Current Orthopaedics (2005) **19**, 49–58

Current
ORTHOPAEDICS
www.elsevier.com/locate/cuor

TRAUMA

Acute injuries of the extensor mechanism of the knee

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KEYWORDS
Extensor mechanism injuries;
Patellar tendon;
Quadriceps tendon;
Injuries;
Patella fractures

Summary Injuries of the extensor mechanism are still a challenge for orthopaedic surgeons. Early accurate diagnosis is important, as the method of treatment and the outcome depend on this. However, other factors include the time since injury, as those treated acutely have a more favourable outcome. Numerous techniques have been described for treating disruption of the quadriceps and patellar tendon. The best results have been obtained by anatomical reconstruction of fresh disruption. For patellar fractures, the best results are reported after anatomical reduction and internal fixation with a tension band, while the worst choice is total patellectomy.

Introduction

Active knee extension is necessary for both standing and walking. However, during these activities, high energy is generated at the knee and the patellofemoral joint, especially during running, jumping and climbing.

Anatomy

The extensor mechanism of the knee consists of the quadriceps muscle and tendon, patella and patellar tendon. The quadriceps muscle originates from the pelvic bones (m. rectus femoris from the anterior inferior iliac spine), the anterior surface of the femur and the intermuscular septa (m.vastus intermedius, vastus medialis and lateralis) inserting into the patella, with a 2 cm length of quadriceps tendon.[1] The patellar tendon is shorter and connects the lower pole of the patella to the tibial tubercle. At maximum flexion, the patella lies deep in the trochlear sulcus (between the femoral condyles). The knee extensor mechanism also consists of the medial and lateral patellar retinacula, which are reinforced by the fascia lata extension which thickens to form the iliotibial band.[1]

Mechanism of the injury

Since the patella is a subcutaneous bone, without subcutaneous soft tissue, it is susceptible to injury by a direct blow. Other than this, injuries of the

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doi:10.1016/j.cuor.2005.01.004

extensor mechanism are caused by an excessively forceful quadriceps tendon contraction. In young healthy individuals it is less likely for a disruption to occur, while it is more probable and common in the old, or in persons with predisposing factors such as renal failure, secondary hyperparathyroidism, diabetes mellitus, rheumatoid arthritis, gout and other metabolic diseases. It may be caused by large doses of corticosteroids or direct steroid injections.[2] There have been reports of patellar tendon failure after anterior cruciate ligament (ACL) reconstruction with a patella tendon bone (PTB) graft, when the middle third of the patella has been taken and devascularisation of the remaining patellar tendon occurs.[3,4] A patellar fracture can even occur during ACL reconstruction with a PTB graft.[5,6] Patellar dislocations can result in patellar osteochondral fractures.[7]

Fractures of the patella

Fractures of the patella occur most frequently in patients between 40 and 50 years of age and they comprise 1% of all fractures.[1,8,9] The patella, except on its distal pole, articulates with the femoral trochlea, and during a direct fall on the knee or in dashboard injuries compression forces are generated. Usually, there is a transverse fracture, but longitudinal, as well as avulsion and stress fractures can occur producing a stellate pattern (Fig. 1). The fracture pattern indicates the kind of treatment required.

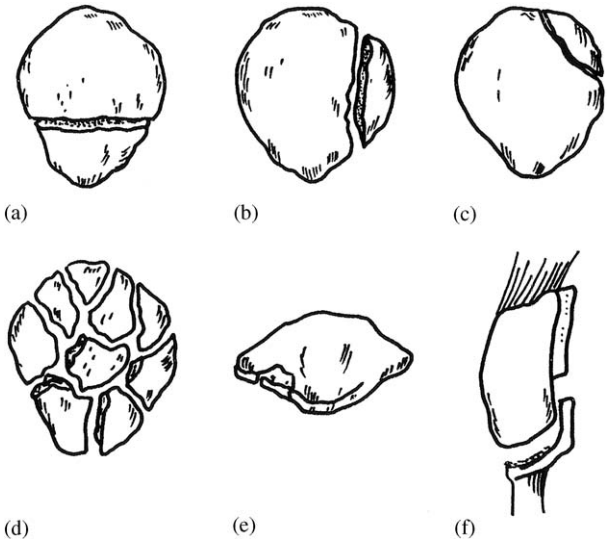

Figure 1 Scheme for classification of patellar fractures according to the fracture line pattern: (a) transverse, (b) vertical, (c) marginal, (d) comminuted, (e) osteochondral, and (f) sleeve.

The aim of treatment is to restore anatomically the articular congruity and extension efficency, as well as to permit early knee motion and weight bearing. In the case of gross comminution, the patella must be sacrificed, and a partial or even total patellectomy is performed. In the latter situation, one must be aware of a significant loss of extension strength and anterior knee protection that results.

Clinical findings

According to Scuderi, fractures of the patella can easily be overlooked.[10] Usually, there is swelling of the soft tissue, while a skin abrasion is present in up to 25% of cases and this can interfere with the timing of surgery and the line of incision.[7] If the parapatellar retinacula (medial and lateral) are preserved, there is minimal displacement of patellar fragments and the patient can raise the extended leg (straight leg-raise), indicating the possibility of non-operative treatment. However, in most cases there is disruption of the extensor retinaculum and mild-to-large displacement of fragments exists with a palpable gap and the patient is unable to raise the leg.[11] In the presence of a large hematoma, the integrity of the knee joint ligaments must be confirmed (ACL-PCL), since a PCL injury is present in 3% of cases.[7] Also a hip examination is necessary, since concomitant fractures of the acetabulum with dislocation of the hip are possible, due to a blow on to the patella with the hip flexed with axial transmission of the forces to the hip joint.

X-ray findings

Standard conventional antero-posterior and lateral radiographs are mandatory in the evaluation of both patellar fractures and disruptions of the quadriceps or patellar tendon. When there is doubt about the existence of patella bipartita or a tendon disruption, a radiograph of the opposite knee joint is helpful. The accessory ossicle of the bipartite patella is always on the superolateral corner of both patellae. If there is a symmetrical high or low position of the patella, this may just be a patella alta or patella baja. An assymetrical patellar position suggests a tendon injury lesion. CT and/or MRI imaging is useful in the evaluation of chondral and tendon injuries.[12,13]