Simultaneous bilateral patellar tendon avulsion in an adolescent

A 13-year-old boy sustained an injury to both knees upon landing after a forceful jump in a soccer game. Plain radiography and magnetic resonance imaging demonstrated bilateral distal patellar tendon avulsions without fracture of the tibial tuberosities and the physes. To our knowledge, this particular injury has not been previously described in the literature. Open surgeries and internal fixation were performed with excellent functional outcome. This type of injury was similar to the well-recognised acute tibial tuberosity avulsion fracture in terms of the pathogenesis and treatment. We propose a further subtype of this injury pattern.

Case report

The patient was a 13-year-old boy, who enjoyed good past health and was of average body height and weight. There was no history of steroid use. The patient complained of immediate bilateral knee pain after a jump during a soccer game in April 2007. He denied any history of pain or swelling in the knees. Physical examination showed bilateral knee effusions with high riding patellae. The extensor mechanisms were disrupted bilaterally, but there was no neurovascular deficit. Roentgenographic examination reviewed bilateral patella alta and no obvious avulsion fracture at both inferior pole of the patellae or tibial tuberosities. The magnetic resonance imaging (MRI) of both knees showed avulsion rupture of both distal patellar tendons with gaps measuring about 0.8 cm on the right
Bilateral patellar tendon avulsion

A 13-year-old boy injured his left knee while playing football. On physical examination, a palpable left patellar tendon was noted. X-ray revealed a patellar tendon avulsion fracture with patella alta (Figs 1a and 2a). The patient underwent open reduction and internal fixation with a 4 mm x 50 mm cancellous screw and a soft tissue washer through the periosteum. The patient was able to return to school 2 weeks after surgery.

Five months after the operation, the range of motion of both knees was 0 to 135 degrees. There was some difficulty in squatting due to weakness of both quadriceps. The cancellous screws and soft tissue washers were subsequently removed (at 11 months after the index surgery). The range of movement of both knees was 0 to 140 degrees, and the patient was able to squat without difficulty. Radiographs of both knees showed normal position of the patellae (Figs 2d and 3) and there was no premature closure of the physes or genu recurvatum deformity. The patient has resumed his usual physical activities without any limitations, and has been followed up for 1.5 years following the operation.

Discussion

The most important difference from previous case reports was the nature of patellar tendon avulsions. In our patient, they were pure patellar tendon avulsions with simultaneous involvement of both knees, which is extraordinary uncommon in children with open physes and not described in the literature to date. Of the reported patients with simultaneous bilateral fracture, the majority underwent open reduction and internal fixation; their mean age being 15 years. The injury has been described as a result of violent active extension of the knee or violent

FIG 1. Diagrammatic representation of the different classification of the tibial avulsion fracture in adolescents

* Tendon injury pattern described in this case report, proposed as subtype 6

FIG 2. (a) Magnetic resonance imaging showing avulsion of right patellar tendon with patella alta and intact physeal plate. (b) Intra-operative photo showing the avulsed end of the right patellar tendon. (c) Lateral radiograph of right knee early after operation. (d) Lateral radiograph of right knee after 12 months of follow-up
passive flexion of the knee against a tight contracted quadriceps mechanism. Such fractures often occur during athletics, and there is a male predominance. It may be due to a greater involvement in vigorous sport and a later age for fusion of the upper tibial epiphysis. Types I and II fractures are most often noted in adolescents from 12 to 14 years of age, while type III fractures are most often observed in older adolescents from 15 to 17 years of age. Osgood-Schlatter disease has been suggested as a predisposing factor for tibial avulsion fractures but proof is lacking. Undisplaced type I or II fractures can be treated conservatively by managements such as castings. For displaced fractures, restorations of the extensor mechanism as well as anatomical reduction of the tibial articular surface are the treatments of choice. If growth potential in the proximal tibial fragment remains, the screws should be inserted parallel to the joint, thereby avoiding the physis.

Regarding pathogenesis, this injury was presumed to occur when the amount of traction by the patellar ligament exceeded the combined strength of the physis beneath the tubercle, or the surrounding perichondrium, or the periosteum adjacent to the tubercle. In our case, both roentgenographic and MRI yielded no evidence of fracture at the lower pole of patella, tibial tuberosity, or across the physis. During the operation, we appreciated that the avulsed patellar tendons were attached to a thin piece of periosteum instead of sizeable bony fragments. Murati et al described a similar case: the bilateral patellar tendon rupture in a child, but this involved the mid-part of the patellar tendon rather than the distal patellar tendon avulsion. We believe that the mechanism of injury and the pathogenesis of the case described in this report are similar to the well-recognised acute tibial avulsion fractures. A further subtype is therefore postulated (Fig 1), which entails tendon injury rather than bony injury.

For the treatment, we reattached the patellar tendon to its anatomical position with cancellous screws and soft tissue washers. We further augmented the fixation with Krackow stitches through tibial bone tunnels and protected the whole construct with figure-of-eight tension band wirings. Basically, we opted for soft tissue to bone healing rather than the bone-to-bone healing as in most such cases. The entire constructs were stable enough to allow early mobilisation and full weight-bearing and walking, which was unlike some previous case reports that entailed cast immobilisation and non–weight-bearing walking for 6 weeks.

In conclusion, we report the first case of simultaneous pure bilateral patellar tendon avulsions from the tibial tuberosity, with no physeal injury, in an adolescent. It was managed successfully by the conventional practice with screw fixation, but Krackow stitches and tension band wiring were also used to augment fixation. The patient was allowed full weight-bearing walking and early knee mobilisation after the operation. He returned to his school life soon after the operation, recovered completely from the injury, and is now able to resume his usual sporting activities without limitation.

References