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CASE REPORT
Reconstructive

Pediatric Arm Reconstruction after Shot-gun Injury Using Peroneal Free-flap and Pedicled Latissimus Dorsi Muscle Flap: Late Follow-up

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Summary: A 15-year-old patient harmed himself upon firing a shotgun that he was carrying when he slipped and fell, causing a destructive wound in the right arm with a medial entry hole and a posterolateral exit hole. The biceps, coracobrachialis, triceps, deltoids, skin cover, and humerus were injured; however, the blood vessels and major nerves of the area were surprisingly not affected. The residual skin muscle defect after debridements was 16×5 cm medially and posteriorly, and the bone loss was 7 cm. The wound was reconstructed during a single surgery with a free fibula flap and a pedicled flap of latissimus dorsi. Ten years after surgery, the patient presents neither functional deficit of the injured limb (shoulder, arm, forearm, and hand) nor sequelae in the donor areas; he performs his daily activities without any limitations. This case confirms that the use of free bone flaps and pedicled muscle flaps in pediatric patients can provide excellent long-term results.
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The reconstruction of extremities in the presence of bone and muscle loss is a challenge.

Lost bone portions cause the form and function of a limb to be lost, and amputation is the final result in many cases.

In pediatric patients, reconstruction is more complex because of the size of the tissues involved.[1]

Whether because of trauma or resection secondary to tumors, this type of bone loss[2–4] can be reconstructed with free bone flaps. However, when there is also associated loss of tissue, such as muscle or skin, the repair requires greater tissue contribution.

The long-term (10 years) outcome is presented for a 15-year-old male patient who suffered an accident involving a shotgun wound to the right arm, which led to bone, muscle, and skin loss. The patient was treated with a single surgery involving a combination of 2 flaps: fibula as a free bone flap and latissimus dorsi as a pedicled muscle flap.

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CASE REPORT

This male patient was 15 years of age when he accidentally injured himself by firing a shotgun he was carrying when he slipped and fell. The pellets caused a large wound in the right arm with a medial entry hole and a superolateral exit hole, injuring the humerus, brachial biceps, coracobrachialis, triceps, and deltoids, as well as the internal and external cutaneous tissues. Despite the destructiveness of the wound, there was no significant vascular or nerve injury.

At admission, the fracture was stabilized with an external fixator, and multiple surgical cleanings and debridements were performed until a suitable area to perform reconstruction was obtained. During this time, the patient received antimicrobials (gentamycin and clindamycin), analgesics, and life support. Twenty days after admission, reconstructive surgery was performed. The tissue defect to be covered was 16 cm long by 5 cm wide in the anterior and lateral areas, and the bone loss was 7 cm (Fig. 1A).

SURGICAL TECHNIQUE

The patient was placed in the left lateral decubitus position for dissection of the latissimus dorsi, which would

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serve to provide coverage to the bone flap and tissue support to the remainder of the arm because of adjacent muscle and skin loss.

Once dissected and subjected only to the vascular pedicle, the dorsal wound was sutured, and the muscle was tunneled toward the arm through the axilla (Fig. 1A).

The width of the dissected muscle was 16 cm at the distal portion and 10 cm in length from the vascular pedicle.

The patient was then placed in the supine position, and the right fibula was dissected to a length of 12 cm.

The fibula was transplanted to the arm, and the length was adjusted to 10 cm. The ends of the fibula were inserted into the medullary canal of the humerus, both distally and proximally, until stability was achieved.

Vascular anastomoses were then performed under microscopy with 9-0 nylon (the T-L peroneal artery with the brachial artery and the T-T peroneal vein with the brachial vein) (Fig. 1B).

Then, the latissimus dorsi muscle was placed on the arm to cover the bone and correct the bone defect. A mesh skin graft was placed on the muscle.

The humerus and the transplanted fibula were immobilized with an external fixator.

Postoperatively, the patient received antimicrobial treatment (cephalosporins), antiplatelet drugs (dextran and aspirin), and life support.

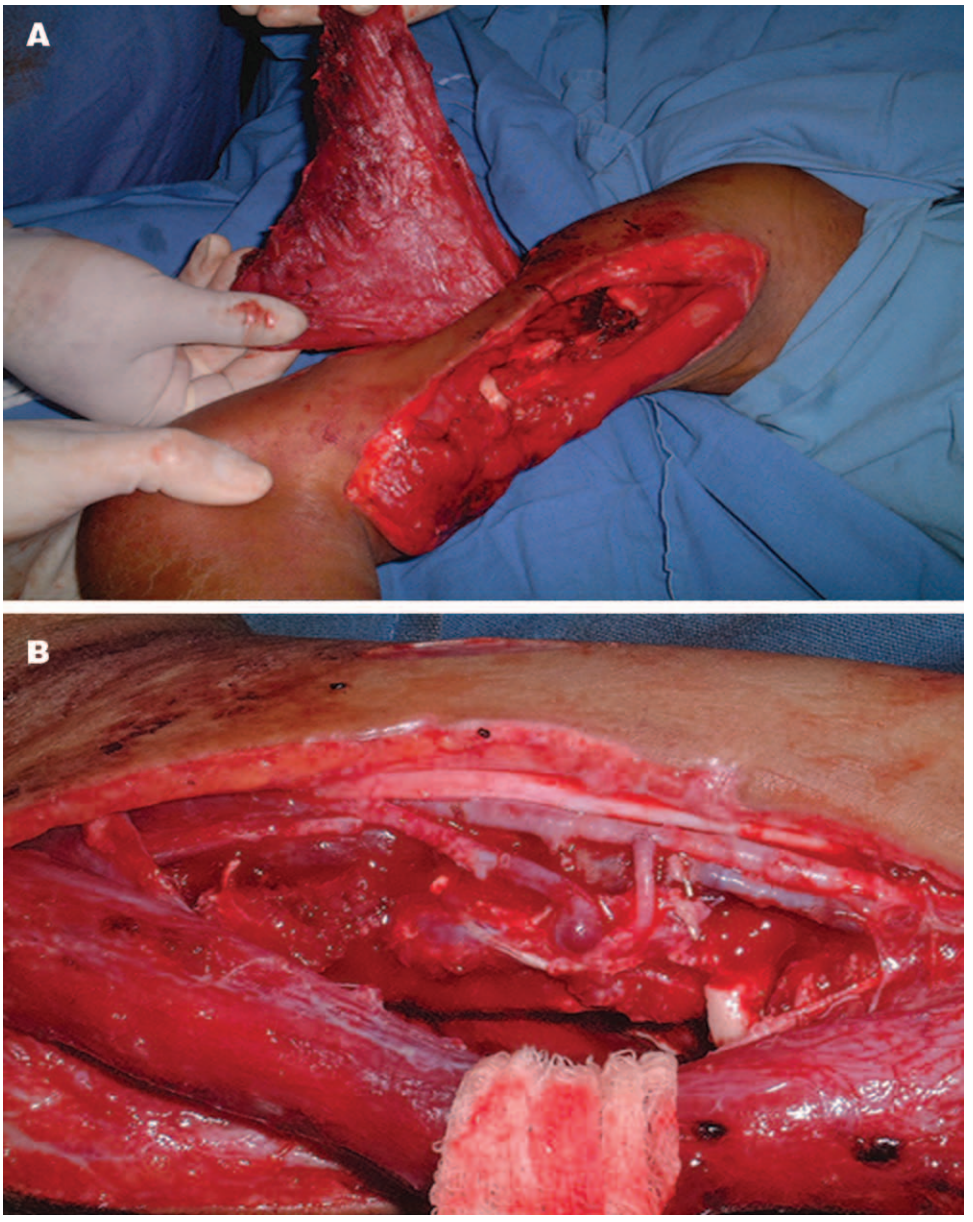

Fig. 1. Intraoperative images of (A) medial cutaneous muscle loss, bone defect, and dissected latissimus dorsi flap externalized through the axilla and lateral defect and (B) revascularized fibula placed in the humerus.

Fig. 2. X-ray image of the humerus 10 yr after reconstruction.

The postoperative evolution was uneventful, leading to hospital discharge 40 days after admission. The patient received postoperative rehabilitation and was reintegrated to activities of daily living.

The patient was reviewed 10 years after reconstruction. X-rays of the arm showed that the bone flap had adapted to the humerus with cortical thickening and medullary recanalization (Fig. 2). The reconstructed forelimb is 0.5 cm shorter than the left forelimb; however, the muscular strength is the same.

The function of the shoulder, arm, forearm, and hand is 100% preserved. (**See Video 1, Supplemental Digital Content 1**, which displays full mobility of the shoulder, elbow, forearm, wrist, and fingers 10 years after surgery, ***http://links.lww.com/PRSGO/A233***.)

DISCUSSION

The use of free flaps in children is common; its success rate is higher than in adults, and there are fewer complications.

The technical difficulties presented by dissection of flaps because of their size and vascular structures are offset by the extraordinary and rapid recovery of these patients after undergoing complex surgeries.[5,6]

In this case, the transplanted fibula grew in line with the bodily growth of the patient; it increased its volume and even rechanneled the medullary canal with the receiving humerus. The muscle that provided coverage atrophied but also grew at the same normal rate as the patient's other tissues without scarring retractions.

Surprisingly, this patient did not have significant vascular or nerve injuries despite the destructiveness of his wound, a factor that undoubtedly allowed full recovery.

Video Graphic 1. See Video, Supplemental Digital Content 1, which displays full mobility of the shoulder, elbow, forearm, wrist, and fingers 10 years after surgery, ***http://links.lww.com/PRSGO/A233***.

At 25 years of age, the patient currently lives in a rural community, performing fieldwork and even playing soccer. There are no functional sequelae in the donor areas of the fibula in his right leg or the latissimus dorsi in the thorax.

In this case, the recovery of the full function of the arm, forearm, and hand, as well as the absence of functional sequelae in donor areas, confirms that in the long term, reconstructions with free bone and muscular flaps are safe and functional in the pediatric population. (**See Video 1, Supplemental Digital Content 1**, which displays full mobility of the shoulder, elbow, forearm, wrist, and fingers 10 years after surgery, ***http://links.lww.com/PRSGO/A233***.)

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PATIENT CONSENT

The patient provided written consent for the use of his image.

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