

Double-Pedicled Free Deep Inferior Epigastric Perforator Flap for the Coverage of Thigh Soft-Tissue Defect

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Summary: Soft-tissue defects caused by radiation injury are a challenging task for the reconstructive surgeon, due to the extent of the soft-tissue damage and the associated injuries of the local blood vessels and bone tissue. We present the application of the versatile deep inferior epigastric perforator (DIEP) flap for the coverage of an extended lateral thigh soft-tissue defect after the surgical resection of an undifferentiated pleomorphic high-grade sarcoma, neoadjuvant chemotherapy, and adjuvant chemo- and radiotherapy. A double-pedicled free DIEP flap (756 cm²) was harvested and anastomosed to the transverse branch of the lateral femoral circumflex artery and a lateral branch of the popliteal artery (P1). The flap survived completely without serious complications, and the patient was able to walk with crutches 3 months postoperatively. This is the first case report of a free bipedicled DIEP flap for the coverage of a thigh defect in a male patient. (*Plast Reconstr Surg Glob Open* 2017;5:e1372; doi: 10.1097/GOX.0000000000001372; Published online 28 August 2017.)

The current limb salvage therapy for soft-tissue sarcoma involves surgery associated with radiotherapy (RT), administered pre- or postoperatively, depending on the histological type, the grade of differentiation, and the margins of surgical resection. Despite the current advances in RT, adverse effects are still encountered. Among these soft-tissue and bone necrosis, local infections and tissue vascularity disruptions are most feared.¹

The ideal reconstruction of soft-tissue defects after RT should provide distant nonirradiated tissue to cover important structures such as blood vessels, nerves, and bone.^{2,3}

The deep inferior epigastric perforator (DIEP) flap, initially described by Allen and Treece,⁴ is a versatile, reliable voluminous flap mainly used in breast reconstruction, which can provide a good alternative for the coverage of large soft-tissue defects in other body parts^{5,6} based on a reliable vascular supply and low donor-site morbidity. When the flap is transferred in its entirety, using either the free or the supercharged inferior epigastric pedicles provides more safety for the flap survival.⁷

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METHODS

A 66-year-old man was diagnosed with an extensive undifferentiated pleomorphic sarcoma of the vastus lateralis and rectus femoris muscles of the right thigh. The neoadjuvant chemotherapy and R0 resection of the tumor were followed by adjuvant chemotherapy and RT, according to the decision of the tumor board. Two months after the end of the oncological therapy, the patient was readmitted to our clinic with an infection of the irradiated area and an open wound of approximately 250 × 50 mm (Fig. 1) on the anterolateral side of the thigh with exposed femoral bone. After serial wound debridements and vacuum therapy, the wound was conditioned for a plastic surgical coverage. The vitality of the exposed femoral bone was proved by the histological investigation of several drill holes as well as by magnetic resonance imaging with contrast agent and positron emission tomography scan (Fig. 2).

As a limb salvage procedure, a DIEP flap was used for the reconstruction. Considering the defect size after debridement (400 × 200 mm), the whole flap was used for coverage, by using both deep inferior epigastric pedicles.

On supine position, first the recipient vessels were identified—the descending branch of the circumflex femoral artery with the 2 venae comitantes and further distally a lateral branch of the popliteal artery (P1) together with 2 venae comitantes.

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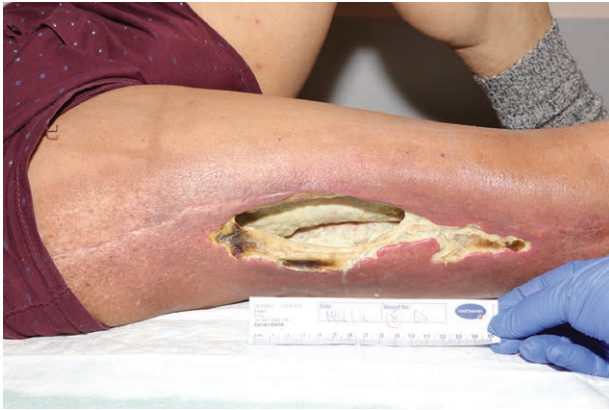


Fig. 1. Radionecrosis wound at admission.



Fig. 2. Soft-tissue defect after radical debridement with the exposed femur and the bone biopsy sites.



Fig. 3. Double DIEP flap first day postoperatively.



Fig. 4. Double DIEP flap 12 weeks postoperatively.

Consequently, a bipediced DIEP flap (756 cm²) was harvested. The vessel anastomosis was performed under the operating microscope in an end-to-end manner.

Postoperatively, the patient received a continuous heparin intravenous infusion (400 IU/h) for 5 days and then aspirin (100 mg/d) for the next 3 weeks. Six days postoperatively, a hematoma was identified on the left side of the abdominal wall, which was subject to an operative revision. A seroma developed under the flap, which was treated conservatively with negative pressure drainage for 10 days postoperatively. Gradually weight bearing was permitted with crutches. The patient was released on the 10th postoperative day.

RESULTS

On follow-up 24 weeks after surgery, the flap was vital with good scarring and an excellent aesthetic result. The patient could walk with crutches (Figs. 3, 4). The donor site showed no signs of hernia or bulging.

DISCUSSION

In this article, we present the first case of a free bipediced DIEP flap for thigh reconstruction.

When used as a single-pedicle flap based on only one of the deep inferior epigastric vessels, the vascular supply

of the DIEP flap is sufficient for only a part of the abdominal wall tissue and the zone IV opposite to the vascular pedicle must be commonly discarded. To facilitate the transfer of the whole abdominal skin and fat for larger defect coverage, the use of both the inferior epigastric vessels has been described. Although its use for the reconstruction of the lower extremity is well known, this is one of the first reported bipediced DIEP flaps for the reconstruction of the thigh. Grinsell et al.⁸ reported the use of a preexpanded double DIEP flap, but the reconstruction was performed more caudally around the knee and intraflap anastomoses were used. Van Landuyt et al.⁵ reported a series of 25 DIEP flaps for lower extremity reconstruction, of which 6 were bipediced, all used for leg reconstruction. Mahajan et al.⁶ reported a series of 12 bipediced DIEP flaps for the reconstruction of limb soft-tissue defects in male patients, of which in 2 cases the thigh was reconstructed after femur radionecrosis. Furthermore, these cases involved the use of an intraflap anastomosis and not of 2 extraflap anastomosis, as in our case. Although the literature provides similar results with intraflap as with extraflap anastomosis of the second pedicle, we find it more reliable in using 2 separate extraflap anastomosis when possible. This minimizes the risk of to-

tal flap failure in the case when one of the anastomoses becomes thrombosed and at the same time it ensures an enhanced blood flow through the flap.

The advantage of using a bipediced DIEP flap is that there is no sacrifice of functioning muscle and the dimension of 2 or 3 perforator flaps is provided with a single donor scar.^{5,8} Although some older studies have reported increased hernia and bulge formation after harvesting a bipediced DIEP flap rather than a single-pediced DIEP, the latest studies show no differences in the complication rates between the 2 techniques.^{9,10} In our case, 12 weeks after surgery the patient showed no signs of abdominal wall impairment.

The rate for partial and complete flap necrosis is reported in the literature to be between 0–11, 1%, and less than 3%, respectively.¹¹ Our flap showed no signs of necrosis. The development of a postoperative donor-site hematoma and seroma is a relatively rare occurrence after DIEP-flap harvesting, with a reported incidence of 3.7%.¹² In our case, a revision of the donor site was necessary due to a hematoma formation, without further complications.

CONCLUSION

The bipediced DIEP free flap supplies a viable source of soft-tissue coverage in the case of extended lower extremity soft-tissue defects.

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