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Issue 9

March/April 2002

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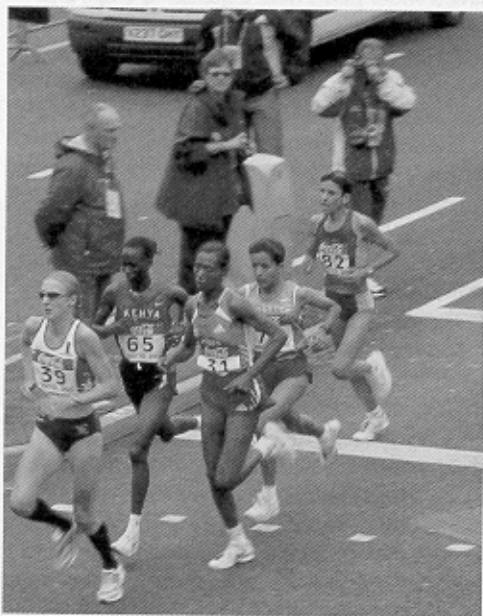
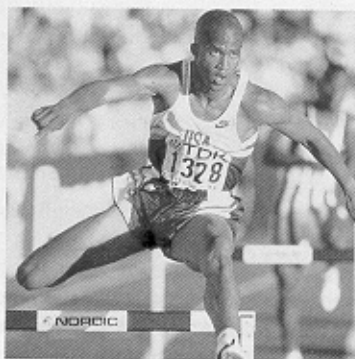
Consultant orthopaedic surgeon John Hardy BSc, MBBS, MD, FRCS(Eng), FRCS(Ed), FRCS(Orth) looks at a common knee injury

THIS article is directed at athletes and their physiotherapists who work in dedicated sports injury clinics. It aims to increase their awareness of a common injury that can have serious late consequences to a sporting career.

Patella dislocation in athletes can be a career-ending problem especially if it is complicated by early osteoarthritis. To avoid recurrent injury and secondary complications requires rapid assessment and referral by the athlete's GP, sports trainer or physiotherapist to an orthopaedic surgeon with an interest in this area. To be assessed properly and avoid long term problems your assessment should consider the anatomy of the hip, knee and other areas besides. Hence the title of this article.

Patella dislocation is common in athletes involved in jumping sports. Most of the incidents that cause patella dislocation are indirect. The common presentation in the patients I have managed is dislocation during training or participating in a hurdling event.

Dislocation of the patella is most common in training and during hurdling events



In theory women are more predisposed to patella dislocation

MECHANISMS OF DISLOCATION

The patella normally tracks congruently in the trochlear groove during flexion and extension of the knee. Subluxation is loss of congruity with some of the opposing surfaces still in contact. Dislocation occurs where there is no contact between the articulating surfaces. To understand the assessment of a dislocation one must understand the mechanisms that maintain a patella in its anatomical position on the trochlear groove of the femur.

With the direction of pull of the quadriceps mechanism and the position of insertion of the patella tendon in relation to the patella there is a resultant vector of force and direction favouring lateral movement of the patella out of the trochlear groove during quadriceps contraction. This angle between the line of pull of the quadriceps and the line of the patella tendon is known as the 'Q' angle.

It is normally $15 \pm 3^\circ$. In theory women, who have a wider pelvis have a greater Q angle and are more predisposed to dislocation. There are many factors that act to neutralise this vector. They include the following:

1. The depth of the trochlear groove.
2. The height of the lateral facet of the trochlear groove.
3. The lower and medial insertion of the more powerful vastus medialis muscle compared to the vastus lateralis muscle.
4. The presence of an intact medial retanaculum.

THE ACUTE INJURY

Having witnessed the inevitable fall that accompanies this injury the diagnosis is made on history and examination. If the patella relocates spontaneously then the history is often that the patient sees and feels the medial femoral condyle become prominent medially as the patella dislocated laterally. If the patella remains dislocated laterally then the diagnosis is obvious. Immediate straightening of the knee often results in spontaneous reduction of the dislocation. Relocation is an imperative part of the initial treatment. On relocation the knee should be splinted and the patient moved from the field of sport and then transferred to an Accident and Emergency Facility for further assessment and treatment. Following spontaneous relocation the diagnosis may not have been obvious. These injuries often then present to sports injury clinics and the diagnosis of patella dislocation or even fracture dislocation can then be missed.

THE HIP

The development of the hip also has a significant influence on the tendency to dislocate the patella. Normally the angle of the neck with the shaft of the femur is neutral or a few degrees anteverted (facing forward) in the adult. The foetal angle of the neck to the shaft of the femur is one of pronounced anteversion of the neck. This angle changes to the adult pattern from about the time a child first walks. Persistence of this anteversion is associated with an intoeing gait. Subsequent growth of the child with persistent femoral anteversion favours external tibial torsion to correct the intoeing gait but this dramatically increases the Q angle above 18° and so favours dislocation.

THE KNEE

The first influence on a tendency to dislocate is the shape of the patella. Wiberg was first to recognise three patterns of the shape of the patella. There is evidence that a particular patella shape predisposes to dislocation. This is largely because the type 3 patella (predominant lateral facet) is commonly associated with a shallow trochlear groove. Aglietti et al compared measurements that quantify patella shape between a cohort of normal people and patients who suffered recurrent patella subluxation⁴. Interestingly, his group discovered that the Q angle was not significantly different between patients that subluxed 15° and the normal group ($15 \pm 3^\circ$). However, there was a significant increase in the sulcus angle on radiographs of the patella in the patients who subluxed 147° compared to 137° in the normal group. This is a measure of how shallow the trochlear groove is. They also found a significant increase in the congruence angle, $+16^\circ$ compared with -8° in the normal group. This latter measurement is an objective measure of lateral patella subluxation with the knee in 45° of flexion.

Aglietti also discovered a significant difference in the Insall-Salvati index of 1.23 (normal 1.04) in the subluxing group. The Insall-Salvati index is the ratio of the length of the patella tendon to

the oblique diameter of the patella when measured from a lateral radiograph. This means that athletes with longer patella tendons are more likely to dislocate than those with normal patella tendon lengths. Thus, patients who have suffered Osgood-Schlatters disease in childhood as a result of over-use and over-training and have lengthened patella tendons as a result are more likely to suffer subluxation and dislocation later in life

In an athlete who has suffered an acute dislocation examine the uninjured side first, as this is far more comfortable for the patient and it gives some indication of whether there is some anatomical reason for the dislocation. What about the acute dislocation in the patient with no predisposing anatomical factors?

Following examination, radiographs are taken to assess the anatomy of the patello-femoral joint and exclude osteochondral fracture. This is often missed by the unwary because the small bony fragment is often missed on the radiograph. The cartilage component is always much larger than the bone that can be seen (Figure 1).

The latter, if suspected but not seen radiographically, is a good indication for further assessment by MRI scan (Fig 3) or keyhole surgery. Fracture of even a small piece of bone with cartilage occurs in up to 5% of all dislocations of the patella". Early recognition of this complication is imperative.

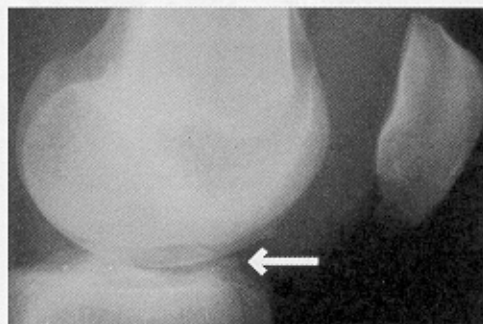


Figure 1 Arrow highlighting small bony fragment of large osteochondral fragment from the patella



Fig 2
Osteochondral fragment clearly seen on MRI scan (circled above patella)

THE BUMPS A DAISY

Occasionally, an athlete lands during a sporting activity with a twist and the patella dislocates. This is often associated with a tearing of the medial soft tissue constraint the medial retinaculum. Whether it is a first or subsequent dislocation, these are the patients that need to be assessed thoroughly and early. Assessment should be by the consultant orthopaedic surgeon (with a specialist interest in knee surgery) which your sports injury clinic has a working relationship with. Referral should be within the first seven days of injury. Assessment should then include a history, examination and further investigations. The examiner should have a high suspicion of the medial retinaculum tear and the osteochondral injury. If patella dislocation has occurred for the first time without a tear of the medial retinaculum then hyperlaxity syndrome should be suspected. This is where athletes are particularly double jointed and can for example touch their hands flat to the ground without bending their knees.

At the end of an assessment the surgeon should have a pretty good idea of the mechanism of injury, the injury or injuries that have occurred and the risks and benefits of surgery.

TREATMENT

Treatment is either conservative or surgical. Conservative treatment includes splinting the knee in extension for three weeks with quadriceps exercises. I prefer to use a removable 'Richards' type splint. Return to sports can be

expected after about six weeks. An Isokinetic dynamometer can be used to monitor return of muscle strength.

Conservative management of the first time dislocation without surgery is associated with an approximately 40% chance of further dislocation of the patella during sporting activities. This is especially true if the medial retinaculum has gone. This is why more and more athletes are opting for the new keyhole techniques to repair the torn retinaculum and prevent further dislocation. Repair of the medial retinaculum reduces this complication of further subluxation or dislocation to 7% or less⁶. This is true of the acute first time dislocations but not necessarily recurrent dislocation. If the athlete has been referred late or has suffered a recurrent dislocation they may require further investigations and more extensive surgery to correct the reasons for this recurrent dislocation. For example a tibial tuberosity transfer operation.

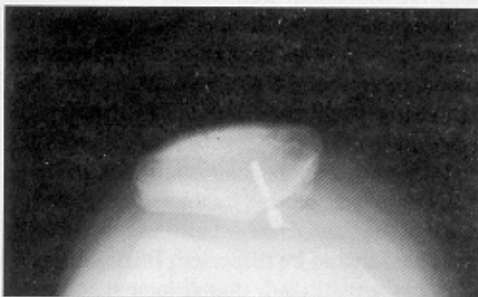


Figure 3 Radiograph of compression screw holding an osteochondral fragment during healing. This lesion healed and the screw was removed six months after the injury. Both surgeries performed with keyhole techniques

When dislocation of the patella results in a chunk of cartilage being dislodged, 78% of these fragments come from the lowest part of the patella, 11% break off the femur and in 11% both the femur and patella loose cartilage. It is my experience that young athletes with osteochondral injury that undergo surgical fixation of the precious joint cartilage within the

week of injury do very well. Late recognition of this injury, which is common in sports injury clinics, reduces the chances of replacing the cartilage and if it can be done then fragment healing into its bony bed is often poor. Loss of these larger fragments of bone and cartilage leads to persistent pain and a reduction of sporting activity with osteoarthritis developing in the latter stages of degenerate change.

SUMMARY

Patella dislocation is a debilitating injury for any athlete especially if it is not assessed soon after injury. This is especially true, as early surgery is known to decrease late complications.

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