Role of menisci

- improving articular congruency and increasing the stability of the knee
- controlling the complex rolling and gliding actions of the joint
- distributing load during movement

Introduction

- Medial meniscus lesions are more common than lateral meniscus because it is attached to the capsule that make it less mobile thus it cannot easily to accommodate the abnormal stresses.
- In increasing age – gradual degeneration and change in the material properties of the menisci thus splits and tears are more likely that usually associated with osteoarthritic articular damage or chondrocalcinosis.
- In younger people - meniscal tears are usually the result of trauma, with a specific injury identified in the history.

Tear of Meniscus

- Usually, meniscus more likely to tear along its length than across its width because the meniscus consists mainly of circumferential collagen fibres held by a few radial strands.
- The meniscus is usually torn by a twisting force with the knee bent and taking weight.
- In middle life, tears can occur with relatively little force when fibrotic change has restricted mobility of the meniscus.

Pathology

Vertical tear
- Bucket-handle tear
  - the separated fragment remains attached front and back
  - The torn portion can sometimes displace towards the centre of the joint and becomes jammed between femur and tibia
  - This causes a block to movement with the patient describing a ‘locked knee’
- posterior or anterior horn tears
  - the very back or front of the meniscus is damaged
- parrot beak tears
  - oblique tear pattern creates a flap of meniscus that may be stable (unlikely to displace) or unstable (displaced or likely to displace).

Horizontal tear
- usually ‘degenerative’ or due to repetitive minor trauma complex with the tear pattern lying in many planes
  - may be displaced or likely to displace
  - If the loose piece of meniscus can be displaced, it acts as a mechanical irritant, giving rise to recurrent synovial effusion and mechanical symptoms
  - Some are associated with meniscal cysts
    - It is also suggested that synovial cells infiltrate into the vascular area between meniscus and capsule and multiply there
    - The lateral meniscus is affected much more frequently than the medial
### Clinical Features
- **Mechanism of injury**: twisting force with the knee bent and taking weight.
- **Severe pain**: avoid further activities
- **Locking of knee in partial flexion**: suggest bucket-handle tear
- **Swelling of knee after hours**
- **Symptoms alleviate with rest and aggravate after trivial twist or strains**
- **Intermittent knee instability followed by pain and swelling**

### Physical Examination
- **Knee joint slightly flexed**
- **Presence of effusion**
- **Wasting of quadricep muscle**
- **Localized tenderness of joint line**
- **ROM**: may have full flexion but slightly limited extension
- **McMurray’s test, Apley’s grinding test, Thessaly test may be positive**

### Investigation
- **Plain X-rays**: Should be normal in young patients with an acute meniscal injury. Meniscal calcifications may be seen in crystalline arthropathy (ex. CPPD).
- **MRI**:
  - Reliable method of confirming the clinical diagnosis
  - Linear high signal that extends to either superior or inferior surface of the meniscus indicative of a tear
  - Parameniscal cyst indicates the presence of a meniscal tear
  - Bucket handle meniscal tears indicated by “double PCL” sign or “double anterior horn” sign
  - A horizontal cleavage in the medial meniscus – the characteristic ‘degenerative’ lesion – or detachment of the anterior or posterior horn without an obvious tear
- **Diagnostic knee arthroscopy**: Infrequently performed due to increased use of MRI scanning

### Treatment
- **DEALING WITH THE LOCKED KNEE**
  - Usually unlock spontaneously
  - If not, do gentle passive flexion and rotation
  - Rest the knee for a few days and may well unlock itself
  - If the knee does not unlock, or if attempts to unlock it cause severe pain, arthroscopy is indicated
  - If symptoms are not marked, it may be better to wait a week or two and let the synovitis settle down
  - If the tear is confirmed, the offending fragment is removed or repaired if possible
- **CONSERVATIVE TREATMENT**
  - If a peripheral tear has been identified and the lesion may be repairable, then arthroscopy and suture repair of the meniscus can be employed
  - Non-operative care should be instigated

### OPERATIVE TREATMENT
- **Indication**
  - If the joint cannot be unlocked
  - If mechanical symptoms (locking or catching) are recurrent and non-operative treatment has failed
- **Tears close to the periphery, which have the capacity to heal, can be sutured; at least one edge of the tear should be red (i.e. vascularized)**
- **Tears other than those in the peripheral third are dealt with by excising the torn portion (or the bucket handle)**
- **Total meniscectomy is thought to cause more instability and so predispose to late secondary osteoarthritis**
- **Partial meniscectomy has lesser morbidity but no obvious advantage**
- **Arthroscopic meniscectomy has distinct advantages over open meniscectomy: shorter hospital stay, lower costs and more rapid return to function but still have complication**
- **Postoperative pain and stiffness are reduced by prophylactic non-steroidal anti-inflammatory drugs**
Introduction

- A small, well-demarcated, avascular fragment of bone and overlying cartilage sometimes separates from one of the femoral condyles and appears as a loose body in the joint.
- Causes - trauma, either a single impact with the edge of the patella or repeated microtrauma from contact with an adjacent tibial ridge.

Pathology

- The lower, lateral surface of the medial femoral condyle is usually affected.
- An area of subchondral bone becomes avascular and within this area an ovoid osteocartilaginous segment is demarcated from the surrounding bone.
- At first the overlying cartilage is intact and the fragment is stable.
- Over a period of months the fragment separates but remains in position.
- Finally the fragment breaks free to become a loose body in the joint.
- The small crater is slowly filled with fibrocartilage, leaving a depression on the articular surface.

Clinical Features

- Usually between 15 and 20 years of age.
- Intermittent pain or swelling.
- Attacks of knee instability.
- "Locking" sometimes occurs.
- The quadriceps muscle is wasted.
- May be a small effusion.
- Tenderness localized to one femoral condyle soon after attack (diagnostic).
- Wilson’s sign: if the knee is flexed to 90 degrees, rotated medially and then gradually straightened, pain is felt; repeating the test with the knee rotated laterally is painless (diagnostic).

Investigation

- Plain X-Rays:
  - A line of demarcation around a lesion in situ, usually in the lateral part of the medial femoral condyle.
  - Once the fragment has become detached, the empty hollow may be seen – and possibly a loose body elsewhere in the joint.
- MRI:
  - Most effective imaging technique to define the site, size and activity of an OCD lesion.
  - An OCD lesion will typically demonstrate an area of low signal intensity in the T1-weighted images, with adjacent bone also appearing abnormal, probably due to oedema.
- Arthroscopy:
  - To determine if an OCD lesion is stable or unstable, prior to fixation or removal.

Management

- ‘Stage’ the lesion.
- Do MRI or arthroscopy.
- In the earliest stage, when the cartilage is intact and the lesion is ‘stable’, no treatment is needed but activities are curtailed for 6–12 months. Small lesions often heal spontaneously.
- If the fragment is ‘unstable’ (i.e. surrounded by a clear boundary with radiographic ‘sclerosis’ of the underlying bone), or showing MRI features of separation, treatment will depend on the size of the lesion and the age of the patient.
- A small fragment should be removed by arthroscopy and the base drilled, the bed will eventually be covered by fibrocartilage, leaving only a small defect.
- A large fragment (more than 1 cm in diameter) should be fixed in situ with pins or Herbert screws, or in the younger patient with open growth plates.
- In older patients, removal of the unstable fragment and cartilage repair techniques (e.g. microfracture or autologous cartilage implantation (ACI) can be carried out.

Articular Defects – Osteochondritis Dissecans
Introduction

- Chronic disorder of synovial joints, in which there is progressive softening and disintegration of articular cartilage accompanied by new growth of cartilage and bone at the joint margins (osteophyte), cyst formation and sclerosis in subchondral bone, mild synovitis and capsular fibrosis.
- The knee is the commonest of the large joints to be affected by osteoarthritis.
- Often bilateral and in these cases there is a strong association with Heberden’s nodes and generalized osteoarthritis.

Pathology

- Articular cartilage breakdown starts in an area of excessive loading.
- Can affect all of the soft tissues around the knee.
- Disease localized to the medial compartment is the commonest pattern occurring, producing varus deformity to normal limb alignment.
- Other intra-articular characteristic features found include peripheral osteophyte formation, bone loss, degenerative change to the menisci and anterior cruciate ligament (ACL) destruction.
- Concurrent chondrocalcinosis is relatively common.

Clinical Features

- Patients are usually over 50 years old and are often overweight.
- Pain that worsen after used or walking up stairs.
- Joint stiffness after rest.
- Pain to start move after prolong sitting.
- Swelling of joint.
- May have knee instability and locking.
- Obvious deformity (varus deformity-medial compartment more severely affected).
- Scar of previous operation.
- Wasted quadricep muscle.
- Knee effusion which associated synovitis.
- Limited movement of joint accompanied by crepitus.
- Loss of the last few degrees of terminal extension as a fixed flexion deformity (shortening of the posterior capsule).
- Long periods of lesser discomfort and only moderate loss of function, followed by exacerbations of pain and stiffness.

Investigation

- Standard X-Ray of Knee:
  - Tibiofemoral joint space is diminished.
  - Subchondral sclerosis.
  - Osteophytes and subchondral cysts are usually present.
  - Soft-tissue calcification in the suprapatellar region or in the joint itself (chondrocalcinosis).
- MRI:
  - Produce additional useful information concerning the soft tissues of the knee.
  - The degree of articular cartilage damage across the whole knee.

Treatment

NON-OPERATIVE TREATMENT

- Educate on good information about the disease, exercise and weight loss if appropriate.
- Physiotherapy - produce gradual strengthening of the quadriceps muscles and increase the level of exercise being undertaken by the patient.
- Analgesic.
- Intra-articular corticosteroid injections.

OPERATIVE TREATMENT

- Indication:
  - Persistent pain unresponsive to conservative treatment.
  - Progressive deformity and instability.
  - Replacement arthroplasty.
  - Arthrodesis - if there is a strong contraindication to arthroplasty or to salvage a failed arthroplasty.
Clinical Features

- Rheumatoid arthritis starts in the knee as a chronic monarticular synovitis, then other joints become involved.

Early stage
- Characterized by synovitis
- The patient complains of pain and chronic swelling of the knee
- Effusion of knee and the thigh muscles may be wasted
- The thickened synovium is often palpable
- May rupture the posterior capsule that cause sudden pain and swelling which closely mimic the features of calf vein thrombosis

As the disease progresses
- Knee becomes increasingly unstable
- Muscle wasting is marked
- Some loss of flexion and extension
- X-rays may show diminution of the joint space, osteopenia and marginal erosions

In the late stage
- Pain and disability are usually severe
- Marked stiffness
- Cartilage and bone destruction predominate
- The joint becomes increasingly unstable and deformed (fixed flexion and valgus)
- X-rays reveal the bone destruction characteristic of advanced disease

Treatment

CONSERVATIVE MANAGEMENT
- General treatment with anti-inflammatory and disease-modifying drugs
- Local splintage
- Injection of corticosteroid
- Introduction of anti-TNF medication, which can stop the inflammatory process within the joint and prevent longer-term joint destruction

OPERATIVE TREATMENT
- Synovectomy and debridement - Only indicated if other measures fail to control the synovitis
- Arthroplasty - Total joint replacement is useful when joint destruction is advanced
**Mechanism of Injury**

- Pivot shaft injury
- Direct thrusting force or collision to knee
- Hyperextension injury
- Twisting movement
- Dashboard injury
- Pulling or stretching ligament

**Introduction**

- ACL injury common in female athlete (4.5:1 ratio)
- PCL rupture less common than ACL rupture
- PCL is much stronger than ACL

Function of ACL
- Prevent anterior displacement of the tibia on the femur
- Prevent tibia being pulled anteriorly during knee flexion
- Prevent hyperextension of knee
- Resists excessive tibial rotation

Function of PCL
- Prevent posterior displacement of the tibia on the femur
- Prevent tibia being pulled posteriorly during knee flexion
- Resists excessive tibial rotation

**History**

**ACUTE**
- History of twisting /wrenching injury
- ‘Pop’ sensation in the knee
- Painful, immediate swelling knee
- Partial tear
  - May have excruciating pain, but no abnormal movement
  - Swelling worse (Acute haemarthrosis) 70%
- Complete tear
  - Permit abnormal movement, which sometimes causes surprisingly little pain
- Bruises or abrasion on site of impact

**Chronic**
- Pain – may or may not present
- May have some degree of instability while walking on uneven ground/ climbing up/ down flights of stairs.
- Loss range of motion

**Ligamentous Injury – ACL & PCL**

**Standing**

1. Inspection of Leg
   - Anterior / Lateral / Posterior
     - Attitude of lower limb
     - Skin changes
     - Wasting of muscle
     - Attitude of knee
   - Type of gait
     - Normal gait
     - Antalgic gait
     - Short limb gait
     - High stepping gait
     - Shuffling gait
     - Wind swipe gait
     - Trendelenburg gait

**Supine**

1. INSPECTION
   - Examine from the foot end of bed
   - Watch for:
     - External rotation
     - Internal rotation
     - Genu varus and valgus
     - Flexion deformity of the knee
     - Q angle of the knee
     - Quadriceps wasting
     - Shortening of limb
     - Shortening of limb
     - (compare level of malleoli)
     - Measurement of limb length discrepancy

**2. PALPATION**

- Temperature
- Feeling for crappitus
- Patella tap
- Fluid shift
- Mobility of patella
- Patella grinding
- Joint line tenderness

**Special Test**

- ACL Anterior Drawer Test
- Lachman Test
- PCL Posterior Drawer Test
- Posterior Sag Test

**3. RANGE OF MOTION**
Treatment

1. Partial tears
   - Usually conservative; PRICE
   - NSAIDS
   - Active exercise to avoid adhesion
     - Muscle-strengthening exercise (hamstring and quadriceps) after symptoms subsides
     - Muscle strength can compensate for stability loss
   - Aspiration of effusion in hemarthrosis
   - Weightbearing is allowed, but
     - The knee is protected from rotational or angulatory strain
       - by a heavily padded bandage or a functional brace

2. Complete tears
   - Isolated tears of the ligament may be treated by early operative reconstruction if in sportsman
   - Indications for ligament reconstruction:
     - Younger, more active patients (reduces the incidence of meniscal or chondral injury)
     - Children (strongly consider operative as activity limitation is not realistic)
     - Older active patients (age >40 is not a contraindication if high demand athlete)
     - Prior ACL reconstruction failure
   - Otherwise, treat conservatively
     - Movement and muscle strengthening exercises are encouraged
   - Isolated tears of the PCL are usually treated conservatively

Investigation

1. Plain x-rays:
   - May show the ligament has avulsed a small piece of bone
   - ACL - avulsion fracture of the proximal lateral tibia (aka Segond Fracture) or Deep sulcus (terminalis) sign
   - PCL – AP and supine lateral or Lateral stress view

2. MRI
   - Can distinguish partial from complete ligament tears
   - Reveal areas of bone bruising

3. Arthroscopy
   - Diagnostic and therapeutic purposes
   - Main indication: for reconstruction of cruciate ligament tears
Mechanism of Injury

Medial Collateral Ligament Injury
- Most commonly due to valgus stress
  - Usually with knee held in slight flexion & external rotation
- Incidence is likely higher than reported
  - Low grade injuries can be missed
- Males > females
- Commonly occur in athletes

Contact injury
- More common
- Direct blow to the lateral knee with valgus force
  - Lead to high grade/complete lig. injury

Non-contact injury
- More common in skiing
- Pivotting or cutting activities with valgus & external rotation force
  - Lead to low grade/incomplete ligament injury

Lateral Collateral Ligament Injury
- Direct blow or force to medial knee (varus stress)
- Excessive varus force, external tibial rotation, and/or hyperextension

Introduction

Medial Collateral Ligament Injury
- Most common ligamentous knee injury
  - Usually associated with ACL or medial meniscus injury
- Incidence is likely higher than reported
  - Low grade injuries can be missed
- Males > females
- Commonly occur in athletes

Lateral Collateral Ligament Injury
- Isolated injury extremely rare (< 2% knee injuries)
- 7-16% of all knee ligament injury in non-isolated cases
  - Particularly PLC injury, others: ACL, PCL
- Isolated LCL injury seen most in gymnasts & tennis players

History

Medial Collateral Ligament Injury
- Recent history of excessive valgus force applied to partially flexed knee
- "Pop" sound during the event of injury
- Pain & stiffness at medial knee
- Most patients are unable to ambulate after acute injury
- Erythema after several days

Lateral Collateral Ligament Injury
- History of varus force to knee
- Pain & stiffness at lateral knee
- Most patient still able to ambulate after acute injury
- Swelling often present
- Instability near knee full extension
- Erythema after several days

Physical Examination

MCL Injury
Look
- Ecchymosis & swelling at medial aspect of knee
- Palpate with knee 25-30° flexion
- Tenderness over medial aspect of knee
- Isolated tenderness at proximal or distal insertion—avulsion-type

Feel
- ROM and stability

Special test
- Neurovascular exam: Saphenous nerve exam
- Valgus stress testing

LCL Injury
Look
- Ecchymosis & swelling of soft tissue at lateral joint
- Palpate with knee 20° flexion
- Tenderness over LCL insertion/lateral aspect of knee
- Isolated tenderness at proximal or distal insertion—avulsion-type

Move
- Hyperextension or varus (lateral) thrust gait

Special test
- Neurovascular exam: Common peroneal nerve exam
- Varus stress test, Dial test

Classification

MCL Tear Classification - Hughston Modification of American Medical Association (AMA) Classification
Grade I (1st degree injury)
- Mild, local tenderness
- Firm endpoint, No joint laxity
- Stretch injury or few MCL fibers torn

Grade II (2nd degree injury)
- Moderate, more generalized tenderness
- Firm endpoint, +/- mild increase in joint laxity

Grade III (3rd degree injury)
- Severe, generalized tenderness
- No endpoint with valgus stress
- Increased joint laxity
  - Grade 1: 0-5 mm lateral joint opening
  - Grade 2: 6-10 mm lateral joint opening
  - Grade 3: >10 mm lateral joint opening

LCL Tear Classification (Based on lateral joint opening compared to contralateral side)
- Grade I
  - 0-5 mm lateral joint opening
- Grade II
  - 6-10 mm lateral joint opening
- Grade III
  - >10 mm lateral joint opening

LCL Tear MRI Classification
Grade I
- Subcutaneous fluid surrounding the midsubstance of the ligament at one or both insertions

Grade II
- Partial tearing of ligament fibers at either the midsubstance or one of the insertions

Grade III
- Complete tearing of ligament fibers at either the midsubstance or one of the insertions
**Treatment**

**NON OPERATIVE**

GRADE I
- NSAID
- Therapy: Active Exercise
- Brace/crutches
- Rest
- Return to SPORT: 5-7 days

GRADE II & III
- NSAID
- Therapy
- Rest
- Brace, crutches & functional bracing
- Return to SPORT:
  - Grade II: 2-4 weeks
  - Grade III: 4-8 weeks

**OPERATIVE**

**Repair**
- Acute injury
  1. Ligament avulsion reattached with suture anchors
  2. Interstitial disruption anterior advancement to origin

**Reconstruction**
- Indication:
  - Chronic Instability
  - Insufficient tissue for repair
- Graft types:
  1. Semitendinosus
  2. Hamstring
  3. Tibialis anterior
  4. Achilles tendon

**Investigation**

- Plain Radiograph
  - AP and Lateral view
  - Stress view (joint instability)
  - Not specific, may find fracture/effusion
- MRI
  - To identify location and extent of injury
  - To identify other injury (nerve, meniscus, lig.)