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CASE REPORT

Burns to reconstructed breasts

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The skin of a reconstructed breast is at risk of accidental burn injury. The case reports of three patients who sustained burns to insensate skin after reconstructive breast surgery are presented. In each case the mechanism of injury was different, and in each case the burn has influenced the final aesthetic outcome of the breast reconstruction. Significant thermal injury with resultant morbidity and scarring can occur from relatively minor insults. Patients must be warned of the risk of this complication.

Case reports

Case 1
A 52-year-old lady requested breast reconstruction 8 months after simple mastectomy for carcinoma. She underwent breast reconstruction using a pedicled transverse rectus abdominus muscle (TRAM) flap. At 10 months after an uneventful recovery, she sustained an area of sunburn to the reconstructed flap. This, according to the patient, followed a period of unaccustomed sun exposure. The area which was burned was covered with the fabric of her bathing costume, and she had no sunburn to areas of normal skin. Early after sun exposure the patient noted a mottled appearance of the skin of the flap, which later developed into blistering and breakdown. The deep dermal burn was treated with dressings and healed over a period of 6 weeks, but left the patient with an area of permanent scarring on the reconstructed breast (Fig. 1).

Case 2
A 44-year-old woman, diagnosed as having a breast carcinoma, elected to undergo left subcutaneous mastectomy and immediate reconstruction with a silicone implant, with augmentation of the contralateral breast. She was treated with postoperative chemotherapy and radiotherapy. She sustained a full-thickness burn of the outer quadrant of the reconstructed breast 2 months after surgery. This was caused by contact with a hot water bottle. She was taken to theatre where the burn, which extended on to the surface of the implant, was excised and the defect repaired with a local transposition flap. The flap was slow to heal but settled without problems to the underlying implant. She was left with permanent scarring to the reconstructed breast (Fig. 2).

Case 3
A 46-year-old lady underwent simple mastectomy for breast carcinoma. She was treated postoperatively with chemotherapy. She was referred for secondary breast reconstruction 2 years later. She subsequently underwent a pedicled TRAM flap.

She presented 2 months after surgery with a full-thickness burn to the upper inner quadrant of her newly reconstructed breast. The burn measured approximately 6 cm×4 cm (Fig. 3). The patient was unsure of the actual insult, but it seemed likely after discussion that the burn had been sustained from resting a cup of hot tea on the insensate flap of her reconstructed breast.

The burn was later débrided and the defect covered with a split-skin graft. She subsequently underwent scar revision, nipple reconstruction and a contralateral mastopexy, but is left with an area of permanent scarring on the reconstructed breast (Fig. 4).

Discussion

Insensate skin or skin with decreased sensation secondary to previous surgery with damage to cutaneous nerves is clearly at risk of burn or other accidental injury. Plastic surgical procedures in particular frequently involve interference in local skin sensation, through skin incisions, underlying dissection, tissue expansion, denervated local skin flaps and in the distant transfer of tissue with or without microvascular anastomosis. Current breast reconstructive methods include tissue expansion and implant insertion, and the transfer of tissue either as free flaps (TRAM) or pedicled (latissimus dorsi and TRAM) insensate flaps, all therefore carrying the risk of burn injury as is illustrated by the above case reports. The injuries illustrated have been sustained from relatively

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Figure 1. Scarring after sunburn to TRAM breast reconstruction.

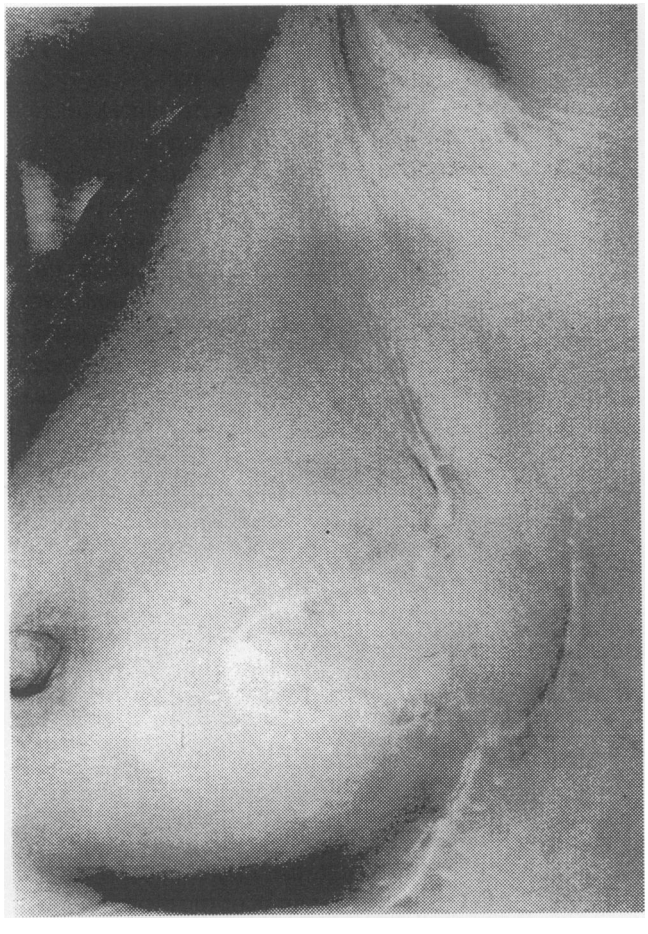

Figure 2. Scarring after local transposition flap to cover full-thickness burn defect.

minor insults, and patients should be warned both pre- and postoperatively of the potential risk of this complication. Advice should be given on the use of barrier creams and oils, as for all scars, to prevent burns to insensate skin.

Given the particular psychological stresses for the patient undergoing breast reconstruction, including that associated with the diagnosis and early treatment of breast cancer as well as the stress of further surgery, and in particular anxiety over expectations, needs and outcomes of the reconstruction, a complication of this nature is clearly disappointing.

Burns of this nature described in the literature *(1–2)* as well as those described above have ranged from 2 months to 5 years after the initial surgery, but the majority have occurred in the 1st year. It may be that the patient is more aware of the potential risk of this injury after this time, but some degree of sensory recovery may be protective.

A number of authors have published work on the recovery of sensory modalities in denervated pedicled and free flaps *(3–8)*. Slezak *et al. (4)* and Lehmann *et al. (5)* have shown in subjective testing the recovery of some sensation in pedicled TRAM flaps used in breast reconstruction. Liew *et al. (3)* showed similar findings in free TRAM flaps. Evidence of this recovery on sensory subjective testing appeared 6 months after surgery and improved over time. Axonal sprouting and ingrowth of nerves from the adjacent skin is the postulated main mechanism of this recovery, one of the factors influencing this process therefore being the presence of scar tissue adjacent to the flap. The normal sensory pattern of the donor site skin, with type and quality of sensory end organs, also influence the degree of sensory recovery, a postulated explanation for the better recovery in the TRAM flaps than in the latissimus dorsi flaps, which carry the inherently somewhat less sensitive skin from the back *(3,5)*. Liew *et al. (3)* showed the recovery of some temperature and pain sensation in the same studies. However, this sensory recovery occurs late and is incomplete, and whether it is sufficient to provide any form of protective sensory feedback is unknown.

The patient in Case 2, in common with a case described

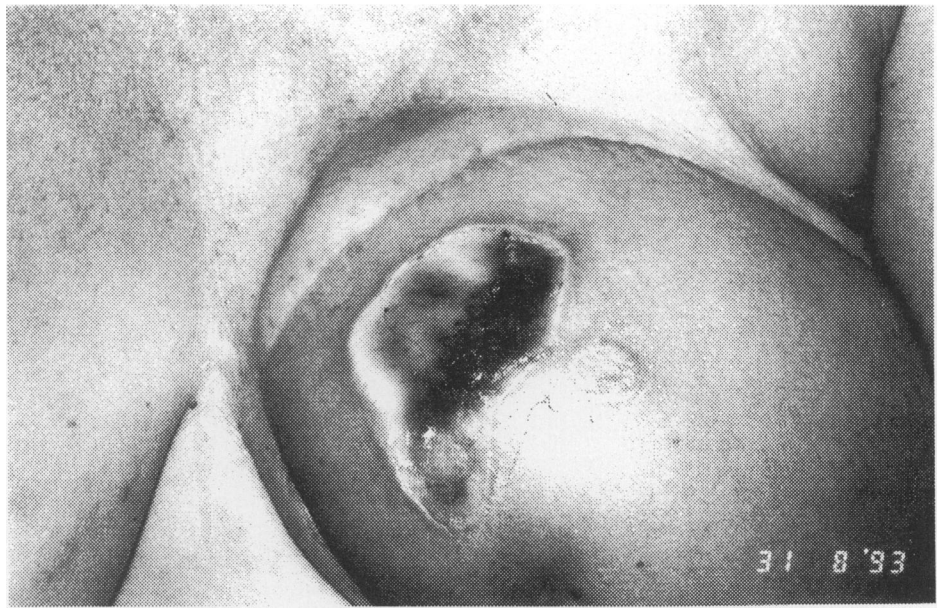

Figure 3. Full-thickness burn to left TRAM breast reconstruction.

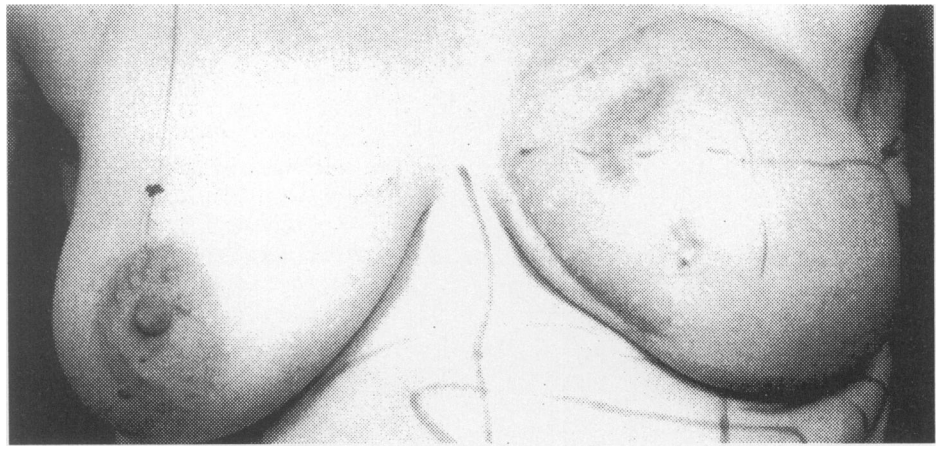

Figure 4. Resultant scarring from the burn in Fig. 3.

by Lejour *(1)*, sustained a significant burn through sun exposure. Sun exposure is clearly capable of producing a thermal injury of this severity, particularly with the lack of nociceptor sensory feedback. The patient may also risk prolonged sun exposure in an attempt to reduce the skin colour difference by tanning between the flap and surrounding skin. It is of interest to note that in common with the case described by Lejour *(1)*, the patient in Case 1 sustained her burn through the fabric of a swimming costume. In the latter, this burn was without evidence of sunburn to the surrounding sun-exposed, but not sun-acclimatised, normal sensate skin. The skin of these denervated flaps may be more prone to thermal injury, not only on the basis of lack of conscious perception of pain; a contributory factor may be the interference in normal local autonomic thermoregulatory mechanisms.

Local thermoregulatory vasodilatation, while under the control of the hypothalamic thermostat, acts both by the local effect of heat on glands and vessels leading to local vasodilatation, and by inhibitory feedback reflexes at spinal level. Temperature, heat pain and pain sensation is transmitted via C fibres to the spinal cord where fibres end in the dorsal horns. Here most decussate and travel up in the anterolateral spinothalamic tracts to the reticular areas of the brain stem, the ventrobasalar complex of the thalamus and further fibres relay up to the sensory cortex. Some of the temperature sensory fibres at the spinal level are inhibitory to the adrenergic outflow, thereby inhibiting vasoconstriction and leading to local vasodilatation and thereby heat dissipation. It is known that regional denervation leads to local vasodilatation by interrupting this reflex and that chemical or surgical sympathectomy, at least initially, causes vasodilatation and increased blood flow in the corresponding area of innervation.

Denervated pedicled flaps, being insensate, do not provide sensory temperature feedback, while free flaps would also have interruption of the sympathetic adrenergic nerve fibres which normally course the vascular supply. It may be that interruption of these reflexes makes the skin of these flaps less able to dissipate local heat by vasodilatation and increased blood flow, and therefore more liable to damaging heat accumulation and subsequent burn injury.

Turkhof *et al. (7)*, Waris *et al. (9)*, and Lahteenmaki *(10)* have shown histologically the presence of regenerating adrenergic nerve fibres across the anastomosis site after microvascular anastomosis in rats, and Lahteenmaki *(10)* the presence of regenerated adrenergic nerves in a free microvascular groin flap in the rat.

Autonomic dysfunction in both denervated pedicled and in free flaps and its recovery, along with its possible clinical relevance, requires further investigation.

Conclusion

These cases serve to illustrate the potential for burn injury secondary to sensory loss in skin after breast reconstruction. A complication of this nature, with the consequent surgical intervention, dressings and resultant morbidity, and long-term scarring is clearly a disappointment both to the patient and the surgeon, and is potentially avoidable.

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