Injuries of the knee and leg

ACUTE KNEE LIGAMENT INJURIES

MCL is the primary stabilizerValgus stresses are resisted by the superficial and deep layers of the medial collateral ligament (MCL),

The main checks to varus angulation are the iliotibial tract and the lateral collateral ligament (LCL).

The cruciate (ACL) , (PCL) ligaments provide both anteroposterior and rotary stability; they also help to resist excessive valgus and varus angulation. Both cruciate ligaments have a double bundle structure and some fibres of each bundle are taut in all positions of the knee .

Clinical features

The patient gives a history of a twisting or wrenching injury and may even claim to have heard a 'pop' as the tissues snapped. The knee is painful and (usually) swollen – and, in contrast to meniscal injury, the swelling appears almost immediately. Tenderness is most acute over the torn ligament, and stressing one or other side of the joint may produce excruciating pain. The knee may be too painful to permit deep palpation or much movement.

The most important aspect of the examination is to test for joint stability. Partial tears permit no abnormal movement, but the attempt causes pain. Complete tears permit abnormal movement, which sometimes is almost painless.

Imaging

Plain x-rays may show that the ligament has avulsed a small piece of bone

Stress films (if necessary under anaesthesia) show whether the joint hinges open on one side

Magnetic resonance imaging (MRI) is helpful in distinguishing partial from complete ligament tears. This may also reveal 'bone bruising', a hitherto poorly recognized source of pain.

Treatment

SPRAINS AND PARTIAL TEARS

active exercise is prescribed from the start, aspirating a tense effusion, applying ice-packs to the knee and, sometimes, by injecting local anaesthetic into the tender area. Weight bearing is permitted but the knee is protected from rotational or angulatory strain by a heavily padded bandage or a functional brace. A complete plaster cast is unnecessary and disadvantageous; it inhibits movement and prevents weekly reassessment the patient can usually return to sports training by 6–8 weeks.

COMPLETE TEARS

Isolated tears of the MCL Operative repair is unnecessary. A long cast-brace is worn for 6 weeks and thereafter graded exercises are encouraged.
Isolated tears of the LCL are rare. If the diagnosis is certain, these can be treated conservatively as for MCL tears.
Isolated tears of the ACL should be by early operative reconstruction
Isolated tears of the PCL are treated conservatively. Most patients end up with little or no loss of function.

Complications

Adhesions If the knee with a partial ligament tear is not actively exercised, torn fibres stick to intact fibres and to bone.

Ossification in the ligament This is usually discovered as a chance finding in x-rays of the knee and carries no prognostic significance.

Instability The knee may continue to give way the repeated injury predisposes to osteoarthritis.

CHRONIC LIGAMENTOUS INSTABILITY

Clinical features

The patient complains of a feeling of insecurity and of giving way. The joint looks normal apart from slight wasting; there is rarely tenderness but excessive movement in one or more directions can usually be demonstrated.

Imaging
MRI is a reliable method of diagnosing cruciate ligament and meniscal injuries, providing almost 100 per cent sensitivity and over 90 per cent accuracy

Arthroscopy
Arthroscopy is indicated if: (1) the diagnosis, or the extent of the ligament injury, remains in doubt; (2) other lesions, such as meniscal tears or cartilage damage, are suspected; (3) surgical treatment is anticipated.
Partial meniscectomy and removal of loose cartilage tags can be performed at the same time.

Treatment

Most patients with chronic instability have reasonably good function and will not require an operation.

The indications for operation are:

1. Recurrent locking
2. intolerable symptoms of giving way;
3. suboptimal function in a sportsperson or others with similarly demanding occupations
4. ligament injuries in adolescents (the long-term effects of chronic instability in this group are more marked).

ACUTE INJURIES OF EXTENSOR APPARATUS

RUPTURE OF QUADRICEPS TENDON

The patient is usually elderly, may have a history of diabetes or rheumatoid disease, or may have been treated with corticosteroids. Occasionally acute rupture is seen in a young athlete. The typical injury is followed by tearing pain and giving way of the knee. There is bruising and local tenderness; sometimes a gap can be felt proximal to the patella. Active knee extension is either impossible (suggesting a complete rupture) or weak (partial rupture). The diagnosis can be confirmed by MRI.

Treatment

Partial tears Non-operative treatment will suffice: a plaster cylinder is applied for 6 weeks, followed by physiotherapy that concentrates on restoring knee flexion and quadriceps strength.

Complete tears Early operation is needed, or else the ruptured fibres will retract and repair will be more difficult. Early supervised movement through the brace is important to prevent adhesions, the repair heals over the next 12 weeks.

RUPTURE OF PATELLAR LIGAMENT

uncommon injury; it is usually seen in young athletes and the tear is almost always at the proximal or distal attachment of the ligament. There may be a previous history of 'tendinitis' and local injection of corticosteroid.
The patient gives a history of sudden pain on forced extension of the knee, followed by bruising, swelling and tenderness at the lower edge of the patella or more distally.

X-rays
may show a high-riding patella and a tell-tale flake of bone torn from the proximal or distal attachment of the ligament.
MRI will help to distinguish a partial from a complete tear.

Treatment
ACUTE TEARS
Partial tears can be treated by applying a plaster cylinder.

Complete tears need operative repair or reattachment to bone. a hinged brace with limits to the amount of flexion permitted. This range can be gradually increased after 6 weeks.

Early repair of acute ruptures gives excellent results. Late repairs are less successful and the patient may be left with a permanent extension lag.

LATE CASES

Late cases are difficult to manage because of proximal retraction of the patella. A two-stage operation may be needed: first to release the contracted tissues and apply

traction directly to the patella, then at a later stage to repair the patellar ligament and reinforce it with grafts of tendon from gracilis or semitendinosus. Postoperatively a hinged brace is used to hold the knee in extension with supervised knee movement and limits to the amount of flexion until the repair is healed, usually at 12 weeks.

FRACTURES OF TIBIAL TUBERCLE

Fracture or avulsion of the tibial tubercle usually occurs as a sports injury in young people. The diagnosis is suggested by the history. The area over the tubercle is swollen and tender; active extension causes pain.

The lateral x-ray shows the fracture. Sometimes the patella is abnormally high, having lost part of its distal attachment.

An incomplete fracture can be treated by applying a long-leg cast with the knee in extension for 6 weeks.

Complete separation requires open reduction and fixation with lag screws; a cast or hinged brace is applied for 6 weeks.

Osgood–Schlatter disease Repetitive strain on the patellar ligament may give rise to a painful, tender swelling over the tibial tubercle. The condition is fairly common in adolescents who are keen on sport. Treatment consists of restricting sports activities until the symptoms subside

FRACTURED PATELLA

Direct injury – usually a fall onto the knee or a blow against the dashboard of a car – causes either an undisplaced crack or else a comminuted (‘stellate’) fracture without severe damage to the extensor expansions.
Indirect injury occurs, typically, when someone catches the foot against a solid obstacle and, to avoid falling, contracts the quadriceps muscle forcefully. This is a transverse fracture with a gap between the fragments.

Clinical features
knee becomes swollen and painful. bruising over the front of the joint. The patella is tender and sometimes a gap can be felt. If there is an effusion, aspiration may reveal the presence of blood and fat droplets.

X-ray
may show one or more fine fracture lines without displacement, multiple fracture lines with
irregular displacement or a transverse fracture with a gap between the fragments, significant gap is more than3 mm wide.

A fracture line running obliquely across the superolateral corner of the patella should not be confused with the smooth, regular line of a (normal) bipartite patella. Check the opposite knee; bipartite patella is often bilateral.

Treatment

Undisplaced or minimally displaced fractures If there is a haemarthrosis it should be aspirated. The extensor mechanism is intact and treatment is mainly protective. A plaster cylinder holding the knee straight should be worn for 3–4 weeks, and during this time quadriceps exercises are to be practised every day.

Comminuted (stellate) fracture The extensor expansions are intact and the patient may be able to lift the leg.

Undersurface of the patella is irregular and there is a serious risk of damage to the patellofemoral joint. For this reason some people advocate patellectomy, To others it seems reasonable to preserve the patella if the fragments are not severely displaced, a hinged brace is used.

Displaced transverse fracture
The lateral expansions are torn and the entire extensor mechanism is disrupted. Operation is essential.by The fragments are reduced and transfixed with two stiff K-wires; flexible wire is then looped tightly around the protruding K-wires and over the front of the patella

DISLOCATION OF PATELLA

traumatic dislocation is due to indirect force: sudden, severe contraction of the quadriceps muscle while the knee is stretched in valgus and external rotation. **Predisposing factors** are anatomical variations such as genu valgum, tibial torsion, high- shallow intercondylar groove, as well as patellar hypermobility riding patella (patella alta) and a due to generalized ligamentous laxity or localized muscle weakness.

Clinical features

patient may experience a tearing sensation and a feeling that the knee has gone ‘out of joint’; when running, he or she may collapse and fall to the ground. If the dislocation has reduced spontaneously, the knee may be swollen and there may be bruising and tenderness on the medial side.

Imaging

Anteroposterior, lateral and (‘skyline’) *x-ray views* are needed. In an unreduced dislocation,
the patella is seen to be laterally displaced and tilted or rotated. In 5 per cent of cases there is an associated osteochondral fracture.

Treatment

patella can be pushed back into placeThe cast is retained for 2 or 3 weeks and the patient then undergoes a long period (2–3 months) of quadriceps strengthening exercises.

Complications

Recurrent dislocation Patients treated non-operatively for a first-time dislocation have a 15–20 per cent chance of suffering further dislocations.

TIBIAL PLATEAU FRACTURES

Mechanism of injury

Fractures of the tibial plateau are caused by a varus or valgus force combined with axial loading

Schatzker classification

Type 1 – a vertical split of the lateral condyle

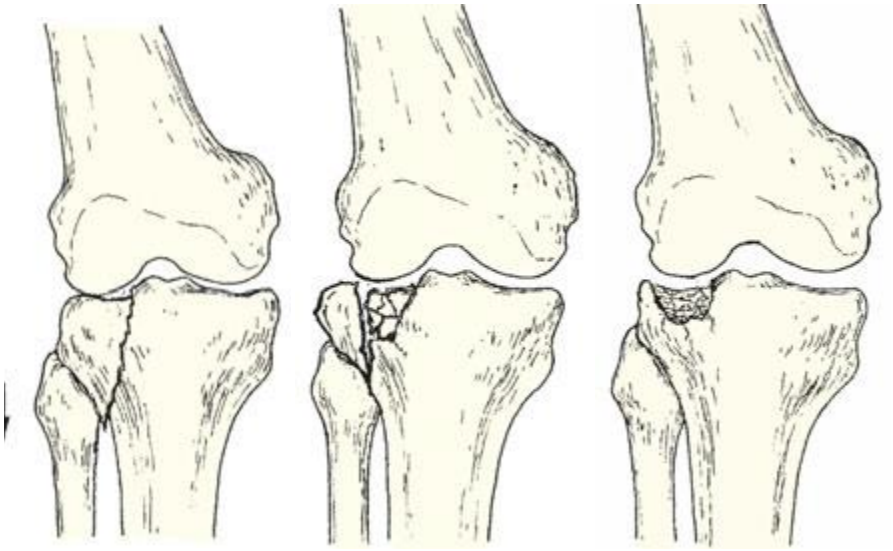
Type 2 – a vertical split of the lateral condyle combined with depression of an adjacent loadbearing part of the condyle

Type 3 – depression of the articular surface with an intact condylar rim

Type 4 – fracture of the medial tibial condyle

Type 5 – fracture of both condyles

Type 6 – combined condylar and subcondylar fractures



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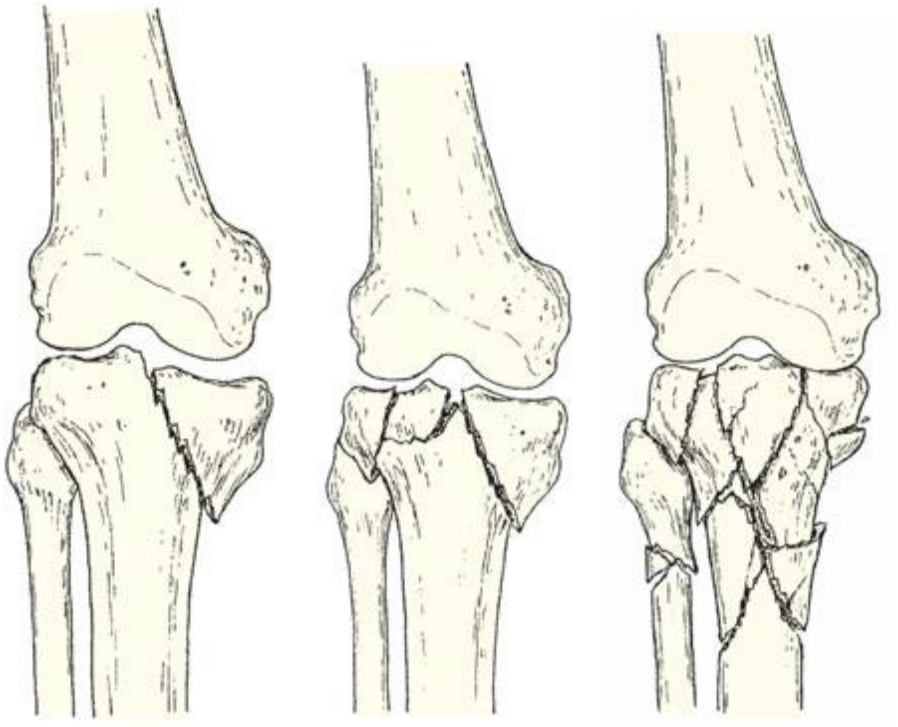

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Clinical features

The knee is swollen and may be deformed. Bruising is usually extensive and the tissues feel ‘doughy’ because of haemarthrosis.

Imaging

Anteroposterior, lateral and oblique x-rays will usually show the fracture

Treatment

Treatment by traction is simple and often produces a well-functioning knee for undisplaced ,displaces need operativ treatment.

Complications
EARLY

Compartment syndrome – With closed types 4 and 5 fractures there is considerable bleeding and swelling of the leg – and a risk of developing a compartment syndrome. The leg and foot should be examined repeatedly for signs.

LATE
Joint stiffness This is prevented by avoiding prolonged immobilization and encouraging movement as early as possible.

Deformity Some residual valgus or varus deformity is quite common overloading of one compartment may predispose to osteoarthritis in later life.

Osteoarthritis If, at the end of treatment, there is marked depression of the plateau, or deformity of the knee or ligamentous instability, secondary osteoarthritis is likely to develop after 5 or 10 years.

FRACTURES OF TIBIA AND FIBULA

A twisting force causes a spiral fracture of both leg bones at different levels;

Indirect injury is usually low energy; with a spiral or long oblique fracture one of the bone fragments may pierce the skin from within.

Direct injury crushes or splits the skin over the fracture; this is usually a high-energy injury and the most common cause is a motorcycle accident.

Pathological anatomy

choice of treatment – depends on the following factors:

1. *The state of the soft tissues* directly related to the amount and type of soft-tissue damage

2. *The severity of the bone injury* High-energy fractures are more damaging and take longer to heal than low-energy fractures

3. Stability of the fracture –Severely comminuted fractures are the least stable of all, and the most likely to need mechanical fixation.

4. *Degree of contamination* – In open fractures this is an important additional variable.

Management

The main objectives are:
(1) to limit soft-tissue damage and preserve (or restore, in the case of open fractures) skin cover;
(2) to prevent – or at least recognize– a compartment syndrome;
(3) to obtain and hold fracture alignment;
(4) to start early weight bearing (loading promotes healing);
(5) to start joint movements as soon as possible.

LOW-ENERGY FRACTURES

undisplaced or minimally displaced, a full-length cast from upper thigh to metatarsal necks is applied with the knee slightly flexed and the ankle at a right angle. Displacement of the fibular fracture, unless it involves the ankle joint, is unimportant and can be ignored.

Displaced it is reduced under general anaesthesia with x-ray control. Apposition need not be complete but alignment must be near-perfect (no more than 7 degrees of angulation) and rotation absolutely perfect

The limb is elevated and the patient is kept under observation for 48–72 hours. After 2 weeks the position is checked by x-ray. A change from an above- to a below-the-knee cast is possible around 4–6 weeks, when the fracture becomes ‘sticky’. The cast is retained (or renewed if it becomes loose) until the fracture unites, which is around 8 weeks in children but seldom under 12 weeks in adults.

Displaced or comminuted fracture treated by operation using *Indications for skeletal fixation Closed intramedullary nailing Plate fixation External fixation*

HIGH-ENERGY FRACTURES

Initially, the most important consideration is the viability of the damaged soft tissues and underlying bone. Tissues around the fracture should be disturbed as little as possible and open operations should be avoided unless there is already an open wound.

Early complications

VASCULAR INJURY , COMPARTMENT SYNDROME , INFECTION ,

Late complications

Malunion , *Delayed union , Non-union , Joint stiffness , Osteoporosis , Regional complex pain syndrome*

FATIGUE FRACTURES

Repetitive stress may cause a fatigue fracture of the tibia(usually in the upper half of the bone) or the fibula (most often in the lower third). *X-ray* For the first 4 weeks there may be nothing abnormal about the x-ray, but a bone scan shows increased activity.

Treatment

The patient is told to avoid the stressful activity. Usually after 8–10 weeks the symptoms settle down. A short leg gaiter can be applied for comfort during weight bearing.