TECHNICAL TIPS

Recurrent patellar tendon rupture: Reconstruction using ipsilateral gracilis and semitendinosus tendon autografts

Peer van der Zwaal*, Ewoud R.A. van Arkel

Department of Orthopaedic Surgery and Trauma, Medical Centre Haaglanden, P.O. Box 432, 2501 CK, The Hague, The Netherlands

Accepted 4 December 2006

Introduction

Extension disability as a result of recurrent patellar tendon rupture is a rare and surgically challenging problem. This is because repetitive injury results in a massive loss of tendon fibres and thus substantially diminishes the possibility of adequate reinsertion. In this case, an augmentation and/or reconstruction of the patellar tendon is required. Here, we describe an operative technique for the reconstruction of the patellar tendon using the ipsilateral semitendinosus and gracilis (STG) tendon autografts following a recurrent patellar tendon tear.

Cases

Two patients presented to our clinic with an extension deficit of the knee. Patient A was a 21-year old male, who received a patellar tendon repair after a right patellar tendon rupture a year earlier. Patient B was a 34-year old man who had sustained a comminuted patella fracture and complete patellar tendon rupture of his left knee 2 years before referral to our clinic. His initial injury was treated with a partial patellectomy and reinsertion of the patellar tendon. Both patients presented with pain, swelling, a patella alta and the inability to extend their knee following a hyperflexion trauma. Radiological examination confirmed the clinical diagnosis of a recurrent patellar tendon rupture (Fig. 1). They were treated with a patellar tendon reconstruction using autologous STG grafts. The grafts were fixed in the tibia using an interference screw. Patient A received two additional staples in the tibia for support (Fig. 2). Post-operatively an extension brace was applied for 6 weeks, followed by a week of 24 h a day continuous passive motion training (steadily increasing the range of motion from 20° to 90°) and 6 weeks in a cast brace. Three months after the surgery, their knee had regained full range of motion and normal strength. At, respectively, 25 and 28 months of follow-up, the patients had no deterioration in function and strength.

Operative technique

The patient is placed under spinal or general anaesthesia and intravenous antibiotic prophylaxis is administered. He is positioned on the operating
table in supine position with the knee joint in 90° of flexion and hanging freely from the table. The procedure starts with a range of motion and ligamentous examination of both knees. After exsanguinating the limb and applying tourniquet ischemia, the knee is prepped and draped in the usual sterile fashion. A median incision is made from the proximal pole of the patella to approximately 3 cm distal to the tibial tuberosity. The pes anserinus is incised and the semitendinosus and gracilis tendons are identified. A kocher is placed at the distal end of the tendons to prevent retraction. The tendons are dissected from their insertion point and five continuous sutures are placed on both the right and left side of the end of the tendon using an atraumatic vicryl 1.0 bioabsorbable suture (Bunnell’s stich). The tendons are harvested using a standard tendon stripper and need to be at least 18 cm in length. The tendons are stripped of muscle and fatty tissue and sutures are placed at the proximal end as described above. The grafts are fixed onto a workstation and put under sufficient tension to eliminate the elastic properties. The knee is now extended and placed horizontally on the operating table. The hardware cerclage, often used for primary repair, is removed. A horizontal tunnel is drilled through the distal half of the patella and through the tibial tuberosity with a canulated burr over a K-wire. Care must be taken not to damage the articular surface of the patella in order to prevent future patellofemoral osteoarthritis. The inner diameter of the tunnels equals the diameter of the bundled tendons, usually approximately 7 mm. The grafts are placed in the proximal tunnel and inserted crosswise through the tunnel in the tibial tuberosity. The patella is mobilized to its anatomical position by taking the knee through the range of motion from 0° to 90° and using the contralateral patella as a control. There is no need for a quadriceps release. The grafts are tightened and sutured onto each other. Now they are fixed in the distal tunnel using a bioabsorbable interference screw (Arthrex, Naples, FL) (Fig. 3). The screw diameter is 2 mm wider than diameter of the tunnel. If there is less torque than 15 inch/lbs, additional staples are used for securing the graft in the tibia. After attaining haemostasis the wound is closed in layers and a standard dressing is applied. The patient can be submitted to the

Figure 1 Pre-operative X-ray of patient A showing a patella alta.

Figure 2 Post-operative lateral X-ray of the patient A. The position of the patella is restored. Note the additional staples in the tibia to supplement the interference screw.

Figure 3 Illustration showing a schematic overview of the patellar tendon reconstruction using ipsilateral semitendinosus and gracilis tendon autografts. Note the interference screw in the tunnel through the tibial tubercle.
inpatient clinic for 1 night. Directly after surgery the patient receives an extension brace for 6 weeks. The patient is allowed to bear full weight as tolerated post-operatively. This is followed by 1 week of 24 h a day continuous passive motion training, steadily increasing the range of motion from 0–20° to 0–90° and 6 weeks in a cast brace. The rehabilitation program is supervised by a physical therapist. Profylaxis of thromboembolic events is provided in the form of daily subcutaneous injections of Nadroparine (GSK, Zeist, The Netherlands) 2850 international units, a low molecular weight heparine, for 6 weeks.

Discussion

The patellar tendon is a strong and important structure in the extensor mechanism of the knee. Acute patellar tendon ruptures are relatively uncommon and usually occur in young male adults when forceful quadriceps muscle contraction is resisted by a flexed knee joint. Rupture is associated with tendinopathy caused by repetitive microtrauma, diabetes mellitus, rheumatoid arthritis, chronic renal failure or steroid medication.\(^1\) Patellar tendon rupture is also a rare but catastrophic complication following total knee arthroplasty. The diagnosis is made upon clinical examination, inability to extend the knee, a palpable defect distal to the patella and a patella alta. Additional information from X-ray, ultrasound and MRI examination can be helpful in the diagnostic process or to distinguish the patellar tendon rupture from other pathology, for instance a patella fracture or quadriceps tendon rupture.

Patellar tendon rupture can be treated by end-to-end sutures or reinsertion, often combined with a cerclage reinforcement.\(^6\) Early surgical treatment will lead to the best clinical results.\(^8\) Recurrent or chronic rupture of the patellar tendon however is a very uncommon condition and provides the orthopaedic surgeon with a difficult problem. Large trials have never been performed and therefore there are no gold standard protocols for treatment or rehabilitation programs. Surgical repair is always indicated. Unfortunately, due to the quantitative and qualitative impairment of the tendon fibres, simple reinsertion often is not sufficient or not even possible. Furthermore, a chronic rupture usually is accompanied by abundant scar tissue formation and quadriceps muscle contracture. In this scenario, a patellar tendon augmentation usually is required in order to create a stable and functional extensor mechanism.

Dejour described a series of 13 cases of old patellar tendon ruptures treated with a contralateral autograft composed of a block of tibial bone, middle third of patellar ligament, block of patella, and quadriceps tendon. They had a mean flexion of 91° and no extensor lag after 8.6 months.\(^2\) Casey used multiple strands of cerclage wire in a figure of eight pattern in four patients with chronic ruptures. The patients were mobilized immediately after surgery without bracing. At follow-up, there was no extensor lag and a mean flexion of 112°.\(^2\) Ecker et al. treated four patients diagnosed with chronic patellar tendon rupture with a transfer of semitendinosus and gracilis tendons supplemented by cerclage wiring. Both tendons remain attached to their insertion point and are led through two separate horizontal tunnels in the patella and tibial tuberosity. All patients returned to pre-injury level of activity.\(^4\)

Patellar tendon reconstruction using STG autografts, as described above, creates a strong and stable extensor apparatus. An important contributing factor to the stability of the augmentation is the placement of an interference screw in the distal tunnel through the tibial tubercle. When additional fixation is needed one or two staples can be inserted over the interference screw. Furthermore, in this procedure there is no need for any allograft material or a second operative intervention for hardware removal. Additionally, the extensive rehabilitation program, which is supervised by a physical therapist throughout the process, is a significant factor for a good functional outcome, emphasizing controlled range-of-motion exercises and quadriceps strengthening, will enhance the results of surgery.\(^5\) It is unclear, however, whether post-operative immobilisation or direct full range of motion exercises leads to better results. We suggest that the ipsilateral STG autograft reconstruction provides surgeons with a straightforward and effective operative technique in the case of extensor lag caused by a recurrent patellar tendon rupture.

References