



Case report

Simultaneous anterior cruciate ligament reconstruction and dome-shaped high tibial osteotomy for severe medial compartment osteoarthritis of the knee

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Abstract

Background: The optimal surgical procedure to address both anterior cruciate ligament (ACL) deficiency and medial compartment osteoarthritis (OA) has been controversial.

Case report: A 49-year-old woman with a 30-year history of chronic anterior cruciate ligament (ACL) deficiency, medial compartment osteoarthritis, and varus deformity presented with medial knee pain and apprehension with walking and playing soccer. Her preoperative range of motion was from 0° of extension to 135° of flexion. The anterior drawer sign (1+), Lachman test (1+), and pivot shift test (glide) were positive before surgery, as measured by the International Knee Documentation Committee knee examination form. The patient underwent simultaneous arthroscopic ACL single-socket and single-bundle reconstruction using hamstring tendons, dome-shaped high tibial osteotomy using the TomoFix fixation device, and mosaicplasty to the medial condyle. The standing femorotibial angle changed from 185° preoperatively to 172° postoperatively. Range of motion exercises were started 1 week after surgery, and partial weight bearing was allowed 2 weeks after surgery. The patient returned to her baseline physical level 2 years after the operation. Range of motion was –10° of extension and 130° of flexion, and the anterior drawer sign, Lachman test, and pivot shift test were all negative at the final 3-year follow-up.

Conclusion: An ACL reconstruction combined with a dome-shaped high tibial osteotomy using a locking plate is one option for treating an aged athlete with ACL deficiency and severe medial compartment osteoarthritis, and can allow the athlete to return to sports activity.

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Keywords: dome-shaped osteotomy; medial osteoarthritis; anterior cruciate ligament (ACL); reconstruction

Introduction

The number of anterior cruciate ligament (ACL) reconstructions in aged patients has been increasing in the United States.¹ Middle-aged patients with ACL deficiencies and severe osteoarthritis (OA) of the femorotibial joint are sometimes seen in the outpatient clinic. The optimal surgical procedure to address both ACL deficiency and medial

compartment OA has been controversial: ACL reconstruction alone,² high tibial osteotomy (HTO) alone,³ staged combined ACL reconstruction and HTO,⁴ and a combination of ACL reconstruction and HTO^{5–10} have all been explored.

To the best of our knowledge, no previous studies have reported a return to baseline physical activity in patients with severe OA who were treated with a combination of a dome-shaped osteotomy fixed by a locking plate and an ACL reconstruction. Here, we present a case of simultaneous ACL reconstruction and dome-shaped HTO in an athlete with ACL deficiency and severe OA of the medial compartment.

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Case Report

The patient was a 49-year-old female with the chief complaint of left knee pain and apprehension while walking. She had sprained her knee playing soccer 30 years ago and had experienced medial knee pain with walking for the past 20 years. Her Tegner activity score was 7. Her preoperative range of motion was 0° of extension and 135° of flexion. The anterior drawer sign (1+), Lachman test (1+), and pivot shift test (glide) were all positive according to the International Knee Documentation Committee form.¹¹ The radiographic Kellgren–Lawrence classification was Grade 4 and the standing femorotibial angle (FTA) was 185° (23% mechanical axis point from the medial edges of the level of the tibial plateau: MA; Figures 1A and 1D). The medial proximal tibial angle and mechanical lateral distal femoral angle were 84.9° and 87.4°, respectively. The only medial proximal tibial angle was slightly out of normal range. The tibial slope was 5°.

The patient was diagnosed with ACL deficiency and severe medial compartment OA, but she hoped to continue sports activity. The Japanese Orthopaedic Association (JOA) and Lysholm scores were 50 and 36, respectively. Arthroscopy revealed that the ACL was absent (Figure 2A). In the lateral compartment, the cartilage on both the femur and the tibia, as well as the meniscus, was nearly intact (Figure 2C).

First, an osteochondral graft was performed at the medial femoral condyle using an osteochondral autologous transfer system (Acufex, Smith & Nephew, Andover, MA, USA). Two 8.5 mm osteochondral grafts were harvested from the non-weight-bearing area of the lateral femoral condyle. In

addition, a microfracture was created around the osteochondral graft area and on the lateral tibial plateau. Second, 1.5 cm was resected from the middle third of the fibula and a dome-shaped HTO was performed. Both osteotomy sites were fixed proximally and distally using the TomoFix Japanese system (Synthes, Bettlach, Switzerland) with the aim of making the FTA 172° (60% MA, Figures 3, 4A). The proximal plate was affixed with two posterior screws, and the anterior screw was deferred at this time. An ACL single-socket and single-bundle reconstruction was performed by means of a transtibial technique using the four-strand semitendinosus tendon combined with the Leeds–Keio ligament and TightRope RT (Arthrex Inc., München, Germany; Figure 3). The line of the osteotomy was 22 mm distal to the tibial joint line, and the tibial tunnel was created at the proximal site of the osteotomy line so as not to interfere with the osteotomy site (Figure 3). Bone tunnels were made in the femur (6.5 mm) and in the tibia (7.5 mm). The graft length pattern was 2 mm over the top pattern. The tendon was fixed using double spiked staples (Meira, Gifu, Japan) at the distal osteotomy site under 30 N load at 10° of knee flexion. Finally, the anterior screw was inserted so as not to interfere with the tibial bone tunnel (Figure 4A, B).

The rehabilitation protocol was as follows. A knee brace with a 30° extension limit was placed postoperatively to prevent graft stretching for 1 month. Range of motion exercises were started at 1 week. Partial weight bearing was started at 2 weeks, and full weight bearing was permitted at 4 weeks. The knee brace was removed at 3 months, at which time the patient started jogging. At 6 months, the patient was allowed to resume sports activity. One year after the operation, she returned to sports activity.

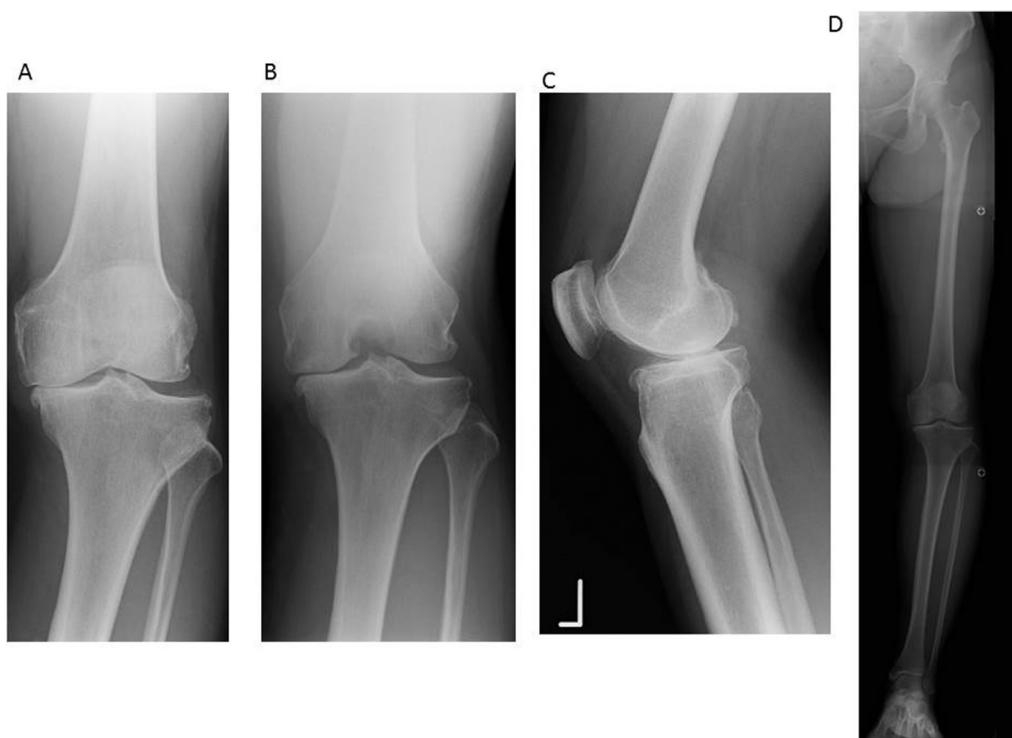


Figure 1. Preoperative radiographs: (A) weight-bearing anteroposterior view, (B) Rosenberg view, (C) lateral view, and (D) long standing axis weight-bearing view.

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