A rare case of delayed radiation necrosis following adjuvant radiotherapy for recurrent breast cancer

Rakesh Quinn[1]
Sarah Forsyth[1]
Thomas Lam[1]
Farid Meybodi[1]
Verity Ahern[1]

Author details can be found at the end of this article

Correspondence to:
Rakesh Quinn; rakesh.quinn@health.nsw.gov.au

Introduction

Radiation therapy is a common treatment modality following surgical intervention for invasive breast cancer. Almost all patients experience some degree of acute radiation dermatitis, typically mild to modest erythema. Chronic radiation tissue injury is a rare presentation that can present several years later. It is a complex problem, that is often resistant to conservative management and requires a multidisciplinary approach.

Case report

A 66-year-old woman presented with an 8x8 cm deep ulcerating right chest wall wound in 2021 (Figure 1). She was an otherwise fit lifelong non-smoker taking no regular medications. She had undergone a right simple mastectomy and adjuvant radiotherapy for invasive breast cancer in China in 1989. Three years later, she underwent surgical excision of a recurrence, followed by further radiotherapy in China. Information about the tumour pathology, radiotherapy dose, fractionation and modality was unobtainable.

In 2012 the patient was referred to a radiation oncologist at the authors' centre with telangiectasia, connective tissue fibrosis and skin atrophy approximately 10x10 cm corresponding to an area of radiation fibrosis, which is likely to represent the region of reirradiation in this case. Within this area and covering the medial end of the mastectomy scar was a 1–2 cm scaling scab. This lesion intermittently healed but had a relapsing superficial ulcer that gradually increased in size. In the 2 months before re-presentation, the width and depth of the ulcer rapidly progressed.

A left mammogram and bilateral ultrasound of the breast and axilla showed no abnormalities. A thoracic computed tomography scan demonstrated dystrophic calcification along the scar with a soft tissue density, overlying the right 4^{th}–7^{th} ribs. Fluorodeoxyglucose positron emission tomography (FDG-PET) scan showed increased metabolic activity in this region only. Punch biopsies from the depth of the wound, its lateral edge and skin of the ipsilateral chest wall distant to the wound showed no evidence of malignancy, only changes consistent with chronic radiation dermatitis.

A consultant at a hyperbaric oxygen unit was consulted and definitive surgical excision without hyperbaric oxygen was recommended. Wide excision and debridement of the chest wall was performed. Intraoperative assessment of the underlying ribs by a cardiothoracic surgeon deemed resection of ribs unnecessary. The defect was reconstructed with a pedicle transverse rectus abdominus myocutaneous flap (Figures 2 and 3). Histopathological examination showed radiation dermatitis without evidence of malignancy. On follow up the flap had completely healed.

Discussion

Chronic radiation dermatitis developing years after radiation treatment with soft tissue breakdown can occur secondary to impaired vascularity, replacement of healthy tissue with fibrosis and impaired fibroblast proliferation (Borab et al, 2017). Late radiation tissue injury affects <10% of breast cancer survivors (Fehlauer et al, 2003). Hyperbaric oxygen treatment has been used as an adjunct treatment for radiation-induced tissue injury, despite the lack of high-quality evidence supporting its use (Borab et al, 2017; Enomoto et al, 2017). Hyperbaric oxygen is thought to aid healing by inducing angiogenesis and fibroblast proliferation (Borab et al, 2017). Many of these wounds end up requiring surgical debridement of all affected tissue, including osteomyelitic bone, and reconstruction with a musculocutaneous flap (Fujioka, 2014; Borab et al, 2017; Li et al, 2019).

Re-irradiation after resection of breast cancer recurrence improves local control compared to surgery alone (Muller et al, 2011). However, the cumulative radiation dose

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Figure 1. Chronic radiation necrosis of the right chest wall.

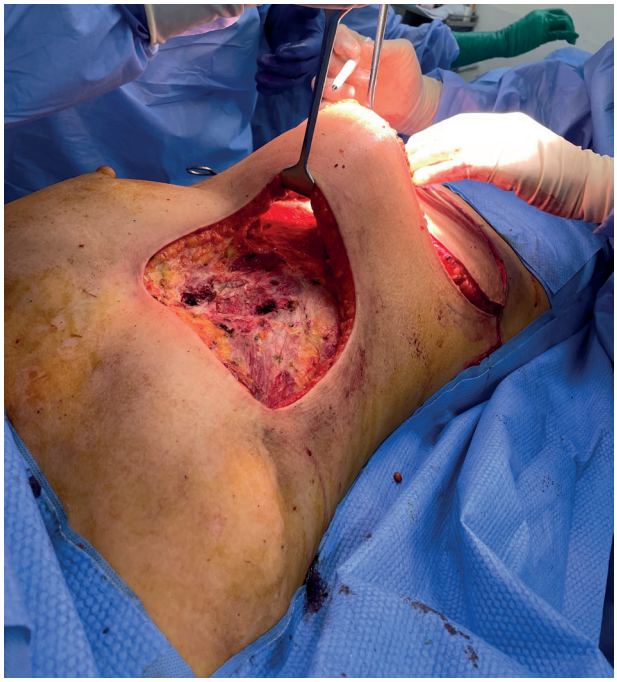

Figure 2. Transverse rectus abdominus myocutaneous flap.

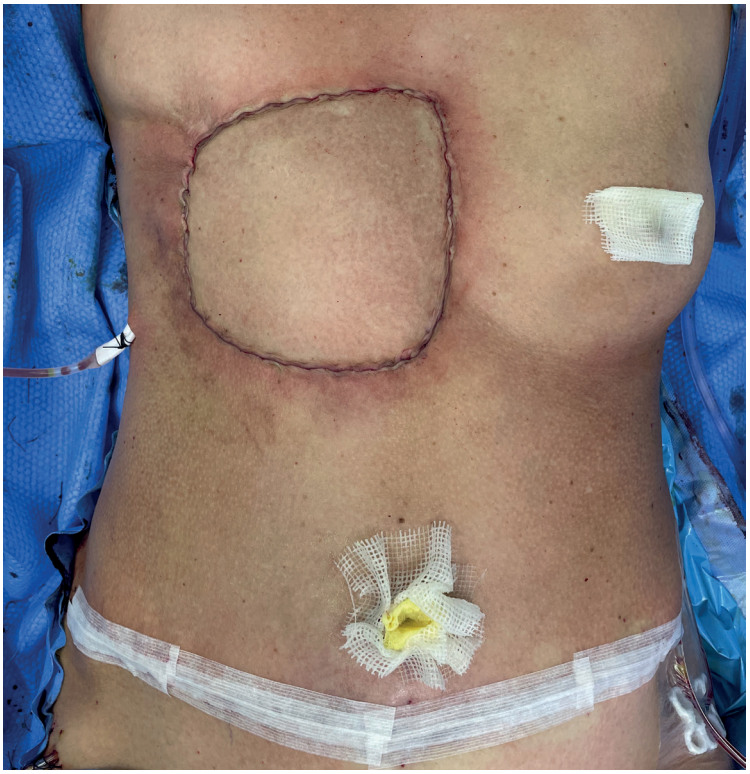

Figure 3. Postoperative outcome.

may exceed 100 Gy in 2 Gy fractions with a high risk of late complication (Muller et al, 2011). Late radiation tissue injury resulting in ulceration and necrosis is rare nowadays because of improvements in radiation treatment technologies and techniques. The severity of radiation tissue injury is dose-dependent (Ma et al, 2017). The standard treatment regimen for postmastectomy radiotherapy is 50 Gy in 25 treatments, with increasing frequency and severity of acute radiation dermatitis above this dose (Borab et al, 2017; Ma et al, 2017). This patient's cumulative radiation dose almost certainly exceeded 50 Gy and, as her initial radiotherapy took place 30 years ago, it may have been delivered by a

Learning points

- Chronic radiation-induced tissue necrosis is a known but rare complication of radiotherapy.
- Management of radiation-induced ulceration is complex because of the chronic changes in the tissue and the need for radical surgical intervention.
- Hyperbaric oxygen therapy is thought to improve angiogenesis and fibroblast proliferation, and can be used as an adjunct treatment for radiation-induced injuries.
- These patients should be managed in a multidisciplinary setting with complex wound nurse care, consultation with hyperbaric oxygen physicians and subspeciality surgical input.

cobalt machine with higher skin and bone radiation dose effects than delivered by linear accelerators (Munshi et al, 2012).

Various management techniques for chronic chest wall ulcers have been described (Martella et al, 2010; Enomoto et al, 2017; Ma et al, 2017; Li et al, 2019). Ma et al (2017) reported the largest cohort, where 85% of patients required surgical debridement and flap reconstruction. Nine patients with mild chronic radiation-induced ulcers were successfully managed conservatively with vacuum dressings. The long-term local effect of ionising radiation on tissue leads to fibroblast damage, impaired granulation tissue formation, microthrombi within small vessels and fibrotic changes (Borab et al, 2017). Therefore, moderate and severe cases of radiation-induced ulcers are less likely to respond to conservative management (Ma et al, 2017).

This case highlights the risk of re-irradiating the chest wall for recurrent breast cancer. It is a complex management problem not commonly seen which often requires multidisciplinary input and radical surgical intervention.

Author details

[1]Department of Plastic and Reconstructive Surgery, Westmead Hospital, Westmead, Australia

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