ISOLATED AVULSION OF THE POPLITEUS TENDON

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We report four patients with a mean age of 17 years (14 to 22) with external rotation injuries of the knee in slight flexion. Radiographs showed a small fragment in the area of the lateral femoral condyle. At operation, the fragment, consisting of the femoral insertion of the popliteus, was anatomically reduced and fixed. At a mean follow-up of 35 months all the knees had an excellent function score.

An isolated lesion of the popliteus often presents as a tendon avulsion whereas major damage to the posterolateral corner of the knee involves combined ligamentous injuries. In patients with an acute haemarthrosis and lateral pain in a stable knee, the diagnosis of isolated avulsion of the popliteus tendon should be suspected. Arthroscopy with special attention to the lateral gutter is indicated. We advise anatomical reduction and fixation of the fragment to prevent possible long-term effects on other posterolateral structures.

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Injuries to the popliteus tendon usually occur as part of extensive damage to the posterolateral ligamentous structures of the knee (Müller 1982). An isolated lesion of the tendon is rare, with only six cases reported previously (Naver and Aalberg 1985; Rose and Parisien 1988; Burstein and Fischer 1990; Gruel 1990; Mirkopoulos and Myer 1991). The history of injury and the symptoms can easily be confused with those of a torn meniscus.

We present four patients with isolated avulsion of the popliteus tendon who underwent operative fixation of the fragment.

PATIENTS AND METHODS

Between 1986 and 1991 four patients with an isolated avulsion of the popliteus tendon presented at the North Sydney Orthopaedic and Sports Medicine Centre. There were three men and one woman with a mean age of 17 years (14 to 22). All the injuries were acute. Two had occurred while playing rugby, one during waterskiing and one while ice-skating. In all four cases the mechanism of injury consisted of external tibial rotation in slight flexion of the knee. One patient had an associated posterior dislocation of the contralateral hip which was treated by closed reduction followed by partial weight-bearing.

All the patients complained of pain on the lateral side of the knee with effusion, tenderness over the lateral femoral condyle and a restricted range of motion. The joints were stable in the sagittal and coronal planes and did not show rotatory instability when examined under anaesthesia. Radiography showed a small fragment in the region of the lateral femoral condyle in all four patients (Fig. 1).

Arthroscopy was performed through an anterolateral portal in three patients. After thorough irrigation, definite laxity of the popliteus tendon was shown by probing. No other intra-articular abnormality was noted. When the popliteus recess was inspected an osteochondral fragment was found, measuring between 1.5 and 2 cm in length and 0.8 and 1.2 cm in width, displaced about 5 mm from the lateral femoral condyle. In one patient the fragment was reduced and then fixed with a staple through a small longitudinal incision over the lesion, two others had open reduction and fixation with a staple through a longitudinal incision anterior to the lateral collateral ligament (Fig. 2) and one had open reduction and fixation with a 35 mm AO screw.

Postoperatively, all patients wore a knee brace for four weeks. They were advised to use partial weight-bearing during the first two weeks, except for the patient with the contralateral posterior dislocation of the hip who was allowed full weight-bearing. After two weeks a gradual increase in weight-bearing was allowed. Progressive movement and isometric exercises were started on the first day after surgery.

The mean period of follow-up was 35 months (19 to 53).
All patients were examined by an independent examiner (MN) and function was assessed using the International Society of the Knee questionnaire (Insall et al 1989).

RESULTS
Details of the four patients are given in Table I. All knees were rated excellent on functional scoring, all were stable with a full range of motion. There was no effusion and no tenderness over the lateral femoral condyle. Active internal rotation of the tibia against resistance and passive external rotation of the tibia with the knee at 30° flexion were painless and symmetrical. The patients have all returned to their preinjury level of sporting activity.

DISCUSSION
The popliteus muscle is located on the posteromedial surface of the proximal tibia and the semimembranosus blends into its aponeurosis. The tendon courses extrasynovially through the knee and is inserted into the lateral femoral condyle and the head of the fibula as part of the arcuate ligament complex. Insertion into the lateral meniscus is disputed (Tria, Johnson and Zawadsky 1989; Stäubli and Birrer 1990), and it is questionable whether the lateral meniscus is protected by the action of the popliteus during flexion. The main function of the popliteus is to initiate and maintain internal rotation of the tibia on the femur and prevent forward dislocation of the femur on the tibia during initial flexion (Last 1950; Basmajian and Lovejoy 1971; Mann and Hagy 1977). Popliteus is an important stabiliser of the posterolateral corner of the knee: on electrical stimulation it produces an active ‘pivot shift’ (Peterson, Pitman and Gold 1984).

The mechanism of injury in all our patients was external rotation of the tibia in a partially flexed knee, but it is not clear why only the popliteus was damaged and the other posterolateral structures were spared. During examination of the injured knee the remaining intact structures of the popliteal corner seemed to compensate for the injured popliteus, giving a stable joint. Four of the six cases of isolated popliteus injury described in the literature as well as our four cases presented as bony avulsions. In the case reported by Burstein and Fischer (1990) there was rupture of the femoral insertion, suggesting that isolated lesions of the popliteus occur most commonly as osteochondral avulsions whereas more major damage to the posterolateral corner involves a combination of ligament injuries.

An acute haemarthrosis and lateral pain in a stable knee should lead to suspicion of an isolated avulsion of the popliteus tendon; arthroscopy should be undertaken, and the lateral gutter and the popliteus recess inspected (Rose...
Table 1. Details of four patients with isolated avulsion of the popliteus

<table>
<thead>
<tr>
<th>Case</th>
<th>Age at operation (yr)</th>
<th>Sex</th>
<th>Radiographic findings</th>
<th>Type of operation</th>
<th>Follow-up (mth)</th>
<th>ISK*</th>
<th>Range of motion (degrees)</th>
<th>Passive external rotation (degrees)</th>
<th>Active internal rotation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>22</td>
<td>F</td>
<td>Avulsion</td>
<td>Arthroscopy</td>
<td>32</td>
<td>190</td>
<td>5 to 140</td>
<td>20</td>
<td>Symmetrical</td>
</tr>
<tr>
<td>2</td>
<td>18</td>
<td>M</td>
<td>Avulsion</td>
<td>Arthroscopy</td>
<td>34</td>
<td>200</td>
<td>0 to 140</td>
<td>20</td>
<td>Symmetrical</td>
</tr>
<tr>
<td>3</td>
<td>15</td>
<td>M</td>
<td>Avulsion</td>
<td>Open reduction</td>
<td>53</td>
<td>190</td>
<td>0 to 140</td>
<td>15</td>
<td>Symmetrical</td>
</tr>
<tr>
<td>4</td>
<td>14</td>
<td>M</td>
<td>Avulsion</td>
<td>Arthroscopy</td>
<td>19</td>
<td>200</td>
<td>5 to 140</td>
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* International Society of the Knee


The treatment of an isolated popliteus lesion is not well-defined. The muscle is an important stabiliser of the lateral corner of the knee and although good short-term results have been reported without reconstruction of the popliteus (Naver and Aalberg 1985; Burstein and Fischer 1990; Gruel 1990), we advise anatomical reduction and fixation of the avulsed fragment. This prevents the possibility of long-term posterolateral instability. The proprioceptive receptors incorporated in ligaments and tendons mean that the length of these structures must be maintained to allow immediate activation of stabilising forces. Popliteus is the main tendinous co-ordinator posterolaterally (Müller 1982). Resection of the avulsed popliteus insertion results in loss of tendon length and tension and will prevent adequate activation of the concomitant posterolateral stabilisers. Reduction and fixation of the fragment is technically easy and appears to restore normal anatomy and function.

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

REFERENCES


