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Osteoarticular allograft reconstruction of post-traumatic defect of distal femur in a pediatric patient: A case report and literature review

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ABSTRACT

Successful results of osteoarticular allografts in reconstruction of periarticular bone defect after tumor resection encouraged its utilization in post-traumatic defects. Here we describe a case of post-traumatic skeletal defect in a 4 year-old girl treated with osteoarticular allograft reconstruction. Due to severity of the associated soft tissue injury and contamination at presentation staged treatment with antibiotic spacer followed by the reconstruction was carried out. At the end of one year the patient achieved 'Musculoskeletal tumor society' functional score of 27 points and radiographic score of 93%. Reconstruction immediately after healing of soft tissues prevented development of any varus or valgus deformity of the knee. Our case demonstrates utility of osteoarticular allograft in a pediatric post-traumatic skeletal defect.

Introduction

Periarticular post-traumatic bone defect in a pediatric patient is a challenging problem to manage given the various issues including reconstruction of the joint surface, the growing skeleton of the patient, future possibility of collapse and malalignment, and the potential for revision surgeries. Post-traumatic bone loss can be managed with options including nonvascularized or vascularized bone autograft and bone transport [1–3]. Absence of an articulating surface, however, limits the use of bone autografts or bone transport as a reconstructive option in the treatment of periarticular post-traumatic bone defects. Successful restoration of joint-function after tumor resection has been reported with osteoarticular allograft reconstruction. Reconstruction of peri-articular post-traumatic bone loss with the osteoarticular allograft in pediatric patients <5 years old has not been reported in the literature. We report a case of post-traumatic defect of the medial femoral condyle in a 4-year-old female patient reconstructed with osteoarticular allograft. Approval for the retrospective chart review was granted by the institutional review board. The patient consented to the publication of the case report.

Case report

A 4 year-old female patient presented with an injury to her left lower extremity subsequent to a lawnmower rollover accident. On physical exam, a degloving injury to the left thigh and amputation of the medial side of the forefoot was noted. Gross contamination with grass and dirt was evident. The wound over the left knee was 12 cm × 8 cm in size, the medial condyle was exposed and the extensor mechanism was partially disrupted (Fig. 1). The left foot had exposed phalanges with multiple tendon avulsions and fractures through rays 2–4. No neurovascular injury was evident. Radiographs revealed a medial femoral condyle fracture with unicortical fracture of the medial tibial plateau. Multiple fragments of the medial femoral epiphysis with extension into the physis and disruption of portions of the medial femoral metaphysis was evident. Although the medial femoral condyle was fragmented, the overlying articular cartilage was still present in a shelled out fashion (Fig. 2).

With presence of the severity of the soft tissue injury and the gross contamination, parents of the patient were counseled regarding the risks and benefits of the limb salvage procedure. Debridement and irrigation was performed on the day of admission 11 h after the accident. Intraoperative findings included defective vastus fascia medially, complete obliteration of the medial capsule and MCL complex, fracture of the medial femoral

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Fig. 1. Photograph demonstrating the wound over the thigh during the initial debridement.

condyle with shelled out cartilage and unicortical fracture of the medial tibial plateau. Subsequently, three debridement and irrigation procedures were performed as necrosis of the skin edges occured. Intraoperative cultures of the tissue samples did not show any significant results. Skin and deep fascia were mobilized by creation of the subfascial flaps. A lattice created using a vessel loop and a negative pressure VAC-assisted device were used to delay the closure (Fig. 3). The intention of mobilizing the soft tissues was to ensure provision of the adequate coverage with tension free construct in the definitive reconstructive procedure. Gentamicin impregnated methyl methacrylate beads were placed to assist in wound disinfection. Eventually an antibiotic loaded cement spacer was placed to replace the medial femoral condyle and provide support for the remaining articular cartilage. The spacer was prepared from 40 g m bone cement, 0.5 g m Gentamicin and 2 g m Vancomycin. The idea behind placement of the spacer was simulation of the osteoarticular allograft which was the future reconstructive option planned. The spacer was placed to maintain the space and prevent infection. It was secured in place with two 0.045 mm K wires (Fig. 4). The shelled out articular cartilage was preserved to avoid any damage to the articular cartilage of the tibial plateau. However it was presumed that this fragment of the cartilage was avascular and would have to be discarded in the future procedures. Chopart amputation through the previously debrided traumatic wound of the foot was also performed.

The patient was sequentially evaluated clinically and with serial radiographs till the soft tissues were completely healed. Prognosis and future possibilities were discussed with the parents of the patient. MRI was obtained of the affected and contralateral knee for near matching volumetric analysis of the defect. At 4 months the medial femoral condyle reconstruction with an osteoarticular allograft was performed. Through the previous medial scar her quadriceps and arthrofibrosis was mobilized. The piece of shelled out cartilage that was left in place appeared to be somewhat intact but with an inadequate blood supply and not healed to the allograft thus likely not a functional cartilage. Hence it was excised. The antibiotic impregnated cement spacer was removed. A cadaveric knee osteoarticular allograft obtained from Musculoskeletal Transplant Foundation (Jessup, PA, USA) was cut to size 2.5 × 2.2

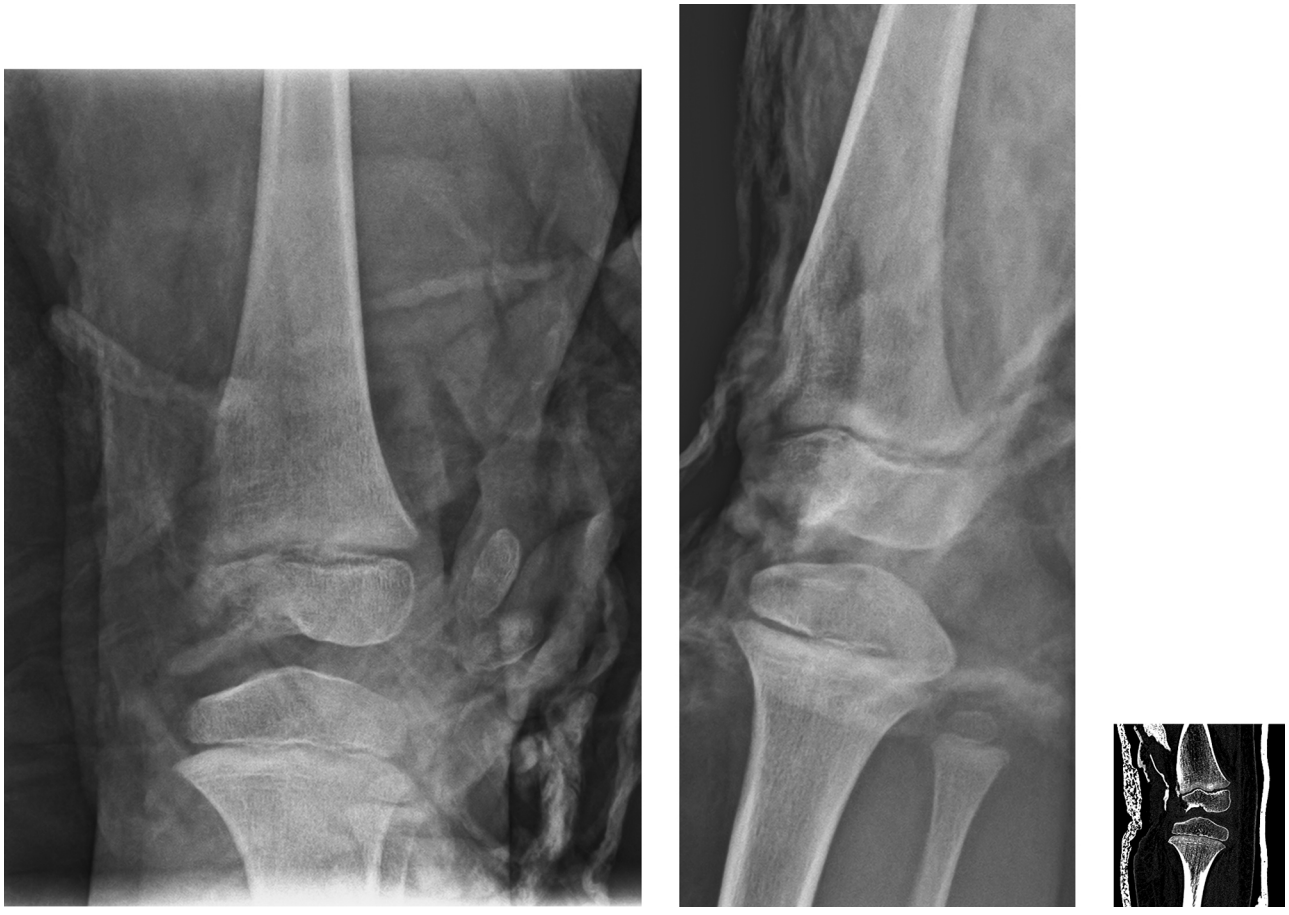

Fig. 2. Pre-reconstruction images showing skeletal defect (A) Anteroposterior radiograph (B) Lateral radiograph (C) CT scan.