figure1: The patient with advanced breast cancer who had undergone a rectus abdominis myocutaneous flap cover for a defect after mastectomy following neo-adjuvant radiotherapy. The distal edge of the flap necrosed and the patient reported with the chest wall defect that ideally needed a flap cover.

Figure 2: The defect after debridement. The edges have not been trimmed and only the necrotic tissue has been excised, thereby not grossly increasing the wound dimensions.

neo-adjuvant chemotherapy and radiotherapy and then underwent a simple mastectomy elsewhere. For a breakdown of the suture line, she was subjected to a transverse rectus abdominis myocutaneous (TRAM) flap at the same centre. There was partial full thickness necrosis of the flap and the patient then presented to our center for further treatment (Figure 1). The adjoining skin and flap tissue were indurated and hence could not be mobilized for closure. Also, owing to the state of irradiation to the whole area, such an exercise would have been foolhardy, subjecting the wound to further risk of dehiscence. It was decided to take her up for a pedicled latissimus dorsi myocutaneous flap cover. However, pre-operative hand held Doppler failed to pick up the signal of the thoracodorsal artery, the vascular supply of the muscle. The operative details of the procedure done prior were not available nor could the earlier treating surgeons be contacted for details. The patient declined the possibility of a free flap. The option of NPWT was then thought of, especially since the patient had received full course of adjuvant therapy and there was no risk to life in case of delay in the wound coverage.

The patient was initially taken up for debridement. At debridement, all necrotic tissue was excised. However, since the wound edges did not require to be sutured together, they were not freshened, thereby not grossly increasing the wound dimensions (Figure 2). The wound had a surface area of 55.25 cm^2 (8.5cm X 6.5cm) after debridement and the NPWT was initiated with a continuous negative pressure of 100 mm of Hg (Figure 3). At change of dressings every 72 hours, the possible advent of granulation tissue was looked for and the contraction of the wound noted. Healing was indolent, as expected and healthy granulation tissue appeared in 27 days after initiation of NPWT. The surface area of the wound then was 17.5 cm^2 (5cm X 3.5cm). The patient was then taken up for STSG cover and the take of the graft was almost 100% at the end of 14 days (Figure 4). The final healing of the wound took 48 days after the start of NPWT. On follow-up over a year, the patient has remained asymptomatic and the skin graft has not broken down.

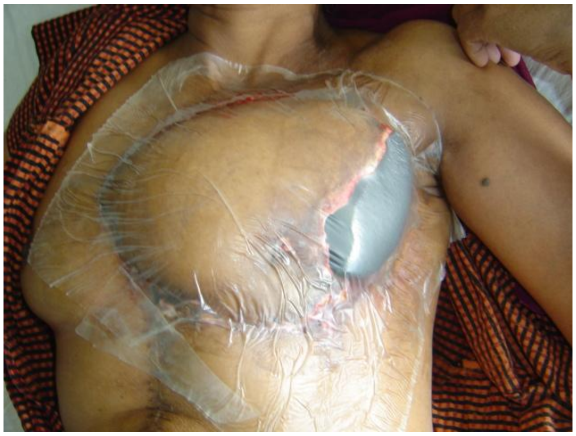

Figure 3: NPWT foam in place before start of therapy.

Figure 4: The wound with coverage after split thickness skin graft application. Wound healing was indolent due to irradiation. Satisfactory healing occurred by 49 days of start of NPWT.

Discussion

NPWT has proven to be a revolutionary break-through in wound management. Wounds that previously were cumbersome to deal with have become manageable. The scientific explanations of the benefits of topical negative pressure are ongoing. The mechanical traction that is applied to the wound bed as a result of the vacuum has a positive effect on the wound healing process and leads to stimulation of granulation tissue formation, decrease in matrix metalloproteinases, stimulation of angiogenesis [1], decrease in edema formation, resulting in improved blood flow [2] and decrease in bacterial colonization [3].

Radiation has deleterious effects on local vascularity, fibroblast activity, growth factor levels, and mesenchymal stem cell populations [4]. Microscopic examination of irradiated tissue reveals microvascular thrombosis and abnormal vasculature. Clinically, irradiated wounds are associated with slower epithelialization, decreased tensile strength, and higher infection and dehiscence rates [5]. Irradiated skin heals poorly, even when sutured to a vascularized flap. Often, a better strategy is to excise the irradiated skin and subcutaneous tissue, and cover the whole defect with a well-vascularized flap sewn to well-vascularized skin [6]. The usefulness of STSG in this setting remains controversial. In some cases, STSG must be considered as the reconstructive option in patients with significant medical co-morbidities, recurrence in the area of previous flap, or failed flap reconstruction that is not amenable to microvascular tissue transfer due to lack of recipient vessels. This was so in our patient. Historically, reported skin graft loss rates in preoperatively irradiated wounds varied from 30%-100% [7,8].

However, traditional teaching may be reversed by the cutting-edge technology of NPWT. In the recent past there have been only a few such studies. In a retrospective study of 17 patients operated with STSG for coverage of irradiated wounds, good results were experienced with the use of NPWT for aiding wound healing [9]. We had a similar result in our patient for whom a complicated surgical procedure could be avoided. The skin graft take was augmented. On a follow-up period of a year too, there was no breakdown of the graft. This case report highlights the effective use of NPWT to simplify the management of challenging wounds over the irradiated chest.

Competing interests and conflict of interest:

None identified

Authors' contributions

VL carried out the literature search and prepared the draft manuscript.
PSB was responsible for clinical photography and conduct of the NPWT dressing for the patient.
SR edited the final manuscript. All authors read and approved the final manuscript for submission.

Ethical consideration

Written informed consent was obtained from the patient for publication of this case report.

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