

Reverse turnover pedicled latissimus dorsi muscle flap for lower back reconstruction

Two case reports

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Abstract

Rationale: Large soft tissue defects on the lower back represent a treatment challenge. Among a variety of reconstructive procedures, the latissimus dorsi (LD) muscle or musculocutaneous flap is one of most frequently used pedicled flaps. However, the pedicled LD flap carries a bulky pivot point and a short arc of rotation. If a pedicled LD muscle flap is transferred using a reverse turnover pattern, these drawbacks can be avoided.

Patient concerns: The first patient was a 56-year-old man with hepatocellular carcinoma and multiple bone metastases involving D11-L4 vertebral bodies. A chronic ulcer was developed on his lower back area after palliative radiation therapy for bone metastases. The second patient was a 41-year-old man with a soft tissue mass on his lower back, which was diagnosed as dermatofibrosarcoma protuberans via previous incisional biopsy. A large soft tissue defect was developed on his lower back as a result of a wide resection.

Diagnosis: Both patients were referred to our department for the treatment of a large soft tissue defect on lower back.

Interventions: They underwent the reverse turnover pedicled LD muscle flap and split-thickness skin graft.

Outcomes: At postoperative 6-month follow-up, both patients remained free of wound problem.

Lessons: The reverse turnover pedicled LD muscle flap is quite straightforward. Even if a soft tissue defect in the lower back is large or complicated by infection or radiation therapy, perfusion of LD by posterior intercostal arteries is likely to be preserved. We recommend the reverse turnover pedicled LD muscle flap as an effective alternative for reconstruction of soft tissue defects involving the lower back.

Abbreviations: D11 = 11th thoracic, D12 = 12th thoracic, L1 = 1st lumbar, L2 = 2nd lumbar, L3 = 3rd lumbar, L4 = 4th lumbar, LD = latissimus dorsi, STSG = split-thickness skin graft.

Keywords: latissimus dorsi, lower back defect, pedicled flap, reverse turnover flap

1. Introduction

Soft tissue defects in the lower back may result from trauma, tumor, spine surgery, infection, radiation therapy, or congenital anomalies. Reconstruction of soft tissue defects in this area is challenging, particularly when patients' general condition is poor or when defects are large. Various reconstructive methods including local rotational or transposition flaps, pedicled muscle and musculocutaneous flaps, perforator-based propeller flaps,

and free flaps have been introduced to repair soft tissue defects in this area.^[1-5] Among them, the latissimus dorsi (LD) muscle or musculocutaneous flap is one of most frequently used pedicled flaps. However, the LD flap carries a bulky pivot point and a short arc of rotation. To address these drawbacks, the LD muscle flap can be transferred to soft tissue defects in a reverse turnover. We present here 2 cases of soft tissue defects involving lower back area that were reconstructed using a reverse turnover pedicled LD muscle flap and split-thickness skin graft (STSG). Informed written consents were obtained from the patients for publication of this case report and accompanying images. Ethical approval of this study was waived by the ethics committee of our institution because it was a case report.

2. Case report

2.1. Case 1

A 56-year-old man was referred to our department for the treatment of a chronic ulcer located on his lower back area. The patient was diagnosed with hepatocellular carcinoma associated with underlying chronic hepatitis B and alcoholic liver cirrhosis. He underwent the transcatheter arterial chemoembolization procedure 14 times and the radiofrequency ablation twice for the treatment of hepatocellular carcinoma. Although the patient was stable without the development of new lesions for 4 years, multiple bone metastases involving D11-L4 vertebral bodies were

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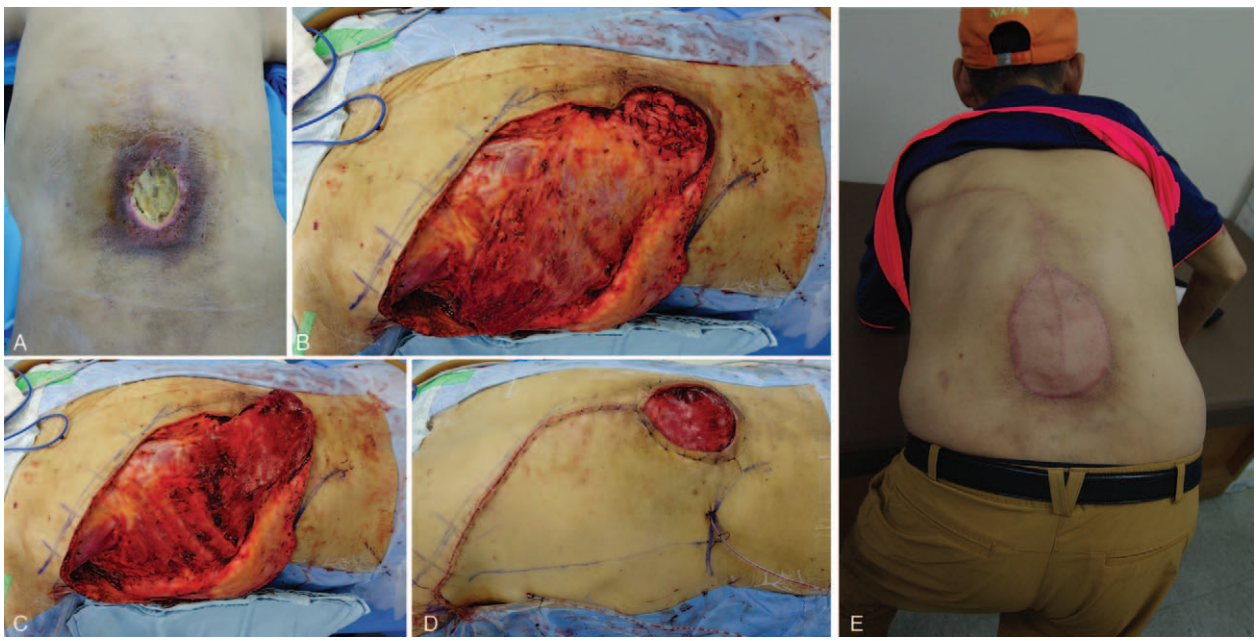


Figure 1. A preoperative clinical photograph (A) of a 56-year-old man (Case 1) diagnosed with chronic radiation ulcer. After radical debridement, a soft tissue defect measuring about 15×10 cm was reconstructed with a reverse turnover pedicled LD muscle flap. The flap was covered with a STSG (B-D). A last follow-up photograph (E) was taken at 6 months postoperatively. A stable postoperative scar was found without any recurrent wound problem. LD = latissimus dorsi, STSG = split-thickness skin graft.

detected at the regular follow-up. He was treated with palliative radiation therapy for D11-L4 metastases and kyphoplasty for D12, L1, and L3 pathologic compression fractures. Fifteen months later, a soft tissue defect was detected at the site of previous radiation therapy involving his lower back. He was prescribed antibiotics and wound care for 6 months; however, the wound condition worsened. When the patient was referred to our department, a spherical soft tissue defect was detected on the midline lumbar area at L2–3 level (Fig. 1A). The defect was largely infected, necrotic and extended deeply to spinous process, interspinous ligament, thoracolumbar fascia and paraspinal muscles. The bacterial culture of the defect was positive for mixed bacterial flora. The condition of surrounding skin and soft tissues was also bad due to previous radiation therapy. Based on the patient's medical history, lean body, and condition of the soft tissue defect, a reconstruction with pedicled muscle flap and STSG was planned. Although conventional reverse LD muscle or musculocutaneous flap was also applicable, a reverse turnover LD muscle flap was preferred to avoid a short arc of rotation. The surgical procedure comprised a sequence of initial thorough debridement and subsequent coverage with a reverse turnover LD muscle flap and STSG. The radical debridement of infected and necrotic tissues including excision of bilateral paraspinal muscles and resection of spinous process of L2 to L4 resulted in an oval 15×10 cm soft tissue defect with a rough floor. A generous skin incision was made from the posterior axillary fold via T7 spinous process to the soft tissue defect along the medial margin of the LD. The dissection between the dorsal surface of the LD and the overlying skin and subcutaneous tissue was performed to expose the whole LD. After transection of the humeral insertion of the LD and ligation of the thoracodorsal artery, veins, and nerve, the LD was separated from the underlying chest wall (Fig. 1B). The aponeurotic origin of the LD from the thoracic spines was divided and the LD was flipped over to reach the soft tissue defect (Fig. 1C). Dissection between the LD and the underlying chest

wall was attempted only until the inverted LD totally covered the soft tissue defect and the perforators from the posterior intercostal arteries were preserved. After the flap was inset and the donor site was closed, a STSG was applied to the flap (Fig. 1D). Postoperative ambulation was allowed immediately. However, the supine position was prevented until the sutures were removed on the day 14 postoperatively. The postoperative course was uneventful, and the flap and grafted skin survived completely. At postoperative 6-month follow-up, no wound recurrence was detected (Fig. 1E).

2.2. Case 2

A 41-year-old man was referred to our department for the treatment of a soft tissue defect involving his lower back. He underwent wide resection of a soft tissue mass, which was diagnosed as dermatofibrosarcoma protuberans via previous incisional biopsy. The surgical treatment included en bloc excision of the mass with 5 cm safety margins, resection of L1 to L4 spinous processes, partial resection of bilateral paraspinal muscles, and adjuvant anhydrous ethanol ablation. When the patient was referred to our department, a teardrop soft tissue defect was found on the midline lumbar area at D12-L5 level measuring about 15×17 cm (Fig. 2). The defect was scheduled for reconstruction with a reverse turnover LD muscle flap and STSG. After incising the skin along the medial margin of the LD from the posterior axillary fold to the soft tissue defect, the whole LD was exposed. The humeral insertion of the LD and the thoracodorsal pedicle were sacrificed. The LD was separated from the underlying chest wall and flipped over to reach the soft tissue defect. Dissection between the LD and the underlying chest wall was carried out only until the inverted LD totally covered the soft tissue defect and the perforators from the posterior intercostal arteries were preserved. After the flap was inset and the donor site was closed, the flap was covered with a STSG. The



Figure 2. Preoperative (A), intraoperative (B–D), and postoperative (E) clinical photographs of a 41-year-old man (Case 2) who underwent reverse turnover pedicled LD muscle flap for reconstruction of the lower back defect, which was caused by wide resection of the dermatofibrosarcoma protuberans. The last follow-up photograph (D) was taken at postoperative 4 months. LD = latissimus dorsi.

postoperative course was uneventful. At postoperative 4-month follow-up, the patient remained free of wound problem.

3. Discussion

In the era of perforator flaps, various perforator flaps such as dorsal intercostal, lateral intercostal, subcostal, lumbar, superior gluteal artery perforator flaps have been documented for lower back reconstruction.^[1] Perforator flaps require tedious dissection and a high level of surgical proficiency. In addition, situations in which patient's condition is not suitable to perform perforator flap are not rare. In this regard, the pedicled LD flap is still a very versatile reconstructive tool for lower back reconstruction. When the pedicled LD flap is harvested in a reverse pattern, soft tissue defects of lower back can be covered without tedious dissection and microvascular anastomosis. The reverse pedicled LD flap was first introduced by Bostwick et al^[6] in 1980. The LD is a type V muscle according to the Mathes and Nahai classification having both a dominant and a secondary blood supply.^[7] The dominant blood supply is derived from the thoracodorsal artery and the secondary blood supply is contributed by the perforators of the posterior intercostal arteries. The muscle can survive in its entirety if either pedicle is interrupted. Dorsal perforating branches from the ninth, tenth, and eleventh posterior intercostal arteries can nourish whole LD without blood supply from the thoracodorsal artery. Therefore, reverse pedicled LD flap can be elevated quickly until sizable perforators from the ninth or tenth intercostal space are encountered.

The disadvantages of the conventional reverse pedicled LD flap are bulky pivot point and a short arc of rotation. To reach soft tissue defects, the muscle pedicle should be rotated 2-dimensionally, resulting in a hump of muscle pedicle, which restricted the arc of rotation significantly. Although the width of pedicle can be decreased by splitting the LD, this may increase the uncertainty of flap circulation. If a reverse pedicled LD muscle flap is transferred using a reverse turnover pattern, these drawbacks can be avoided. In a reverse turnover pedicled LD muscle flap, a flap is harvested without skin paddle and flipped over to reach the soft tissue defect. As LD is very thin, this three-dimensional flip does not induce bulky fold and transfer the muscle without limiting the arc of rotation. The reverse turnover pedicled LD muscle flap was first reported by Giesswein et al^[8] in 1994, although they supercharged the flap with the superior gluteal artery and veins. In 2001, Yamamoto et al^[9] reported the reverse turnover pedicle LD muscle flap without any additional procedure. Since then, 5 adult cases and 12 pediatric cases have been reported in English literature.^[10–13] All pediatric cases involved myelomeningocele defects.^[11,12] Among 5 adult cases, 2 were associated with post-spinal surgery wounds with cerebrospinal fluid leakage, 1 case involved a paraplegic patient with chronic ulcer, 1 case represented sacral defect caused by life-threatening trauma, and 1 case included pelvic defect caused by acute fulminant gas gangrene.^[10,11,13] Preoperative localization of posterior intercostal artery perforators using Doppler was performed only in 2 cases in which full-length LD covered the sacral or pelvic defects.^[10,13] Preoperative Doppler evaluation was not performed in other cases. We also did not carry out preoperative perforator localization. The posterior intercostal artery perforators are usually sizable with robust blood supply to the LD.

Therefore, preoperative Doppler evaluation is unnecessary for the reverse turnover pedicled LD muscle flap.

In this report, we describe 2 cases of soft tissue defects involving the lower back. One case was a chronic radiation ulcer and the other case involved a malignant soft tissue sarcoma. Both cases were successfully treated with the reverse turnover pedicled LD muscle flap. The LD carries blood supply from multiple sizable perforators of the posterior intercostal arteries. Even if a soft tissue defect in the lower back is large or complicated by infection or radiation therapy, perfusion of LD by posterior intercostal arteries is likely to be preserved. Moreover, reconstruction with the reverse turnover pedicled LD muscle flap is quite straightforward. We recommend the reverse turnover pedicled LD muscle flap as an effective alternative for reconstruction of soft tissue defects involving the lower back.

Author contributions

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