Reconstruction of Neglected Patellar Tendon Ruptures Using the Quadriceps Graft

João Luiz Ellera Gomes, MD, PhD; Jairo André de Oliveira Alves, MD; José Mauro Zimmermann Jr, MD

Abstract: Several techniques using different grafts have been described for reconstruction of the patellar tendon after a neglected rupture. Retraction of the quadriceps tendon may compromise repair integrity due to progressive stretching of the graft. The authors present a surgical technique using the central one-third of the quadriceps tendon. This is supported by the fact that the resistance to traction of this segment of the quadriceps tendon equals that of a double-looped semitendinosus graft and that the harvesting of this specific graft promotes muscle inhibition, thus protecting the reconstruction during the recovery period. [Orthopedics. 2014; 37(8):527-529.]

However implausible it may seem, neglected patellar tendon rupture still occurs. Such ruptures become increasingly difficult to treat over time because of quadriceps tendon retraction. In the literature, several techniques have been proposed to address this issue using autologous grafts, such as the semitendinosus tendon, the gracilis tendon graft, or even both.1,2 The contralateral central one-third of the patellar tendon with bone extremities (bone-tendon-bone graft) has also been reported. Results, however, have not been consistently acceptable, and the retracted quadriceps tendon tends to stretch, compromising an initially satisfactory result. This study presents a new technique using the central one-third of the quadriceps tendon to create a new patellar tendon in neglected ruptures occurring several months preoperatively.

MATERIALS AND METHODS

Five patients with untreated patellar tendon ruptures underwent the proposed technique. Four were healthy individuals who sustained tendon rupture during activities of daily living: 2 while falling off stairs; 1 while slipping on the floor, causing hyperflexion of the knee; and 1 during an ankle sprain event. The fifth patient was a kidney transplant patient who described the event as being secondary to a minor injury. Mean age was 27.8 years (range, 17-42 years). The average time between injury and surgery was 10.4 months.

The first patient was a 42-year-old man who had fallen off stairs. His surgery was performed 10 months after trauma. The second patient was 17 years old at the time of his injury—minor trauma during soccer practice—and underwent surgery 14 months after the injury. The third patient, a 26-year-old man, sustained minor trauma while riding a motorcycle and underwent surgery 12 months after the injury. The fourth patient was a 32-year-old man who also suffered minor trauma while playing soccer and waited 4 months for surgery. The fifth patient was a 22-year-old woman with a history of kidney transplantation who had fallen from her own height and waited 12 months for diagnosis and surgery.

SURGICAL TECHNIQUE

An anterior incision was made extending from a point 5 cm above the upper pole of the patella to the anterior tibial tubercle. The retracted and partially absorbed patellar tendon remnants were identified and dissected. In all 5 cases, tendon rupture had occurred at the inferior pole of the patella, leaving an average gap of 4 cm between the patella and the distal...
Patellar tendon rupture is a highly incapacitating condition that requires immediate treatment. However, in some instances, the public health system in Brazil is not prepared to deal with this type of condition with the necessary agility. In some public hospital protocols, all priority for rapid treatment is assigned to bone fractures, mainly because they are easily identified on plain radiographs. As patellar ruptures can be difficult to detect acutely, especially without a comparative radiograph of the contralateral side, they can easily be misdiagnosed as knee contusion if a poor examination is performed. Prognosis after patellar tendon rupture depends in large part on the time elapsed between injury and repair. Operative repair soon after the injury is recommended for optimal results.  

Neglected ruptures become more evident after some time, because of proximal traction on the patella secondary to a lack of resistance to quadriceps tendon pull is decreased in the early postoperative phase. The bone incision continued proximally onto the central one-third of the quadriceps tendon for an average length of 9 cm. This yielded a quadriceps tendon graft with a trapezoid-shaped bone graft at one end (Figure 1). This graft was then inverted and repositioned onto the patellar donor area in such a way that the quadriceps tendon was directed toward the anterior tibial tubercle (Figure 2). The trapezoidal bone plug was then fixed onto the patella with 3 oblique microscrews (Figure 3). The patellar tendon remnants and the fibrous scar tissue below the patella were then pulled with 2 parallel Krackow sutures, through 2 parallel bone tunnels fashioned with a 1.5-cm drill, to the level of the patella. The graft was then oversewn and meshed with these tissue remnants. Plain films were obtained to ensure proper implant placement. In a simultaneous maneuver, the patella was pulled distally while the stitches were knotted at the superior patellar pole and the quadriceps graft was fixed in the tibial tubercle with a cortical screw and a plastic spiked washer. The prepared contralateral knee was used as a reference to establish the adequate length of the repair to prevent a high-riding or low-riding patella (patella alta/patella baja). The wound was then closed in layers and the knee immobilized in a splint, which was kept on for 5 weeks, at which time physiotherapy began. Initial therapy consisted preferably of underwater activities in a swimming pool, with the objective of slow improvement of knee flexion. After 2 months, once at least 110° of flexion had been achieved, weight training was gradually allowed. Postoperative radiographs showed consolidation of the graft in all cases (Figure 4).

RESULTS

Four patients recovered their ability to extend their knees actively even against resistance, thus restoring normal gait. Lysholm scores improved from 33±4 (range, 22-39) before surgery to 89±6 (range, 87-93) after repair. As none of the patients were athletes before their injuries, there was no return to sporting activities. The fifth patient (kidney transplant recipient) died before 1-year follow-up due to clinical complications. There were no cases of superficial or deep infection and no thromboembolic events.

DISCUSSION

Patellar tendon rupture is a highly incapacitating condition that requires immediate treatment. However, in some instances, the public health system in Brazil is not prepared to deal with this type of condition with the necessary agility. In some public hospital protocols, all priority for rapid treatment is assigned to bone fractures, mainly because they are easily identified on plain radiographs. As patellar ruptures can be difficult to detect acutely, especially without a comparative radiograph of the contralateral side, they can easily be misdiagnosed as knee contusion if a poor examination is performed. Prognosis after patellar tendon rupture depends in large part on the time elapsed between injury and repair. Operative repair soon after the injury is recommended for optimal results.  

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ceps contraction. This quadriceps retraction, along with fibrous degeneration, exerts a great stretching force on any type of delayed patellar tendon reconstruction, which can compromise even a well-performed repair. Furthermore, in very retracted quadriceps with a resorbed patellar tendon remnant, the semitendinosus tendon graft commonly used to repair the gap between the patella and the tibial tubercle tends to slowly stretch because of the excessive proximal quadriceps pulling force. A classic article comparing different anterior cruciate ligament grafts showed that the central one-third of the quadriceps tendon equals the resistance to traction of a double-looped semitendinosus tendon. This supports the concept of using the central one-third of the quadriceps tendon for neglected patellar tendon repairs, with an advantage in its favor. With the proposed technique using the central one-third of the quadriceps tendon, the authors induced a muscle inhibition that weakens this powerful muscle traction during the recovery period, which, in turn, carries the benefit of protecting the patellar tendon reconstruction. Another advantage of the proposed technique is that the collagen fiber of the quadriceps tendon is much more similar to that of the patellar tendon than that of the knee flexors, such as the semitendinosus or gracilis tendons. It also avoids disturbance of the contralateral knee, which is necessary when the graft chosen is the central one-third of the patellar tendon in a bone-tendon-bone approach.

**CONCLUSION**

Prompt recognition and treatment of patellar tendon ruptures is essential. Several techniques have been described in the setting of a neglected rupture, each with benefits and complications. The technique presented here is an effective alternative for repair of chronic rupture of the patellar tendon and can restore the function of the extensor mechanism of the knee.

**REFERENCES**