Rehabilitation of Tibial Plateau Fracture Following Anterior Cruciate Ligament Reconstruction: A Case Report

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Abstract

Objective: The purpose of this case report was to describe the management of a tibial plateau fracture in a patient who had undergone anterior cruciate ligament (ACL) reconstruction 3.5 years earlier.

Clinical Features: A 36-year-old man presented with pain and edema following a fall from a height of approximately 2 m while skateboarding. The patient reported having undergone arthroscopic ACL reconstruction with allograft and bioabsorbable screws 3.5 years earlier. Computed tomography scan revealed a comminuted fracture extending through the graft tunnel, as well as evidence of tunnel widening and incomplete bone resorption and generation within the tibial tunnel.

Intervention and Outcome: A trauma surgeon repaired the plateau fracture with internal fixation. The patient was non-weight bearing for 8 weeks while undergoing rehabilitation in a chiropractic clinic (spinal manipulation, physiotherapy, nutritional support) twice per week and returned to full activity within 3 months.

Conclusions: The patient responded favorably to the treatment protocol, which included rehabilitation by a doctor of chiropractic and co-management with a trauma surgeon. (J Chiropr Med 2018;xx:1-5)

Key Indexing Terms: *Tibia; Tibial Fractures; Anterior Cruciate Ligament Reconstruction; Chiropractic*

Introduction

Anterior cruciate ligament (ACL) repair surgery is commonplace. Although complications of ACL reconstruction surgery using autograft and allograft are rare, they may include infection, tunnel malposition, tunnel dimension mismatch, graft failure, and fracture.[1,2] Several cases of fracture through either the femoral or the tibial tunnel following repair have been reported. These fractures have been attributed to a stress riser effect caused by bioabsorbable interference screws,[3,4] bone resorption,[3-5] and tunnel widening.[2-5] Of the 9 cases of tibial tunnel fracture known to the authors, 8 were in patients that had received autografts. Seven of these patients had bone-patellar tendon-bone (BPTB) autograft,[3,6-11] and 1 patient had gracilis-semitendinosus autograft.[2] In the cases of BPTB autograft, Delcogliano et al suggested that bony defects caused by the graft bone block and the tibial tunnel may act synergistically to create a stress riser greater than that produced by either defect alone.[9] Only 1 case of tibial plateau fracture has been reported in a patient that had repair with allograft.[12] The purpose of this case report was to describe a tibial plateau fracture following ACL reconstruction and the rehabilitation by a doctor of chiropractic and co-management with an trauma surgeon.

Case Report

A 36-year-old man (first author, A.R.) presented to an orthopedic surgeon with right knee pain and edema following a fall from a height of approximately 2 m while skateboarding. The patient reported landing on the right foot with knee extended and was unable to bear weight on the affected leg since the time of the injury 2 days earlier. Three and a half years earlier, the patient had undergone arthroscopic ACL reconstruction with allograft and bioabsorbable screws. For that surgery, the tibial tunnel was drilled to 10 × 40 mm, and the bioabsorbable screw used to secure the graft measured 8 × 23 mm. After the ACL reconstruction, the patient completed an established program of physical therapy and returned to full activity within 3 months.

After reviewing the patient's history and conducting a limited physical exam (because of probable fracture), the orthopedic surgeon ordered radiographs and a computed tomography scan. Radiographs revealed a 2- to 3-mm comminuted fracture extending through the medial-proximal tibial tunnel, including the intercondylar eminence and terminating in the lateral plateau (Fig 1). There was evidence

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Fig 1. *Sagittal computed tomography scan revealing a fracture through the tibial tunnel. The interference screw is indicated by the white arrow, and incomplete bony resorption and generation are indicated by the black arrow.*

of bone resorption within the tibial tunnel (Fig 1), and the tunnel measured 13.5 mm in the transverse plane (Fig 2). Bone density was within normal limits. After review of the radiographs, the orthopedic surgeon referred the patient to an orthopedic trauma surgeon for surgical repair.

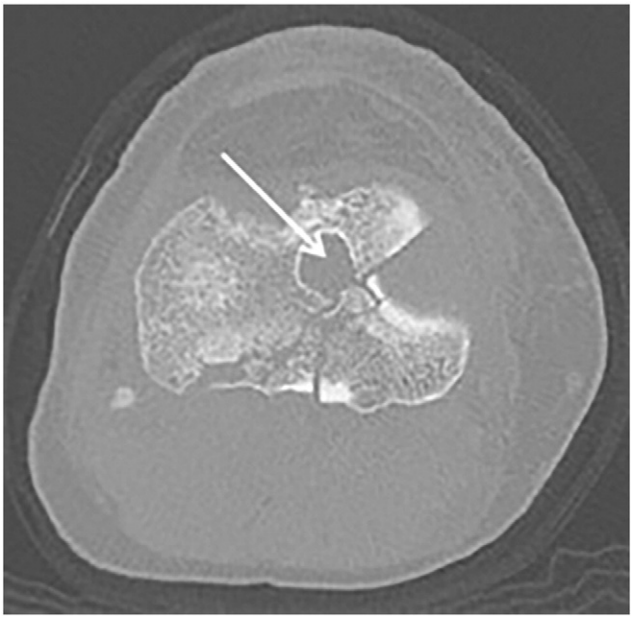

Fig 2. *Transverse computed tomography scan revealing a fracture through the tibial tunnel (indicated by arrow) and tunnel widening, from 10 mm at the time of reconstruction to 13.5 mm at the time of plateau fracture.*

Because the plateau fracture would not be repaired until 10 days after the injury, the patient sought chiropractic care for symptomatic relief and early initiation of rehabilitation. Over these 10 days, the patient received 15 minutes of low-voltage AC sine-wave stimulation (pulse width = 200 μs at 50% $V_{max,}$ current = 0.25 A) of the quadriceps under the care of a doctor of chiropractic. Intensity of muscle contraction was low to avoid further bony displacement, yet adequate to help ease muscle spasm and pain, as well as minimize flexion contracture caused by extension lag. Range of motion (ROM) was not assessed in this period because of the severity of the injury. On the day of surgery, the doctor of chiropractic was present for the presurgical consultation with the patient and debriefed the trauma surgeon regarding treatment rendered. In theater, the fracture was repaired arthroscopically using internal fixation, and the surgeon observed the ACL graft to be intact. Range of motion the day after surgery was 2° in extension and 113° in flexion. Also on the day after surgery, the surgeon, the doctor of chiropractic, and the patient met for a postsurgical visit prior to the patient's release from hospital.

The surgeon instructed the patient to perform 20 repetitions each of 6 different closed kinetic chain home exercises 5 times per day and allowed only 20 pounds of weight bearing on the right leg for the next 8 weeks. The surgeon and the doctor of chiropractic decided that the patient could continue receiving chiropractic treatments twice per week. Each treatment included lumbopelvic spinal manipulation to support normal biomechanics and movement patterns. Passive care modalities included low-voltage AC sine-wave stimulation of the quadriceps (moderate intensity), low-level laser therapy (40J at 810 nm), and soft-tissue mobilization to support normal muscle activation patterns and healing. The patient was also given nutritional recommendation for the following supplements: 600 IU of vitamin D, 1250 mg of calcium, 500 mg of magnesium, 375 mg glucosamine, 300 mg chondroitin, and 375 mg methlylsulfonylmethane (MSM) per day. Nutritional supplementation was aimed at reducing inflammation and cartilage loss and expediting bone growth.

Passive range of motion at 18 days postoperation was 0° in extension and 124° in flexion. At the 2-month postoperative follow-up, ROM was –3° in extension and 146° in flexion, which was greater than 90% of the unaffected leg (–5° in extension and 160° in flexion). No additional physical therapy was prescribed by the surgeon, and the patient was allowed to gradually return to normal activities. The surgeon and the doctor of chiropractic agreed, via interoffice communication, that the patient could continue with chiropractic care. The patient could walk without the assistance of crutches, climb stairs, bike, and surf within the days following. At 3 months postoperation, the patient returned to more vigorous activities (eg, running, skateboarding). Between 3 and 24 months