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Rupture of the quadriceps tendon

AN ASSOCIATION WITH A PATELLAR SPUR

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We reviewed the records of 107 consecutive patients who had undergone surgery for disruption of the knee extensor mechanism to test whether an association existed between rupture of the quadriceps tendon and the presence of a patellar spur. The available standard pre-operative lateral radiographs were examined to see if a patellar spur was an indicator for rupture of the quadriceps tendon in this group of patients. Of the 107 patients, 12 underwent repair of a ruptured patellar tendon, 59 had an open reduction and internal fixation of a patellar fracture and 36 repair of a ruptured quadriceps tendon. In the 88 available lateral radiographs, patellar spurs were present significantly more commonly ($p < 0.0005$) in patients operated on for rupture of the quadriceps tendon (79%) than in patients with rupture of the patellar tendon (27%) or fracture of the patella (15%). In patients presenting with failure of the extensor mechanism of the knee in the presence of a patellar spur, rupture of the quadriceps tendon should be considered as a possible diagnosis.

Rupture of the quadriceps tendon following trauma is often missed. There is no radiographic indicator of the injury. The clinical diagnosis can be confirmed either by ultrasound or MRI. There may be a greater delay in the diagnosis of rupture of the quadriceps tendon than in other causes of extensor failure such as fracture of the patella and rupture of the patellar tendon as the latter are obvious on radiographs. Delay in surgical intervention may compromise recovery.

This paper examines whether an association exists between rupture of the quadriceps tendon and the presence of a patellar spur (Fig. 1), which is defined as a bony projection above the insertion of the quadriceps into the non-articular superior pole of the patella. Recognition of this association might improve the chances of diagnosis of rupture of the quadriceps tendon.

Patients and Methods

The operation registers of the orthopaedic trauma theatres from the Frenchay Hospital in Bristol were examined over a period between March 1990 and April 2004 to identify patients who had undergone repair of the extensor mechanism of the knee. The opera-

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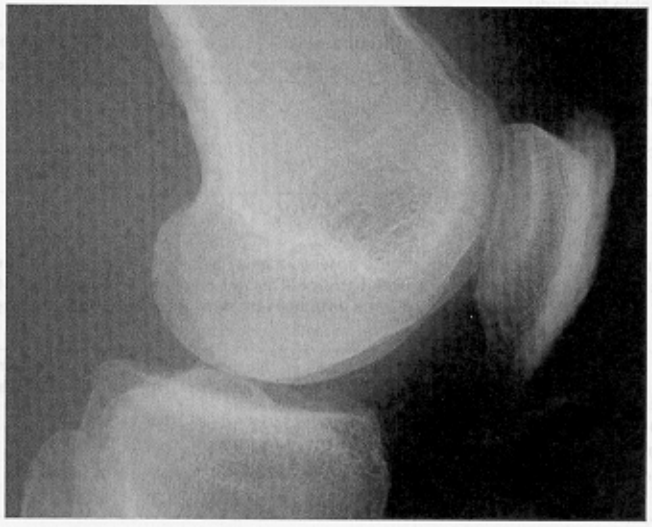

Fig. 1

Lateral radiograph of a knee following rupture of the quadriceps tendon showing a large spur on the non-articular surface of the superior pole of the patella.

Table I. Mean age, SD and range of the three groups studied

Type of injury	Mean age (yrs)
Rupture of the patellar tendon	50.43 (14; 28 to 75)
Fracture of the patella	51.1 (23.2; 11 to 91)
Rupture of the quadriceps tendon	51 (14.5; 19 to 88)

Table II. Gender of the 107 patients with extensor mechanism failure

Type of injury	Gender	
	Female:Male	Total
Rupture of the patellar tendon	2:10	12
Fracture of the patella	23:36	59
Rupture of the quadriceps tendon	5:31	36
Total	30:77	107

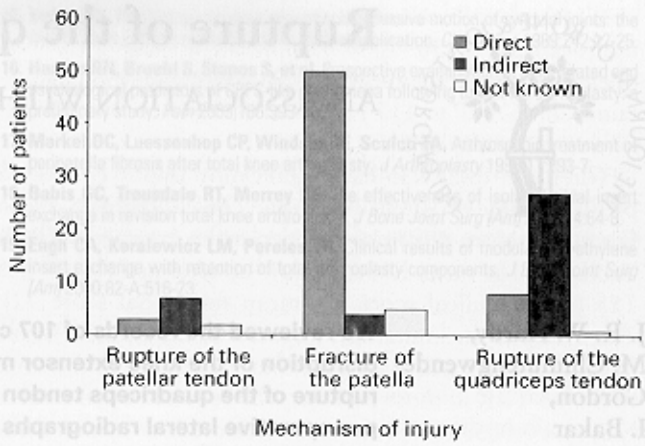

Fig. 2

Bar chart of mechanism of injury for the patients with radiographs.

tions comprised repair of a rupture of the patellar tendon, open reduction and internal fixation of a fracture of the patella and repair of a rupture of the quadriceps tendon.

One hundred and seven patients were identified. The notes and available lateral radiographs of the injured knee were re-examined for demographic data, the mechanism of injury, the presence or absence of a patellar spur, its length, the length of the patella and of the patellar tendon. The latter measurements were used to confirm the diagnosis of rupture of the patellar tendon where there were no other radiographic indicators of failure of the extensor mechanism. The Insall-Salvati[1] ratio was used pre-operatively as it allows for variations in the size of the knee and the radiographic projection; damage to the patellar tendon was inferred if the ratio exceeded 1.2. Associations were tested with chi-squared analysis using SPSS software (SPSS Inc., Chicago, Illinois).

Results

Of the 107 patients identified, 12 underwent repair of a ruptured patellar tendon, 59 open reduction and internal fixation of a fractured patella and 36 repair of the quadriceps tendon. The age distribution was similar for the three types of injury (Table I). Direct injury was a much more common mechanism in the patients with a fracture of the patella than in the other two groups (Fig. 2), and a greater proportion of these patients were male (Table II). There were no patients with bilateral rupture, evidence of renal disease, gout, or steroid use. The radiographs of 88 patients were available (Table III). All patients with rupture of the patellar tendon had an increased Insall-Salvati ratio. Those with rupture of the quadriceps tendon did not.

Table IV shows the distribution of the presence or absence of a patellar spur between the three types of injury. Subsidiary chi-squared testing indicated that the distribu-

Table III. Patients available for study

Type of injury	Number of cases	Number with no radiographs	Number with radiographs	Number with spur (%)
Rupture of the patellar tendon	12	1	11	3 (27)
Fracture of the patella	59	11	48	7 (15)
Rupture of the quadriceps tendon	36	7	29	23 (29)
Total	107	19	88	33 (38)

Table IV. Presence or absence of a patellar spur on the anterosuperior surface of the patella. The numbers in brackets indicate the expected numbers under the null hypothesis that the presence of spurs has no relation to the eventual diagnosis in the patients who present with knee pain, have radiographs and are diagnosed in the three categories.

Type of injury	Number of cases with a spur	Number of cases without a spur	Number with radiographs
Rupture of the patellar tendon	3 [4.13]	8 [6.87]	11
Fracture of the patella	7 [18]	41 [30]	48
Rupture of the quadriceps tendon	23 [10.88]	6 [18.13]	29
Total	33	55	88

tions were not significantly different between rupture of the patellar tendon and fracture ($p = 0.312$), and that the significant differences were between the rupture of the quadriceps tendon and the other two injuries ($p = 0.0$).

Of the 33 patients with spurs, 23 had rupture of the quadriceps tendon. Thus, in patients coming to surgery for painful failure of the extensor mechanism of the knee, the positive predictive value of the presence of a spur for rupture of the quadriceps tendon is 23 of 33 (69.6%). Of the 29 patients with rupture of the quadriceps tendon, 23 had spurs. Thus, the corresponding sensitivity of spurs in picking up a rupture of the quadriceps tendon is 23 of 29 (79.3%).

Discussion

Disruption of the extensor mechanism of the knee is a rare but serious injury.[2] The three most common causes are fracture of the patella, rupture of the patellar tendon and at the quadriceps tendon. The latter injury is often overlooked. The outcome is best following early repair[3-5] so prompt diagnosis is important. The radiographic appearance of a cranially-displaced avulsed part of the patella associated with the tendon should allow the diagnosis to be made.[6] However, avulsion of this sort is unusual.

Reviews of the literature on unilateral quadriceps tendon rupture highlight problems in establishing the diagnosis in older patients.[7,8] Bilateral tendon rupture is rare and is generally associated with chronic renal failure,[9] gout,[10] the use of steroids,[11,12] quinolone antibiotics[13] and diabetes. Bilateral tendon rupture associated with systemic disease, for example in renal failure, tends to be in the younger age group,[9-11,14] and has been reported in patients between 16 and 22 years of age.[15-17] None of our patients had these conditions or bilateral ruptures.

The predictive value of a spur for rupture of the quadriceps tendon must be considered in the light of the obvious selection bias of this cohort of patients chosen for operative repair. We accept that we do not know the prevalence of a patellar spur in the normal population. However, if it is as uncommon as rupture of the quadriceps tendon then the presence of a radiographically-identified spur should alert the examining doctor to the possibility of such an injury in patients with traumatic failure of the extensor mechanism.

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