A paucity of literature exists on quadriceps tendon reruptures. Failed quadriceps tendon repair can cause significant morbidity and disability. Surgical management of quadriceps tendon rerupture can be challenging due to tissue degeneration, tendon retraction, muscle atrophy, and poor bone fixation. A lack of guidance in the literature exists on the appropriate surgical techniques for managing quadriceps tendon reruptures.

This article describes the case of a male recreational athlete with a failed primary quadriceps tendon repair who presented 10 months after rerupture. Examination was significant for morbid obesity, assisted ambulation, and a significant defect at the superior pole of the patella on the affected side. Intraoperative findings were consistent with a 2.0- to 4.5-cm tendon defect across the extensor mechanism with complete retinaculi tears. The authors performed a novel surgical approach for revision of quadriceps tears using a bilateral hamstring autograft through a quadriceps tendon weave and a transosseous patellar repair. Tendon length was restored, and extensor mechanism tension was reapproximated. Postoperatively, the patient achieved a good outcome and had returned to full, painless, sport participation at 2-year follow-up.

This surgical technique is suitable for revision quadriceps tendon repairs of large tendon gap defects, repairs desiring tendon-to-bone in-growth, and repairs requiring large-force transmission across the repair.

The authors are from the Rush Sports Medicine Fellowship Program (FM), Midwest Orthopedics at Rush Sports Medicine, Chicago, Illinois; the Department of Orthopedic Surgery (BUN, SDM), Brigham and Women’s Hospital, Harvard Medical School, Boston, Massachusetts; and the MedStar Union Memorial Hand Fellowship Program (JK), Baltimore, Maryland.

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Correspondence should be addressed to: Benedict U. Nwachukwu, BA, Department of Orthopedic Surgery, Brigham and Women’s Hospital, Harvard Medical School, 75 Francis St, Boston, MA 02115 (benedict_nwachukwu@hms.harvard.edu).

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The need to surgically repair quadriceps tendon tears is well accepted. Numerous surgical techniques have been reported in the literature for primary repair. However, to the authors’ knowledge, no revision techniques have been reported. Revision tears can be complicated by large tendon gap defects, quadriceps muscle retraction, atrophy, and poor patellar bone stock. This scenario can cause significant morbidity, chronic weakness and instability, an extensor lag, and significant difficulty ambulating. Alternative treatment options are limited, ranging from lifetime bracing to knee fusion.

This article describes a novel surgical approach for revision of quadriceps tears using a bilateral hamstring autograft through a quadriceps tendon weave and a transosseous patellar repair. This approach is suitable for repairs of large tendon gap defects, repairs desiring tendon-to-bone in-growth, and repairs requiring large-force transmission across the repair.

**CASE REPORT**

The patient, an active 38-year-old man with a history of gout, tore his right quadriceps while playing basketball 3 years previously. His quadriceps tendon was repaired primarily and was rehabilitated in an extension brace for 6 months. His surgical outcome was satisfactory for 2 years until a fall from standing height resulted in repair failure and rerupture. Ten months after re-injury, the patient reported to the authors with poor knee function and significant pain since the fall. The patient consented for data concerning this case to be published.

Physical examination revealed a healthy-appearing, active, muscular man who was 73 inches tall and weighed 330 lb (body mass index, greater than 43.5 kg/m²). A focused knee examination revealed a well-healed anterior midline incision, a large 3- to 5-cm defect at the superior pole of the patella spanning across the extensor mechanism, and 5 cm of circumferential atrophy compared with the contralateral thigh. Active knee extension was absent, but he had full passive range of motion (ROM). He was unable to ambulate without an extension brace. Radiographs and magnetic resonance imaging confirmed a complete quadriceps tendon rupture; a large tendon gap existed at the attachment site with significant tendon degeneration and scarring proximally.

**Surgical Technique**

The patient was anesthetized, prepped, and draped while in the supine position. A midline knee incision was performed through the previous scar. Intraoperative findings revealed a large tendon defect measuring from 2 to 4.5 cm across the extensor mechanism with complete retinacular tears (Figure 1). Granulation and scar tissue were sharply excised back to healthy bleeding quadriceps and retinaculi. The patellar peristemeum was elevated and preserved. The quadriceps adhesions were then released, and the tendon length was maximized. Next, the superior patellar pole was gently decorticated to healthy bleeding bone using a burr.

Bilateral semitendinosus and gracilis hamstring autografts were obtained. The tendon autographs were then introduced into the quadriceps muscle. The initial graft was weaved via a Mason-Allen technique (Figure 1A). A second graft was placed proximally in the same manner (Figure 1B). A third graft was doubled and placed to provide a sufficient amount of graft to insert across the patella and to fill the tendon defect (Figure 1C). The tendon grafts were prepared to a length of 8 to 10 mm to enable tendon-to-bone in-growth through the patellar bone tunnels.

Three patellar tendon tunnels were then created (Figure 1D). First, 3 K-wires were placed vertically across the patella to confirm tunnel position and separation.
The technique presented... Moreover, in instances when the... was then started. Specifically, continuous passive ROM was started 2 weeks postoperatively, beginning at 0° to 30° and advancing 10° each week with patellar mobilization and quadriceps stimulation. At 1-year follow-up, the patient had 0° to 110° of passive ROM, no extensor lag, and was ambulating with no assistive device. At 2-year follow-up, the patient demonstrated active knee extension against resistance (5/5), 1 cm of extensor lag, and had returned to full activity, including participating in playing basketball and other recreation events, as tolerated. The patient reported no pain or disability with sporting activity.

**DISCUSSION**

The need to repair a quadriceps tendon rupture surgically to achieve optimal function is well accepted. However, revision tears are surgically challenging due to tissue degeneration, tendon retraction, muscle atrophy, and poor bone fixation, all of which can present obstacles to creating suitable tendon-to-bone in-growth capable of withstanding the large forces transmitted across the patellofemoral joint. The patellofemoral joint can withstand up to 5 to 8 times one’s body weight, resulting in over 1 ton of force being placed on the joint in the current patient. Moreover, in instances when the gap cannot be primarily approximated, surgeons must provide a stable biological construct in the defect to allow histological tendon-to-bone in-growth. Bilateral hamstring autograft tendon is a solution to these problems. Previous anterior cruciate ligament studies have reported substantial force transmission tolerance and reliable histologic in-growth with hamstring autograft.11-14

**CONCLUSION**

Tendon repair techniques are often stratified based on the identified tendon gap, the need for tendon approximation, and considerations for additional tissue reinforcement.15 The technique presented in the current article is suitable for a large-gap, high-force transmission revision quadriceps tear.

**REFERENCES**


**Figure 2: Intraoperative picture of the bilateral autograft hamstring tendon graft woven through the quadriceps via a Mason-Allen technique with enough length to be accepted in 8- to 10-mm deep patellar bone tunnels.**


