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Original Article

The 'reading man flap' for pressure sore reconstruction

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ABSTRACT

Background: The treatment of pressure sores represents a significant challenge to health care professionals. Although, pressure wound management demands a multidisciplinary approach, soft tissue defects requiring reconstruction are often considered for surgical management. Myocutaneous and fasciocutaneous flaps can provide stable coverage of pressure sores. **Purpose:** Here, we describe our experience using a recent fasciocutaneous flap, which is named 'reading man' flap, in sacral, ischial, and trochanteric pressure sores. **Materials and Methods:** During a period of 1 year the authors operated 16 patients, 11 men, and 5 women, using the reading man flap. The ages of the patients ranged from 24 to 78 years. The location of pressure sores was 8 sacral, 5 ischial, and 3 trochanteric pressure sores. The mean size of pressure sores was 8 cm × 9 cm. **Results:** All pressure sores covered bt the Reading Man flap healed asymptomatically. After follow-up of 2-8 months, no recurrences were encountered and no further surgical intervention was required. **Conclusion:** The reading man flap was found to be a useful technique for the closure of pressure sore in different anatomic locations. The advantage of tension-free closure and the minimal additional healthy skin excision made this flap a useful tool in pressure sore reconstructions.

KEY WORDS

Local flap; pressure sore; 'reading man' flap

INTRODUCTION

The treatment of pressure sores is a challenge for the health care professionals because they are difficult to heal have tendency to recur, add significantly to the health care cost and are often compounded by significant medical illness.[1] The complications and the recurrence rates are the major problems in pressure sore reconstructions, which are reported variedly from 7% to 62%.[2,3]

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It is widely accepted that invasive type 3 or 4 pressure sores require surgical intervention, because the conservative non-surgical therapy is extremely extended and increases the possibility of early recurrence.[4] The myocutaneous flap was the first choice in pressure sore reconstruction, providing the theoretical advantages of eliminating the dead space because they are bulky, they have a good blood supply to overlying soft tissues, and they have superior resistance to infections.[5] However Thiessen *et al*.

performed 37 muocutaneous flaps and 57 fasciocutaneous flaps in 94 pressure sores and after a mean follow-up of 3.1 years they found that complication and the recurrent rates were not associated with the type of the flap.[6]

In this study, we present our experience in pressure sore reconstruction using a recent fasciocutaneous flap, which is named "reading man flap'.[7] The flap was first described in 2007 for the closure of skin defects in face, trunk, and extremities. The name of the flap was given because its design resembles the silhouette of a man who is reading a book held in his hand.[7] Until now there no references in the medical literature for use of this flap in pressure sore reconstruction.

MATERIALS AND METHODS

Over a period of 1 year we operated 16 patients, 11 men and 5 women. The ages of the patients ranged from 24 to 78 years. There were 8 sacral, 5 ischial, and 3 trochanteric sores. The mean size of the defects after debridement was 8 cm × 9 cm (ranged from 3 cm × 4 cm to 18 cm × 15 cm) [Table 1]. All the pressure sores were invasive types 3 and 4. The mean follow-up was 5 months (2-8 months) which was admittedly short.

Surgical technique

After adequate wound-bed preparation, infection control, and improvement of nutritional parameters, the surgery was scheduled. The patients were operated in general or regional anaesthesia. They were placed in prone or lateral decubitus position depending upon the site of the pressure sore. Local infiltration ofand epinephrine 1:200.000 was followed by a thorough debridement of the calcified tissues, bursa, and bone (the bony prominences were always flattened) until viable tissues were encountered. The finally defect in all cases was almost circular and measured again in order to design the reading man flap.

Table 1: Patient data

Sex	*Age*	*Diagnosis*	*Defect size after debridement (cm)*	*Status*
M	63	Sacral sore	5 × 5	Quadriplegia
F	56	Sacral sore	3 × 4	Paraplegia
M	24	Sacral sore	15 × 18	Paraplegia
M	68	Sacral sore	12 × 8	Cardiac surgery
F	71	Sacral sore	18 × 15	Paraplegia
M	43	Sacral sore	11 × 13	Paraplegia
F	78	Sacral sore	10 × 9	Paraplegia
M	54	Sacral sore	13 × 13	Quadriplegia
M	47	Ischial sore Lt	7 × 8	Lower leg weakness
M	63	Ischial sore Lt	5 × 6	Paraplegia
F	29	Ischial sore Lt	5 × 7	Lower leg weakness
M	32	Ischial sore Rt	5 × 4	Quadriplegia
M	73	Ischial sore Rt	7 × 9	Femur fracture
M	61	Trochanteric sore Lt	6 × 8	Lower leg weakness
F	52	Trochanteric sore Rt	5 × 8	Paraplegia
M	59	Trochanteric sore Rt	9 × 6	Quadriplegia

After determination of the relaxed skin tension lines in the defect area, we designed two skin flaps in an unequal Z-plasty manner. Once its direction was decided, the central limb of the unequal Z-plasty was drawn as an imaginary tangential line passing through the margin of the defect. The length of the central limb of the Z-plasty was designed to be 50% longer than the diameter of the circular defect. Beginning from the free end of this line another imaginary line is drawn with an angle of 60°. Then beginning from the other end of the central limb our third imaginary line was drawn with an angle of 45°. The two skin flaps were elevated as fasciocutaneous flaps and one flap was moved to the defect and the other was transposed to cover the first flap's donor site [Figure 1].

RESULTS

The postoperative period was uneventful. There was no flap necrosis or wound dehiscence. Drains were used for 9 ± 2 days. Follow-up ranged from 2 to 8 months (median 5 months), and none of the patients developed recurrences or required a second surgery during the follow-up [Figures 2-7].

DISCUSSIONS

The pressure wound management demands a

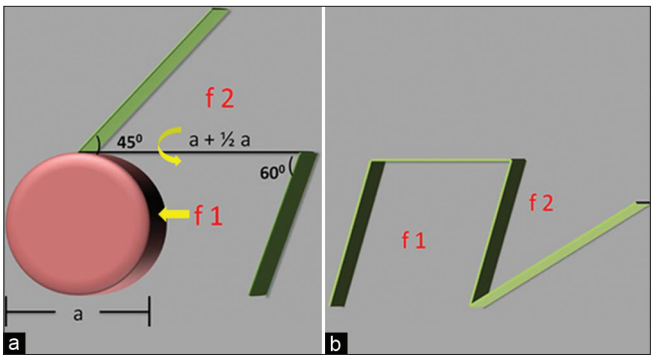

Figure 1: (a) An unequal Z-plasty is drawn and created two flaps (f1, f2). The f1 flap is used for the defect closure whereas the f2 flap is transposed for closure of donor site (b) the final result after flaps transposition

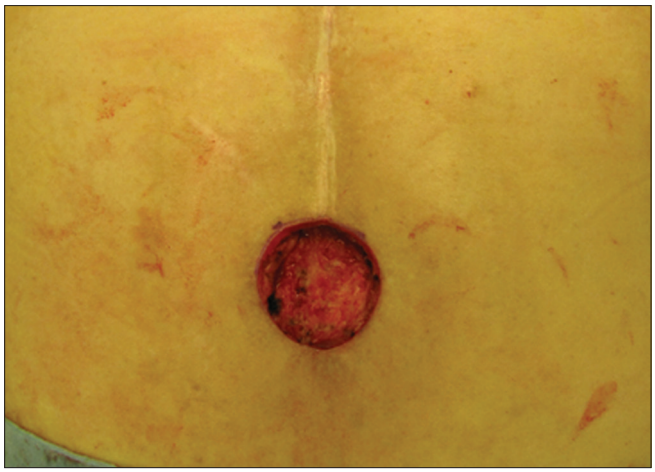

Figure 2: Sacral pressure sore area (5 cm × 5 cm) after surgical debridement

Figure 3: Second postoperative day

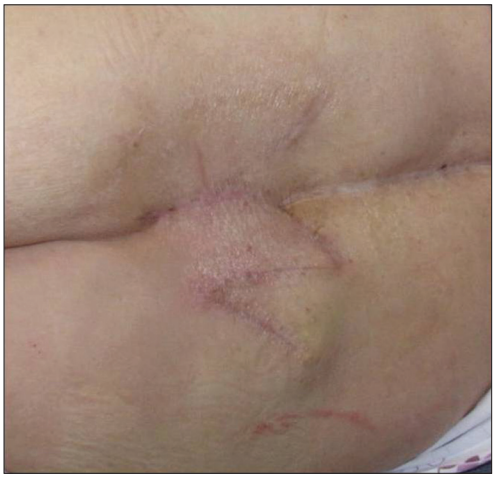

Figure 4: After 3 months

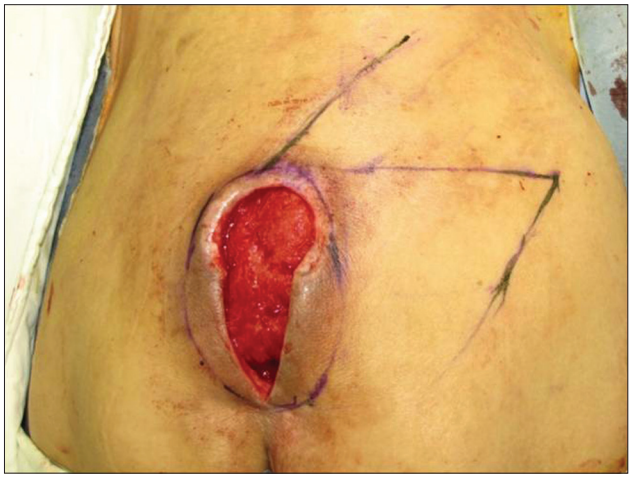

Figure 5: Sacral pressure sore (12 cm × 8 cm) before surgical debridement with 'reading man flap' design

Figure 6: Third postoperative day. No signs of ischemia or venous congestion were observed

Figure 7: After 8 months

multidisciplinary approach. The goals of management are (1) prevention of complications, particularly invasive infections, related to the existing sore, (2) preventing the existing sore from getting larger, (3) preventing sores in other locations; and if it is possible, (4) closure of the wound.

For the invasive type pressure sores (type 3 and 4), in which there is full thickness tissue loss with or without exposed muscle, bones or tendons, surgery remains the best option. In these cases attempt at healing by conservative treatment alone can be quite extended and increases the possibilities for early recurrence as the healing by secondary intention is usually resulting in unstable scars.[4]

Various myocutaneous or fasciocutaneous are used for repairing pressure sores, but in terms of lowest recurrent rate there is very little to choose between the two, and there are various other factors in the patient that contribute to recurrences.

The theoretical advantages of using muocutaneous flaps are (1) they can eliminate the dead space because they are bulky flaps, (2) they provide a well-vascularized and cushioning tissue over the a pressure bearing area.[6] and their vascularity helps fighting infection at the local site. However the long-term results and complications seem to be the same with the fasciocutaneous flaps because the deneurotized muscle becomes atrophic and loses its dynamic function and the ability to absorb the pressure.[8] Thiessen *et al*.[6] in their study showed that the complications and the recurrent rates were similar with myocutaneous and fasciocutaneous flaps.

Yamamoto *et al*. reported that the use of the fasciocutaneous flap is expected to provide a better long-term result in surgical reconstruction of pressure sores than the myocutaneous or muscle flap.[9] Lin *et al*. using a posterior-thigh fasciocutaneous flap for the treatment of ischial pressure sores in 12 patients had only two recurrences after 24 and 27 months.[10] In addition Homma *et al*. suggested the use of posteromedial thigh fasciocutaneous flap for reconstruction of primary or recurrent ischial pressure ulcers.[11]

The major advantage of fasciocutaneous flaps is the preservation of the underlying muscle, which is particularly important to ambulatory patients. In terms of skin defect size, a local flap is the ideal alternative. It requires a simple and safe procedure with minimal invasion and preserves the underlying donor tissues for further reconstruction. Although the local fasciocutaneous flaps like the Limberg flap has stable circulation, they are inappropriate for large skin defects because inappropriate wound tension occurs, leading to dehiscence.[12]

Since the advent of perforator flap, several flap designs have been proposed for the coverage of sacral, ischial, and trochanteric pressure sores. However the lack of the simplicity of these flaps makes them not very attractive surgical option for many surgeons.

In our cases we used a local flap (reading man flap), based on the Z-plasty concept for pressure sore reconstruction. The advantage of this flap compared to other local flaps such as Limberg, banner, and Dufourmentel (1) is that it results minimal distortion and displacement of the neighbouring mobile anatomic structures, so the defect closure is done with lesser tension and (2) the amount of additional healthy skin excision is less than that in the Limberg flap.[13]

However, the existence of osteomyelitis or big cavity in the ischical or trochanteric region is a contraindication for this flap as this flap is not able to fill the dead space.

CONCLUSION

We used the 'reading man' flap in 16 patients with pressure sores in different anatomic locations and achieved wound close with minimal tension. In the postoperative period there was no wound dehiscence, flap necrosis, haematoma, or infection and during our limited follow up we encountered no pressure sore recurrence. Among the many surgical options for the reconstruction of pressure sore, the 'reading man' flap is an easy, effective, and trustful alternative method.

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