Journal of Pediatric Surgery (2012) 47, E13–E17

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Journal of Pediatric Surgery

www.elsevier.com/locate/jpedsurg

Two different flaps for reconstruction of gunshot wounds to the foot and ankle in a child

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Received 3 February 2012; revised 27 March 2012; accepted 28 March 2012

Key words:
Gunshot injury;
Flap;
Foot and ankle;
Reconstruction

Abstract An 8-year-old boy was shot in his right foot and ankle, which resulted in soft tissue lesions of the medial malleolus and lateral calcaneus, fracture of the medial malleolus, and partial loss of the calcaneus. We designed a distally based sural flap and a posterior tibial perforator flap for reconstruction of soft tissue defects at the lateral aspect of the calcaneus and the medial malleolus, respectively. Both flaps survived successfully, and the boy had a normal gait during follow-up.

Reconstruction of complex soft tissue defects of the foot and ankle region in children, especially those with severe infections, has been a challenge for orthopedic and plastic surgeons for years. Although various local pedicle flaps have been developed to cover soft tissue defects, extreme demand has been placed on these flaps in terms of ease of performance, minimal discomfort, and durable coverage [1,2]. In addition, more than 1 flap procedure is needed for separate defects on some occasions. These factors may strengthen the challenges associated with donor site selection. Reconstruction of the foot and ankle in adults has been frequently noted. However, little attention has been given to the pediatric trauma population because of limited case reports and small sample volumes. In this case report, we present the combination of a distally based sural flap and posterior tibial perforator flap for coverage of soft tissue defects in the foot and ankle caused by gunshot injury in a child.

1. Case report

An 8-year-old boy was shot in his right foot and ankle, which resulted in soft tissue lesions of the medial malleolus and lateral calcaneus, fracture of the medial malleolus, and partial loss of the calcaneus. He was admitted to our unit 7 days after the gunshot injury. Open reduction and internal fixation with Kirschner wires had been performed elsewhere for the medial malleolus fracture. The dimensions of the defects at the medial malleolus and lateral calcaneus were 4 × 5 and 3 × 4 cm, respectively (Figs. 1 and 2). Significant sinus tracts and infection were observed between the ankle joint and calcaneus.

The wounds were treated with subatmospheric wound dressing (SAWD) after debridement. To maintain fracture stability, the Kirschner wires were not removed. Seven tissue samples obtained from the infected area were collected for bacterial culture and histologic examination. Antibiotics were initially administered empirically and were later administered based on culture results. Antibiotics were administered via intravenous injection.

Subatmospheric wound dressing was removed 7 days after debridement. To cover the soft tissue defects of the

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0022-3468/$ – see front matter © 2012 Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.jpedsurg.2012.03.084

Fig. 1 View of defect (4 × 5 cm) of medial malleolus with exposed fracture upon admission.

Fig. 3 Preoperative view of defect of lateral aspect of calcaneus and design of distally based sural flap.

lateral calcaneus, a distally based sural flap was designed based on a previous description by Masquelet et al [3]. In brief, a fasciocutaneous flap (4 × 5 cm, based on the size of the defect) was taken from the middle back part of the leg that was centered over the axis of the sural nerve: an imaginary line connecting the midline of the popliteal fossa to the last perforating branch of the peroneal artery, which is usually 3 to 4 cm above the tip of the lateral malleolus in children (Fig. 3). This represented the most distal point about which the pedicle could be pivoted. For flap dissection, an incision was initiated on the lateral edge of the flap and continued until the crural fascia was reached. An incision was then made in the fascia, and the dissection was continued underneath the fascia toward the pivot point. Because osseous loss and infection were noted, an extra 3 × 4–cm adipofascial flap was dissected more proximally in the donor site, which was used to fill the dead space in the calcaneus and was then covered by the fasciocutaneous flap (Fig. 4). An open tunnel was created for passage of the flap, and the donor site was closed primarily (Fig. 5). Subatmospheric wound dressing was applied on the wound at the medial malleolus for drainage. No complication was noted after coverage of the flap.

To repair the soft tissue defects at the medial malleolus, a 4 × 7–cm posterior tibial perforator flap was designed 8 days after the application of the distally based sural flap (Fig. 6). Preoperatively, a Doppler probe was used to locate the posterior tibial artery and its most distal perforating branches. The flap was designed as an island flap based on the marked perforator. The flap was then raised as a fasciocutaneous flap with the perforator piercing the fascia. The flap was transferred into the defect from an open tunnel. The donor site was also closed primarily without skin grafting (Fig. 7). The flap survived, and the infection healed well.

The patient was discharged from our unit after 37 days of hospitalization. A 26-month follow-up was performed after reconstruction of the soft tissue defects. The Kirschner wires were removed 12 months after discharge. Contour adaption was good, and the patient did not require custom shoe wear

Fig. 2 View of defect (3 × 4 cm) of lateral aspect of calcaneus with exposed bone.

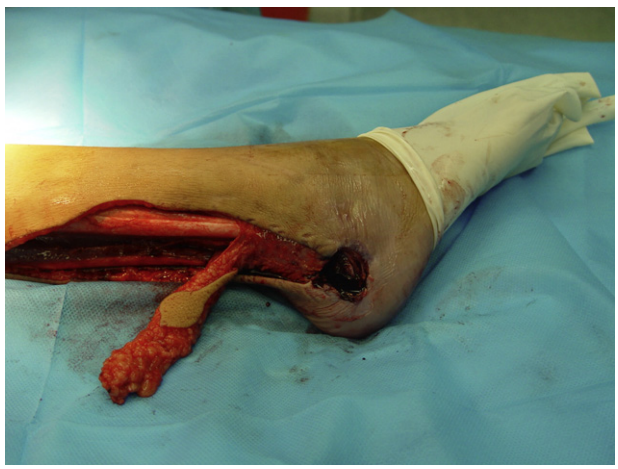

Fig. 4 Intraoperative view of distally based fasciocutaneous sural flap with an extra adipofascial portion.