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A simplified approach to reconstruction of hemipelvectomy defects with lower extremity free fillet flaps to minimize ischemia time

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Summary External hemipelvectomy associated with trauma or during the operative management of musculoskeletal sarcomas may yield a soft tissue defect that can only be sufficiently covered by free tissue transfers. The application of "spare-parts surgery," such as a fillet of leg or thigh flap, uses distal uninvolved parts that are otherwise viable tissues as donor tissues to cover defects. This concept has great utility to achieve soft tissue coverage in challenging cases, such as hemipelvectomy. However, during such complicated and time-consuming cases, prolonged ischemia time of the proposed donor tissues can be problematic. We describe a technique developed by the senior author (SJK) that minimizes the ischemia time of donor free tissues during external hemipelvectomy. This technique is applicable to other surgeries where filleted spare parts are the donor-site source for free tissue transfer.

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Introduction

Reconstruction of defects created after external hemipelvectomy can be a daunting task. Often, the reconstructive surgeon is challenged with coverage of a massive area with exposed pelvic girdle, orthopedic/spinal implants, and pelvic viscera. Resection margins required for malignant sarcomas or massive benign aggressive lesions often render local tissues unfit for use as rotation flaps or pedicled flaps. Moreover, the extensive surface area, deep cavities, and the need for padding of pressure bearing points require a very large flap that contains vascularized skin and subcutaneous fat, plus additional vascularized muscle and fascia.

The fillet flap represents the implementation of the concept of "spare-parts surgery." The fillet flap, described over 25 years ago,[1,2] has enjoyed success in many reconstructive settings because of a readily available large volume of vascularized tissues and lack of donor-site morbidity. More recently, when used as a free tissue transfer, the lower extremity fillet flap has been described as a reconstructive option for complicated defects such as that resulting from hemipelvectomy.[3–6] However, due to the concern of the impact of prolonged ischemia times on the flap donor tissues that is required when both flap dissection and transfer follow the hemipelvectomy, widespread adoption of lower extremity free fillet flaps for reconstructive coverage of hemipelvectomy defects has been limited. In an effort to reduce warm ischemia time (by converting warm to a cold ischemia time), Yamamoto et al. suggested isolating the fillet flap vascular supply first, with harvest and placement of the flap in crushed ice and water after the hemipelvectomy was completed.[6] Boehmler[7] suggested a two-stage procedure in which the fillet flap was dissected free and immediately anastomosed in the contralateral femoral vessel, with planned return to the operating room in 3 days for wound flap coverage. Although theoretically allowing temporary patient resuscitation, as described, this approach requires 2 staged operations of considerable length and additional vascular anastomoses.[7]

To best of our knowledge, the current literature lacks a simplified method that allows for a reduction in overall ischemia time of fillet of lower extremity free flaps when used for coverage of hemipelvectomy (or other site) defects. We report a novel, yet simple, approach to the reconstruction of hemipelvectomy defects using lower extremity free fillet flaps with minimal flap ischemia time, performed as a single-stage operation in conjunction with the oncologic resection, developed by the senior author (SJK). This technique also has applications to the use of free fillet flaps in regions outside of pelvic reconstruction.

Methods

Institutional review board exemption was granted to these data. Our experience with reconstruction of hemipelvectomy defects with a free fillet flap was reviewed. The details of our technique are described. Patient demographics, oncologic profile, complications, and outcomes are reported.

Surgical technique

The patient is positioned supine, with an ipsilateral hip bump as needed to elevate the hemipelvis. An upper body and lower body air warmer is used, as well as thermal retentive garments placed on the patient's head and nonoperative extremities. Large-bore peripheral or central intravenous access is secured, and a Foley catheter equipped with a temperature probe placed. Sequential compressive devices and compressive stockings are placed on the uninvolved extremity. Prior placement of an inferior vena cava filter may be warranted in select patients.[8] The patient is prepped completely with chlorhexidine[9] from the umbilicus to posterior midline to the foot, including both the oncologic and lower extremity operative areas. Although all operative areas are fully prepped and draped, only the lower extremity is initially exposed. The reconstructive surgical team begins the operation by placing an incision over the anterior tibia (Figure 1). Dissection proceeds laterally in the subfascial plane, mobilizing the muscle compartments with the attendant neurovascular structures. The tibia and fibula are dissected free in a subperiosteal fashion; the fibula is discarded. Next, circumferential incisions are made at the tibial tuberosity and proximal ankle, and all additional soft tissue attachments are divided (Figure 2). An extension of the incision is

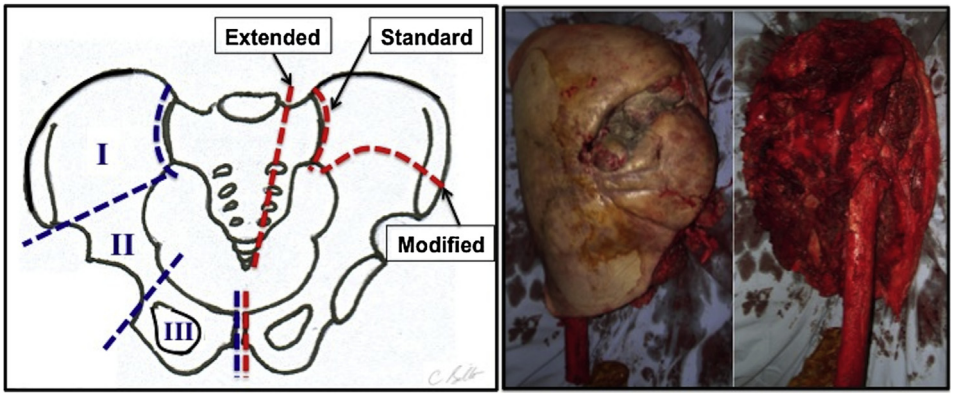

Figure 1 Anterior skin incision marked on anterior tibia and circumferential proximal and distal extensions.