Case Report

Delayed Reconstruction of a Quadriceps Tendon

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Received: 19 July 2006 / Accepted: 2 October 2007
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Abstract Rupture of the quadriceps tendon is an uncommon injury and rapid diagnosis is important because delay in surgical repair generally is believed to adversely affect outcome. One study of 20 patients suggests repair should be done during the first 48 to 72 hours postinjury to achieve a successful outcome and late repair led to unsatisfactory recovery. Cases of delayed tendon repair have been reported, the longest to our knowledge being 11 months before surgical intervention. We present a case of successful outcome of a quadriceps tendon rupture reconstructed at least 8 years after occurrence and a review of the literature of delayed reconstructions. We show that successful restoration of extensor mechanism function can be achieved several years after tendon rupture.

Introduction

Quadriceps tendon rupture is an often overlooked injury of the knee resulting in delays in diagnosis and treatment. Early diagnosis is considered important as delay in surgical repair generally is believed to adversely affect

outcome. Based on a study of 20 patients Scuderi [4] suggested repair should be performed in the first 48 to 72 hours postinjury to achieve a successful outcome; late repair led to unsatisfactory recovery. Cases of delayed tendon repair have been reported, the longest to our knowledge being 11 months until surgery [1]. We report a patient who had successful repair at least 8 years after rupture.

Case Report

An 80-year-old woman presented with an ongoing problem with her right knee. She recalled tripping and falling approximately 13 years previously and was assessed in her local hospital the next day for anterior knee pain. Information obtained from medical records of her examination at that time noted her knee was swollen and tender over the superior pole of the patella. Movement was painful and she was unable to actively extend the knee against gravity. She was diagnosed with a ligamentous injury by accident and emergency staff and treated with a knee support. Subsequently, she used a cane when walking. She had two additional falls, one 3 years later and the other 2 years after that. On each occasion, she sustained similar injuries and was given the same diagnosis. There was no history of a subsequent fall or other trauma to her knee. She stated her knee had not been the same since the initial injury and described mild anterior knee pain noticeable when ascending and descending stairs, occasional giving way to flexion when walking, and had adopted, in her own words, an unusual gait to accommodate the right knee. Her medical history included hypertension only and she had no history of gout, diabetes, or steroid use.

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Each author certifies that his or her institution has approved the reporting of this case report, that all investigations were conducted in conformity with ethical principles of research, and that informed consent for participation in the study was obtained.

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On physical examination, she had a body mass index of 27 kg/m^2 . When asked to stand, she had a tendency to flick the knee into hyperextension, and when walking with a cane, she maintained a straight knee that facilitated hyperextension during the stance phase. When attempting tiptoe walking, and hence a flexed knee, there was marked instability. On moving the knee, there was noticeable patellofemoral crepitus and the patella felt hypermobile, but there was no evidence of patella alta or baja. She was unable to actively perform a straight-leg raise and had an extensor lag of 20° , but on passive movement, full extension was achievable.

Radiographs of the knee confirmed osteoarthritis, particularly of the patellofemoral joint. There was no evidence of lengthening or detachment of the patella tendon and no evidence of calcification at the proximal pole. An ultrasound examination done in light of the history and extensor lag confirmed a quadriceps tendon rupture.

Repair was done through a longitudinal midline incision (Fig. 1A). In extension, a 6-cm gap was found in the quadriceps tendon bridged by a thin sheet of mature scar tissue from the distal end of the tendon to the superior pole of the patella. There was no sign of active inflammation. The tendon was mobilized through a medial and lateral release, longitudinal drill holes were made through the patella for reattachment using four FiberWire[®] (Arthrex Ltd, Sheffield, England) sutures (Fig. 1B), and the repair was reinforced laterally and medially by sutures through the retinacular tissues. The patellofemoral osteoarthritis

Fig. 1A–B The drawings illustrate operative repair of the quadriceps tendon. (A) The incision line (thick dotted line) and placement of the FiberWire[®] sutures are shown. (B) The tendon is pulled down and secured in position by tying the sutures to the patella tendon. The vastus muscles then are sutured in place. (Published with courtesy of the media services department at St George's Medical School, Blackshaw Rd., Tooting, London SW19, UK.)

Fig. 2 The patient is performing a straight-leg raise. (Published with courtesy of Robert Janowski from Kingston Hospital medical photography department.)

was not deemed severe enough to warrant treatment because the patient described only mild anterior knee pain when using stairs.

Fig. 3 The patient is performing a single-leg dip. (Published with courtesy of Robert Janowski from Kingston Hospital medical photography department.)

The patient had an uneventful postoperative recovery involving an initial period of continuous passive movement of 0° to 50° and subsequent full-weightbearing mobilization with a locking knee brace. The brace initially was set to 0° to 30° and then increased to 0° to 60° as she improved control. At no point was the knee immobilized in plaster. The brace was removed at 2 months, at which point she could flex the knee to 100°, and she underwent a program of quadriceps-strengthening exercises. On last review at 1 year postrepair, she was almost pain-free apart from some occasional mild discomfort using stairs, compatible with her arthritic changes, and she was able to walk ½ mile without difficulty. Her quadriceps strength was graded 4+/5, she could perform a straight-leg raise (Fig. 2), range of movement about the knee was 0° to 110°, and there was no evidence of an extension lag (Fig. 3).

To provide a more objective assessment of her outcome, we used the Lysholm [6] score, which assesses patients' symptoms and functional ability on a rating scale with a maximum score of 100. At initial preoperative assessment, our patient was given a score of 32, but at 1 year post-surgery, her score had increased to 91.

Discussion

Ruptures of the knee extensor mechanism are comparatively rare and may occur secondary to trauma or spontaneously, the latter mainly being associated with patients with underlying metabolic disorders [2].

One study of 67 patients and a review of the literature from 1880 until 1978 by Siwek and Rao [5] suggested the majority (88%) of quadriceps tendon ruptures occur in patients older than 40 years, whereas in cases of patellar tendon rupture, 80% occurred in patients younger than 40 years.

The outcome with early diagnosis and repair of quadriceps tendon ruptures has been deemed superior to repair of chronic tendinopathies. Scuderi [4], in a study of 20 patients in 1958, suggested repair should be done in the first 48 to 72 hours postinjury to achieve a successful outcome, and late repair led to unsatisfactory recovery. In the series by Siwek and Rao [5] in 1981, 30 patients with a ruptured quadriceps tendon underwent immediate repair and six were diagnosed late and underwent delayed repair (range, 2–14 weeks postinjury). Five of the six ruptured tendons were reconstructed by approximating the ends with mattress sutures, and one needed quadriceps tendon lengthening with a Codivilla procedure [5]. The outcomes in the six cases were much less satisfactory than those patients who had undergone immediate surgical repair. Three were graded as 'good' and three as 'unsatisfactory.' Only one patient recovered more than 90° knee flexion. Postoperative results were graded as excellent if normal range of movement and

full quadriceps strength existed, good if range of movement was between 0° and 120° and quadriceps strength was able to overcome moderate resistance, and unsatisfactory if range of movement was 0° to 90° and the quadriceps were only able to overcome minimal resistance.

A more recent article by Rasul and Fischer [3] in 1993 followed 19 patients diagnosed with quadriceps tendon rupture; 17 of the patients had early repair within 5 days postinjury and two had delayed repair, one at 4 weeks and the other at 10 weeks. Repair in the chronic cases was difficult because of scar contraction and soft tissue retraction and involved distal advancement of the vastus medialis and lateralis in a vest-over-pants fashion. Patients who had early repair were able to walk unaided with a mean range of movement of 0° to 116° and no muscle atrophy at 6 months. The two patients who had delayed repair had poorer outcomes; one experienced occasional giving way of the patella and patellofemoral joint pain and the other continued to have weakness of the quadriceps, although this was confounded by the fact that he had poliomyelitis affecting the limb before surgery [3].

The longest published delay until surgical repair is 11 months [1]. In this case of a 36-year-old man who injured his leg while playing basketball, a 9-cm gap in the tendon was discovered and direct end-to-end suturing was not possible. A modified Codivilla V-Y and Scuderi triangle flap procedure was used. After 6 weeks wearing a cylinder cast, the patient's leg was placed in a hinged brace. Five months postsurgery, the patient was fully weightbearing, had 0° to 110° range of motion, and had no extension lag [1].

Quadriceps tendon rupture is an often-overlooked injury of the knee that can result in long delays in appropriate management when misdiagnosed. It therefore is important to test the extensor mechanism carefully when a patient with knee trauma presents, especially because radiographic films often appear normal. There is much literature describing worse outcomes in cases of delayed surgical repair, but our case suggests a functional result in terms of pain relief, range of movement, power, and gait can be achieved even several years after injury. We believe it is important not to deny reconstruction surgery to a patient who presents late with a quadriceps tendon rupture.

Acknowledgments We thank Robert Janowski from Kingston Hospital medical photography department and the media services department at St George's Hospital Medical School for the illustrations.

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