

Tibial Plateau Fracture With Proximal Tibia Autograft Harvest for Foot Surgery

Gregory J. Galano, MD, and Justin K. Greisberg, MD

The proximal tibia metaphysis is a useful site for autologous graft harvesting.¹⁻³ Its proposed advantage over allograft is quicker and more reliable incorporation with less risk of disease transmission or immunologic response.⁴ The relatively high donor site morbidity historically associated with iliac crest autograft harvest has made proximal tibia autograft harvest a viable option for lower extremity procedures.⁵⁻⁸

Most experience with the proximal tibial metaphysis has been in harvesting cancellous bone. For some time, the authors have been harvesting structural bone graft from the proximal lateral tibial metaphysis for use in lateral column-lengthening procedures.

This report describes the technique and a complication from one of those procedures. Informed consent was obtained from the patient to use clinical information and images.

TECHNIQUE

In general, a unicortical graft can be harvested from the proximal lateral tibial metaphysis. It is important to work proximal to the anterior compartment musculature and also to remain distal to the knee joint. The graft is outlined with electrocautery and then a small oscillating saw is used to cut the 4 sides of the graft. Thin, curved osteotomes then break the unicortical graft away from the underlying cancellous bone. It is usually easy to harvest a 10- to 12-mm cube of bone. Additional cancellous graft can be harvested from the metaphysis through the cortical defect.

CASE REPORT

The patient was an otherwise-healthy woman in her mid-30s with severe flatfoot deformity that had been present for several years, with progressive pain and the left side more painful than the right. Her height was 5 feet 2 inches and she weighed 160 pounds. She was unable to perform single-leg heel rise on the left foot. She also showed tenderness and

swelling posterior to the medial malleolus, a hypermobile first ray, a gastrocnemius contracture, and a supple hindfoot valgus deformity (Figure 1). After failure of nonoperative management, the patient underwent left leg gastrocnemius recession, anterior process calcaneal lengthening osteotomy, midfoot realignment and arthrodesis, and augmentation of the posterior tibialis tendon with flexor digitorum longus.

A cortical structural graft was harvested from the proximal lateral metaphysis (Gerdy's tubercle). In this case, an 8-mm cube was obtained. Because the patient was of short stature, the distance between the knee joint and the ante-

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rior compartment was small. While the graft was being levered out, a crack was heard. A small articular fracture fragment came out with the graft. The articular fragment was replaced under direct vision and stabilized with two 2.0-mm lag screws. The remainder of the structural graft was used for the lateral column lengthening.

Postoperatively, the patient was non-weight bearing for 2 months, then progressed with normal rehabilitation. By the 2-month visit, she had full knee motion, and she had no symptoms relative to the knee. Radiographs confirmed uneventful healing of the fracture.

At 1 year postoperatively, the patient demonstrated normal gait with no pain or instability in the operative foot or knee, and radiographs of her foot and knee showed good alignment and healing (Figures 2, 3A, and 3B). She underwent right (opposite) foot reconstruction in which an 8×10-mm structural

Dr. Galano is Resident, and Dr. Greisberg is Assistant Professor, Department of Orthopaedic Surgery, Columbia University Medical Center, New York, New York.

Address correspondence to: Gregory J. Galano, MD, Department of Orthopaedic Surgery, Columbia University Medical Center, 622 West 168th Street, PH 11th Floor, New York, NY 10032 (tel, 212-305-5974; fax, 212-305-6193; e-mail, gjg2002@columbia.edu).

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Figure 1. Preoperative lateral weightbearing radiograph shows a flatfoot deformity.



Figure 2. Postoperative lateral weightbearing radiograph of the foot shows reconstruction of the arch.

graft was harvested from the right proximal tibia with no complication. The graft was harvested slightly more distal, in the proximal anterior compartment bone, based on the experience with the opposite knee.

DISCUSSION

Iliac crest bone graft harvest has been associated with numerous complications, including nerve injury (lateral femoral cutaneous, ilioinguinal, or superior cluneal), abdominal hernia, heterotopic ossification, superior gluteal vessel injury, and prolonged donor site pain.^{5,7,8} One recent prospective study using iliac crest bone graft for spinal surgery reported persistent donor site pain in 31% of patients at 1 year postoperatively.⁹ Delawi and colleagues¹⁰ suggested that the incidence of donor site pain after posterior iliac crest bone graft may actually be overestimated. Fracture of the anterior iliac wing has been reported in a series of 3 patients undergoing anterior iliac crest autograft harvest for anterior cervical spine surgery.¹¹



Figure 3. Postoperative knee anteroposterior (A) and lateral (B) radiographs show internal fixation of the lateral tibial plateau fracture.

required operative fixation, although the fracture was in the metaphysis and was extra-articular.

In the study by Alt and colleagues,¹ they encountered no fractures in patients allowed immediate weight bearing as tolerated after proximal tibia autograft harvest, which suggests that the risk of postoperative fracture is low. The current case represents a major complication with proximal tibia autograft harvest, which consisted of a tibial plateau fracture requiring operative fixation.

In this case, the patient was quite short and small, and it may have been too ambitious to harvest such a rela-

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The relatively high morbidity rate associated with iliac crest harvest has led to alternative sites for autologous bone graft for use in lower-extremity orthopedic surgery, including distal femur, distal tibia, calcaneus, and proximal tibia. Prior studies of proximal tibia bone graft harvest have mostly reported minor complications. O’Keeffe and colleagues³ reported a complication rate of 1.3% in 203 harvests, which included a hematoma, superficial wound infection, and tibial eminence fracture. This fracture was considered insignificant and treated with a knee immobilizer. Alt and colleagues¹ observed a complication rate of 1.9% in 54 patients, which included a hematoma requiring evacuation. Geideman and colleagues² had a complication rate of 2.5% in 155 harvests, which consisted of a hematoma and transient dyesthesias. There are several reports of proximal tibia fractures in the maxillofacial literature, but all 4 cases occurred with activity or trauma postoperatively.¹²⁻¹⁴ One case

tively large piece from an area so close to the joint line. Perhaps obtaining the graft under fluoroscopic guidance may be of use in patients of small stature. This technique could help verify that the surgeon is a safe distance from the joint line. Another possible technique of identifying the proper area for graft harvest, aside from palpation of Gerdy’s tubercle, would be to insert a spinal needle into the knee joint to determine the level of the joint. Other authors have described harvesting the anterior tibial crest. This may have been a smart alternative. In the past, the authors have harvested structural graft from the calcaneus, which also may have been a better option in retrospect. In the last 3 years, the senior author has performed 11 cases using structural bone graft from the proximal lateral tibia for hindfoot or midfoot osteotomies. There were no other complications, and all of the patients had no symptoms related to the bone graft site by 2 months after surgery.

SUMMARY

This case demonstrates that while autograft harvest is generally considered safe, it is not completely without risk. However, in our case, anatomic reduction of the small fragment led to an uneventful outcome. Although the intra-articular fracture was shocking to the surgeon, it probably is not of much significance to the clinical outcome.

AUTHORS' DISCLOSURE STATEMENT

The authors report no actual or potential conflict of interest in relation to this article.

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