



Outcome of quadriceps tendon repair

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Complete rupture of the quadriceps tendon is a well-described injury. There is a scarcity of literature relating to the outcome of patients with this injury after surgery. We undertook a retrospective analysis of patients who had surgical repair of their quadriceps tendon at our institution over a 13-year period, totalling 21 patients. Males were more commonly affected, with a male/female ratio of 4:1. The peak incidence was in the sixth decade of life. Assessment consisted of the completion of a functional knee questionnaire and a clinical examination. Symptomatic outcome following surgical repair was good with a mean symptom score generated of 19.16 out of a maximum of 25 using the Rougraff *et al* scoring system. Most of the patients returned to their pre-injury level of activity. Five degrees deficit and extension lag was present in three patients; these patients had the quadriceps repaired using transosseous sutures. Patients who had direct repair of the tendon using the Bunnell technique had lower Rougraff scores than the rest.

Keywords : quadriceps tendon ; rupture ; repair ; outcome.

eration of the quadriceps tendon plays an important role in the pathophysiology of this condition (3). Misdiagnosis and delayed diagnosis are frequent, and it has been shown that delayed surgical repair is associated with adverse outcome (6). A number of medical conditions that predispose to rupture of the quadriceps tendon have been identified such as chronic renal failure, diabetes, rheumatoid arthritis, hyperparathyroidism, various connective tissue disorders and steroid use/intra articular injection (4). Patients with these conditions may represent up to 20% of all ruptures (2). A number of different surgical techniques have been described for repair of the ruptured tendon (7, 8). To date, no one repair type has been shown to yield superior results over another (1). We set out to discover this, both in terms of subjective symptomatic and functional perception of outcome and objective assessment based on physical examination.

INTRODUCTION

Although there is no reported incidence in the literature, quadriceps tendon rupture can be considered an uncommon injury and relatively little is known about how patients with this injury ultimately do following repair. It generally occurs following trivial trauma and has a peak incidence in the 6th and 7th decades of life, suggesting that degen-

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Table I. — Technique of repair of the quadriceps tendon rupture and outcome

Number of cases	Type of surgical repair	Outcome score	Extension lag
10	Attachment of torn lower end of quadriceps tendon through the superior pole of the patella, passing the threads through drill holes	21.3/25	3 patients had 5° extension lag
9	End to end technique for midsubstance (Bunnell)	18.8/25	No extension lag
3	Wire augmentation after repair (1 patient responded to questionnaire)	8/25	No extension lag

MATERIALS AND METHODS

All the patients who attended our trauma service, provided by five Consultant Orthopaedic surgeons, with ruptures of their quadriceps tendons, between 1991 to 2004, were included in our study. During this period 21 patients were diagnosed as having ruptured their quadriceps tendons. Medical records were reviewed for information relating to the mechanism of injury, type of surgical repair, presence of a recognised medical risk factor and length of follow-up. A functional outcome questionnaire was sent to the patients. Four patients were deceased at the latest assessment.

Twenty patients had unilateral rupture of their quadriceps tendon and there was one case of bilateral rupture. The average age of the patients was 66.2 years (range : 49 to 80). Seventeen of the patients were male and four were female. Diagnosis was predominantly made on clinical grounds. When any doubt existed, ultrasonography was used as an adjunct (five patients). The commonest mechanism of injury was a simple fall on a flat surface. The presence of a complete rupture of the quadriceps tendon in a previously mobile patient was seen as an absolute indication for repair. The mean interval between injury and surgery was 5.8 days (range : 1 to 40). Three distinct repair types were employed (table I). The commonest was a suture of the tendon to the superior pole of the patella through drill holes using ethibond. Other repair types consisted of simple suture repair using an end to end technique for midsubstance tears and simple suture repair with wire reinforcement as described by Bunnell.

Postoperatively patients were immobilised in a cylinder cast for 6 weeks and mobilised partially weight bearing. Thereafter they were referred for physiotherapy, mainly working on re-establishing range of motion. Follow-up at the out patient department was at 6 weeks

and then at 3 months. The functional questionnaire completed by patients at follow-up is modelled on that previously used by Rougraff *et al* (6). Five distinct issues were addressed in the functional questionnaire (table II). Each of these was given a score from one to five, the higher the score the better the symptomatic result. The length of time taken to return to the pre-morbid level of activity was also examined.

RESULTS

Of the original 21 patients 12 were contacted successfully. Of the 9 who were not available for follow-up, 4 had died. The right knee was injured in 15 and the left knee in 6. Three patients had medical risk factors, 2 had diabetes and one had a previous patellectomy. Length of follow-up averaged 3.5 years (range : 6 months to 12 years).

The mean score generated from the functional questionnaire was 19.16 out of a maximum of 25, indicating a good symptomatic outcome. The mean active ROM of the affected limb was 0.5-102.5 (0-110 being the normal range) at the time of discharge. There were no postoperative complications. To our knowledge, no patient re-ruptured the quadriceps tendon post repair.

DISCUSSION

From our study, it would appear that males have a greater inherent predisposition to rupturing their quadriceps tendon than females, with a male to female ratio of 4:1 observed.

In contradistinction to other studies, except for one study (5), we found bilateral rupture to occur at

Table II. — Scoring system used to assess the outcome following repair of the quadriceps tendon (Rougraff *et al* (6))

Overall satisfaction 1-5	very good /good/fair/poor/very poor
Knee strength 1-5	very good /good/fair/poor/very poor
Knee movement 1-5	normal/almost normal/reduced/stiff/very stiff
Ability to climb stairs 1-5	normal/normal with bannister/one step at a time/with assistance/never
Pain 1-5	never/rare/occasional/frequent/constant

a surprisingly low rate (one out of 21 ruptures). Previous studies have suggested that this injury is bilateral in approximately 10%. In addition, predisposing medical risk factors were identified in only 3 of 21 cases compared with a reported frequency of up to 20% elsewhere. We think that patients who have undergone patellectomy are at risk of rupturing their quadriceps tendon.

Post operatively patients were immobilised in cylinder casts for 6 weeks following surgical repair of their injury. We found that this did not have an adverse effect on the subsequent range of motion. Added to the observation that no patient re-ruptured his tendon, this would lead us to advocate this form of immobilisation as in one previous study (5).

In our series we found that outcome varied according to the type of repair (direct or transosseous with or without augmentation). Although the functional score was the best among the group who have had transosseous repair, three patients in this group did develop a slight extension lag. Extension lag did not correlate with functional out-

come. Overall there were good results in all patients with rupture of the quadriceps tendon.

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