



The Paediatric Knee

Introduction

Fortunately many of the conditions occurring in children are self-limiting and full recovery is the usual outcome. However more serious conditions may occur and if these are missed (especially if during the rapid growth phase) the consequences of a missed diagnosis are significant. If a systematic approach is followed the child with, for example, hip pathology or a tumour will hopefully not be missed.

The History and Examination

Never miss the opportunity to observe the young child in the waiting room and walking into your office. For the young child a detailed history from the parents, in particular focusing on developmental milestones and family history (where indicated) is important. If the problem is an acute injury a detailed mechanism of the injury should be sought. If the older child is accompanied by a parent it is usually best to ask the child first.

SPECIAL CONSIDERATIONS IN THE CHILD (The Knee is not always the problem)

1. Referred pain from the Hip

The hip joint should always be examined first before assessing the knee. Pain from the hip, like in the adult, is referred usually to the medial joint line of the knee. It is possible for the patient to have both hip and knee pathology.

Restricted abduction in flexion indicates hip pathology until proven otherwise.

Always consider Perthes disease (age 6-10) and Slipped capital femoral epiphysis (age 10-14).

2. High index of suspicion for growth plate fractures

Trauma resulting in ligament injuries in adults can result in bone or growth plate fractures in children. Isolated knee ligament injury is rare in children younger than 14 years since the ligaments are stronger than the physes.

If a child limps or is unable to weight bear a fracture should be suspected even if the initial X ray is normal.

3. Tumour

Benign and malignant (primary and metastatic) tumours do occur about the knee. Local trauma often focuses attention on an area in which a tumour is subsequently diagnosed.

Tumours can present with pain, swelling or pathological fracture. Keep this diagnosis in mind if the symptoms and signs are atypical. The most common tumours are osteosarcoma, osteoid osteoma and aneurismal bone cysts.

4. Infection

The most common presentation is pain, warmth and tenderness over the affected part and an unwillingness to move the adjacent joint. It is possible to get an effusion in the neighbouring knee joint with proximal tibial osteomyelitis however the growth plate usually prevents infective spread into the joint. The most common organisms responsible for osteomyelitis are Staphylococcus aureus, Streptococci, E Coli, Proteus and Pseudomonas. Often no primary infective site is found. All patients with an infection should be checked for diabetes or impaired immune function.

5. Inflammatory Arthritis

Patellofemoral Conditions

A large number of children will suffer significant patellofemoral pain. It is more common in girls and in children with certain lower limb morphologies.

The aetiology, classification and treatment of this very common clinical problem remains contentious and a simplified approach is presented below. There is often a spectrum of symptoms and signs that cross the indistinct classification boundaries.

1. Recurrent (Habitual) Patellar Dislocation

This condition is congenital and is usually apparent in the infant/toddler. Every time the knee is flexed the patella dislocates laterally. The usual cause is a shortened extensor mechanism and the treatment is a lengthening soft tissue procedure (e.g. Z plasty lengthening of rectus femoris).

2. Acute Patellar Dislocation

Dislocation of the patella usually results from a sudden strain on the partially flexed knee while playing sport. Pain is often poorly localized. The patella dislocates laterally and the knee is held flexed. The Medial Femoral Condyle appears very prominent.

To reduce the patella apply medial pressure to the patella and extend the knee. If the patella has spontaneously reduced it is important to differentiate this injury from an ACL rupture or a fracture.

An X ray (including a skyline patella view) is important as often there is an associated osteochondral fracture either from the medial aspect of the retropatellar surface or the lateral femoral trochlear.

If there is a loose body an arthroscopy may be indicated to remove or it or an arthrotomy required to reimplant it. Usually the injury is treated by splinting the knee for a few weeks to allow the tissues to heal and vastus medialis strengthening exercises. In some patients foot orthotics or patella taping can be useful.

Failure to seek treatment results in further dislocation episodes.

3. Recurrent Patellar Dislocation/Subluxing Patellae

Up to half of all acute dislocations recur. The condition is often bilateral and affects girls more than boys in a ratio 2:1. There is often a family history and the patellar apprehension test is usually positive.

Numerous aetiological factors are associated

1. Genu valgum, internal femoral torsion, external tibial torsion and pronated feet.
2. Generalised Ligamentous laxity (hypermobility patella).
3. A weak and/or dysplastic VMO, a short vastus lateralis, a tight ITB or lateral retinaculum.
4. Patella alta, shallow femoral trochlear, deficient LFC, a flat retropatellar surface.

X rays may show patella alta and define any malalignment of the patellofemoral joint on the skyline view. Recurrent dislocators run the risk of osteochondral damage and later arthritis. When possible surgery should be delayed until skeletal maturity since disruption of the tibial tubercle may result in physeal arrest. Surgery may be indicated to treat chondral lesions, remove loose bodies or tighten soft tissue structures.

4. **Anterior Knee Pain**

The rate of growth is often a factor in the aetiology of knee complaints in adolescents. Muscle tendon units must accommodate the rapid growth of long bones and may end up being quite tight with over tensioning of these units. This condition is known by many names including PFPS, Chondromalacia patellae, patellar migraine and excess lateral patellar pressure syndrome.

The history is one of anterior knee pain during or after exercise and is often exacerbated by stairs. Sitting with a flexed knee may create the pain. The examination is often normal. There may be any of the signs seen in the subluxing patellae, an effusion or tenderness of the patellar/retropatellar surface. Almost all patients have tight hamstrings.

As with the clinical signs, the pathological changes of the articular cartilage are variable, from no abnormality to extensive chondral lesions.

Management is largely conservative involving VMO retraining, patellar taping, stretching tight structures and relative avoidance of aggravating activities. Calf and hamstring stretching are emphasized. Surgery is rarely needed.

Osgood-Schlatter's disease

This is very common tibial tuberosity apophysitis and typically affects 10 to 14 year olds. It is an overuse syndrome caused by excessive physical exertion before skeletal maturity is reached.

The history and examination are classical with gradual onset of localized pain at the tibial tubercle. The pain is exacerbated by distance running, jumping, squatting, stair climbing and stretching the quadriceps. The patient presents with a painful tender swelling of the tibial tubercle which looks prominent and is tender to palpation.

The Quadriceps and hamstrings are invariably tight and there may also be patellofemoral malalignment and anterior knee pain.

Xrays usually show enlargement of the tibial tuberosity with or without fragmentation.

It is usually not necessary to stop sport and treatment includes:

- Relative rest
- Ice
- Calf and Hamstring stretching (Quadriceps stretches may aggravate it)
- Reassurance the condition will abate

In very resistant cases a plaster cylinder is used and surgery is rarely necessary (except where X rays show a separated fragment of bone in a skeletally mature knee which remains extremely painful). Simple excision of the fragment often gives a very good result.

5. **Sinding-Larson Johansson Disease**

The patellar ligament is partially avulsed (with fragmentation of the bone) from the lower pole of the patella. It is a similar condition to Osgood Schlatters disease but affects the distal patellar apophysis and localised tenderness occurs at this point. Soft tissue calcification or a stress fracture of the inferior pole of the patella may be seen on xray. The patient usually recovers with rest but it may cause more disruption to sporting activities and be less amenable to treatment.

OCD

Osteochondritis Dissecans (OCD) is thought to be a localized area of aseptic necrosis of bone with the overlying cartilage only secondarily involved. It is most commonly found on:

1. The lateral aspect of the Medial Femoral Condyle
2. The Lateral Femoral Condyle
3. The Patellofemoral joint (much more rare)

The patient presents with pain, swelling, catching and/or locking and on examination there is usually an effusion and quadriceps wasting. Xrays typically show a fragment with a sclerotic line around it and a tunnel view of the intercondylar notch can be required to define the lesion on the Medial Femoral Condyle. It is best seen on MRI which also looks at the state of the articular cartilage.

It is more common in boys (3:1) and is bilateral in approximately 25%. OCD usually presents between ages 10 – 20 years. In very young children it can be considered a variation of normal because the fragment seen on xray is often just a delayed ossification centre which heals spontaneously

The management of OCD for most surgeons depends on clinical, radiological and if necessary arthroscopic findings and is beyond the scope of this summary.

The prognosis is relatively good with most returning to their normal activity level in 6 months with a low incidence of subsequent premature osteoarthritis.

Meniscal Injuries

Traumatic meniscal injuries in children are rare. In general they may not demonstrate the same clinical picture as an adult with a meniscal tear. The pain may not be well localized and there may not be an effusion. Therefore the clinician should have a high index of suspicion.

The majority of meniscal tears in children are associated with a discoid lateral meniscus. The child usually describes a traumatic event, which may be minor and is thereafter troubled by lateral joint line pain and often catching or locking.

Xrays may suggest a discoid meniscus with a flattened LFC, however MRI demonstrates the abnormality. Management involves partial lateral menisectomy.

Chondral Injuries

These can cause loose bodies and present in various ways. The fracture is often bigger than it seems on xray and open reduction with internal fixation may be indicated.

Stress Fractures

These are most often seen in the tibia, fibula and metatarsals. They are more common in boys and overweight adolescents who do a lot of running. There is no specific injury to the limb and the child develops a painful limp. The pain is relieved by sitting or lying and is seen 3 months after starting the new activity. These are best treated with rest but can be treated in a walking cast and gradual return to activity.

Ligamentous Injuries

Knee ligament injuries are rare in young children. The most significant ligamentous injury is ACL disruption. The ligament rarely ruptures in its midsubstance and more commonly avulses a bony fragment from the tibial insertion. Management for this is prompt fixation of the bony avulsion.

The child with ACL injury usually has similar historical and examination findings to the adult.

Anterolateral instability is a cause of premature degenerative joint disease in young athletes. These children should be strongly advised to have their joints stabilized before they return to active sports. If the athlete is close to skeletal maturity they may decide to wait and restrict their activities and have an "adult" style reconstruction once their growth plates have fused.

Angular Deformities

The standing femoral tibial angle varies through childhood.

At birth there typically is a varus angle of approximately 10 degrees.

At 18-24 months there typically is a neutral relationship.

At 3.5 years there typically is a valgus angle of approximately 15 degrees.

By 6-7 years most children will have an alignment in the adult range of up to 7 degrees of varus or valgus.

When to be concerned?

1. When the deformity is severe.
2. When alignment is asymmetric.
3. When alignment is inappropriate for the child's age.

Causes include

1. Infantile tibia vara (Blount's disease)
2. Physeal fracture
3. Epiphyseal dysplasias
4. Adolescent Tibia vara.

In most cases the concerned parent or older child can be reassured and followed up if necessary. However if any of the above are suspected an X ray and Specialist referral is indicated.

CONCLUSION

A systematic approach to the examination of the injured knee and appropriate investigations will enable accurate diagnosis of the patient's condition to be made. This allows early referral or treatment and reduces the likelihood of chronic knee disability.

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