

Recurrent Patellar Tendon Rupture in a Patient After Intramedullary Nailing of the Tibia: Reconstruction Using an Achilles Tendon Allograft

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Abstract

Various complications after intramedullary (IM) nailing of the tibia have been reported, the most common of which are anterior knee pain and symptoms similar to patella tendonitis. Complete rupture of the patellar tendon after IM nailing of the tibia has been reported on 2 occasions, in conjunction with predisposing patient factors, such as systemic disease or a proud tibial nail. Patellar tendon ruptures are disabling injuries that can be technically difficult to repair because of the poor quality of remaining tendon tissue, quadriceps muscle atrophy and/or contracture, and scar-tissue formation. Many methods have described the surgical reconstruction of the knee extensor mechanism, which is most commonly performed after total knee arthroplasty.

We report the successful surgical and clinical outcome of patellar tendon reconstruction using an Achilles tendon allograft in a patient subject to late and recurrent ruptures after IM nailing of the tibia through a mid-patellar tendon-splitting approach. Seven months after tendon reconstruction, the patient exhibited full knee flexion, an extension lag of 10°, 4/5 quadriceps strength, and return to her baseline ambulatory status.

Ruptures of the patellar tendon usually occur in patients under age 40 years, with men having a higher incidence than women.¹ History of local steroid injection,^{2,3} total knee arthroplasty,⁴⁻⁸ anterior cruciate ligament reconstruction with central third patellar tendon autograft,⁹⁻¹¹ and a variety of systemic diseases are associated with an increased tendency to rupture.¹²⁻¹⁵ Primary acute ruptures of the patellar tendon can be difficult to repair because of the quality of remaining tissues. In cases of chronic tendon ruptures subject to delayed treatment, additional complications such as tissue contracture and scar-tissue formation are likely to exist.¹⁵⁻¹⁷

Complications after intramedullary (IM) nailing of the tibia include infection, compartment syndrome, deep vein thrombosis, thermal necrosis of the bone with alteration of its endosteal architecture, failure of the hardware, malunion, and nonunion.¹⁸ The most common complaint after IM nailing of the tibia is chronic anterior knee pain and symptoms similar to tendonitis; incidences as high as 86% have been reported.¹⁸⁻²⁰ Extensive review of the literature found only 2 reports of patellar tendon rupture after IM nailing of the tibia; both cases used a patellar tendon-splitting approach. The first report described patellar tendon rupture 8 years after IM nailing of the tibia during a forced deep-flexion movement.²¹ Radiographic examination showed the IM nail positioned proud relative to the tibial plateau, impinging upon the patellar tendon. An intraoperative examination confirmed the radiographic findings and found rupture of the patellar tendon to be consistent with the exposed tip of the IM nail. The second report described patellar tendon rupture 2 months postoperatively in a patient with Ehlers-Danlos syndrome, a hereditary disorder characterized by alterations to muscle/tendon tissue and hyperextensible skin.²²

Patellar tendon rupture after IM nailing of the tibia is a rare complication. Patellar tendon re-rupture after primary repair in a patient with history of IM tibial nailing has not been reported. This case outlines the progression of such a patient with a recurrent patellar tendon rupture that was successfully reconstructed using an Achilles tendon allograft. The patient's surgical history of IM tibial nailing through a mid-patellar tendon-splitting approach 4 years prior to initial tendon rupture is noteworthy and potentially predisposed the patient to injury. The patient provided written informed consent for print and electronic publication of this case report.

Case Report

A 44-year-old woman, 5 ft, 3 in tall, and weighing 129 lb (body mass index, 22.8), with a history of osteoporosis and transverse myelitis, presented with pain and persistent swelling about the left knee. Her baseline ambulatory status required crutches because of decreased sensation and strength in her

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lower extremity in conjunction with a foot drop; she had mild quadriceps and hamstring muscle weakness but otherwise normal knee function. The patient had been seen 4 years earlier at our facility for IM fixation of a distal tibia fracture through a patellar tendon–splitting approach. The fracture was well healed and showed no signs of complication or nail migration; the nail was not proud.

Initially, the patient was admitted to another hospital through the emergency department for swelling and pain about the left knee. She was believed to have an infection and was placed on antibiotics by the primary care team. An orthopedic evaluation showed induration, edema, and warmth in the patellar tendon region of the left knee. Magnetic resonance imaging (MRI) showed a full-thickness patellar tendon rupture. Aspiration of the knee was performed and cultures were negative; white blood cell, erythrocyte sedimentation rate, and C-reactive protein values were normal. The risks and benefits of various treatments were discussed, and surgical intervention was elected to repair the patellar tendon.

Intraoperative findings showed a massive midsubstance rupture of the patellar tendon, accompanied by medial and lateral retinacular tears and a quadriceps tendon partial rupture; the central aspect of the quadriceps tendon attaching to the patella remained intact. The patella was retracted proximally; no evidence of active infection was present. Good-quality tissue remained attached to both the tibial tuberosity and the inferior pole of the patella. A No. 2 FiberWire suture (Arthrex, Inc, Naples, Florida) was used to run whip stitches in the distal end of the patellar tendon and a second No. 2 FiberWire suture was used to run whip stitches in the proximal aspect of the patellar tendon rupture. The 4 ends of the sutures were tied together, thus re-approximating the distal and proximal ends of the ruptured patellar tendon. No bone drilling was used because the midsubstance tear was amenable to good

repair with reasonable expectation of healing based on tissue quality. The quadriceps tendon, which was partially torn, was repaired with a No. 1 Vicryl suture (Ethicon, Somerville, New Jersey). The medial and lateral retinacula were also repaired with a No. 1 Vicryl suture. The suturing scheme effectively re-approximated the knee extensor mechanism, and the patient was placed in a knee immobilizer that permitted no flexion for 6 weeks postoperatively.

After 3 months of gradual improvement with physical therapy, the patient returned for a follow-up visit, concerned that her knee function was beginning to decline. Physical examination showed patella alta with a thinned and diminutive palpable tendon in the patellar tendon region. She was capable of active flexion to 90° and extension to 50°, but beyond 50°, she was unable to actively extend; she was capable of full passive extension. MRI showed a repeat full-thickness patellar tendon tear with retraction from the inferior pole of the patella; previous tears to the quadriceps tendon were healed. Because of the recurrent nature of the injury, the patient’s physical examination, MRI findings, and anticipated poor quality of remaining tendon tissue, patellar tendon reconstruction using a cadaveric Achilles tendon allograft was recommended. The patient chose surgery for potential improvement in knee range of motion, active extension, and ambulation.

The previous anterior midline incision was used and carried down through the subcutaneous tissues where a complete rupture of the patellar tendon was identified. A limited amount of good-quality tendon tissue remained at the medial aspect of the tibial tuberosity. The remaining tissue located at the patella’s inferior pole was nonviable for use in surgical repair. Retinacular contractures were released to bring the patella distally; the trochlear groove was used as the anatomic landmark for the patella resting position. During reconstruction, the knee was placed into 30° of flexion, with the patella located in the trochlear groove, and the cadaveric Achilles tendon was placed on the midline of the patella, where measurements



Figure 1. With the knee flexed to 30°, the patella was placed in the trochlear groove and cadaveric Achilles tendon tissue placed over the patella to reconstruct proper anatomic position, length, and tension.



Figure 2. Cadaveric and host tissues at the proximal-medial aspect of the tibial tuberosity are sutured together. Richards metallic ligament staple (Smith & Nephew, Memphis, Tennessee) has secured graft anatomically at the tibial tuberosity.



Figure 3. Reconstructed patellar tendon before surgical closure.

were done to assess proper length and tension (Figure 1).

The patient's remaining native tissue on the medial aspect of the tibial tuberosity was used to augment the Achilles tendon graft medially. The cadaveric Achilles tendon graft was primarily used to replace the central and lateral aspects of the patellar tendon. Additionally, the calcaneal bone segment at the end of the Achilles tendon graft was removed prior to use. Cadaveric and host tissues at the medial aspect of the tibial tuberosity were sutured together with a No. 1 Vicryl suture (Figure 2). The distal aspect of the cadaveric Achilles tendon was used to re-approximate the patient's native patellar tendon insertion at the tibial tuberosity. To supplement the graft anchor, a Richards metallic ligament staple (Smith & Nephew, Memphis, Tennessee) was used to fix the distal aspect of the Achilles tendon graft into the tibial tuberosity.

Proper tensioning of the graft was performed by visualizing patella tracking during the arc-of-knee motion and properly suturing the graft to allow for functional range. The proximal aspect of the cadaveric Achilles tendon was sutured into host tissues surrounding the superior pole of the patellar and quadriceps tendon. The edges of the graft were sutured with supplemental No. 1 Vicryl sutures (Figure 3).

Before surgical closure, knee range of motion was checked and noted to be 0° to 100°. The repaired construct was stable and uncompromised throughout the entire range of motion. Patella tracking was central and significantly improved; knee stability was normal to varus and valgus stress.

The patient was placed in a knee immobilizer for 6 weeks before range of motion was allowed. Seven months postoperatively, the patient returned for a follow-up visit, ambulating with 2 forearm crutches, which was her baseline ambulatory status. Physical examination revealed passive range of motion from 0° to 130°, an extension lag of 10°, and 4/5 quadriceps strength. It was recommended the patient continue physical therapy to improve strength and range of motion.

Conclusion

This is the first report in the literature documenting a recurrent patellar tendon rupture after primary repair in a patient with a history of IM tibial nailing. It is also the first report of a cadaveric Achilles tendon allograft used as a solution to this problem. Complete reconstruction of the patellar tendon using an Achilles tendon allograft is a method commonly used for ruptures after total knee arthroplasty.^{4,7,23,24} This case report highlights the utility of a cadaveric Achilles tendon in the setting of a recurrent patellar tendon rupture with poor remaining tissue quality.

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