Examining Joints

How to Succeed in Clinical Examinations
Examination of a joint is a common exam case, which offers easy marks provided you can apply some basic principles and understand the signs you elicit. Some students fear such cases, probably because they don’t apply the underlying principles. A joint is a joint; be it shoulder, hip or knee, the same examination strategy applies, with a few specific tests for each. Students may forget this, resulting in a non-structured, clumsy examination. This guide offers a structured approach to examination, illustrated by typical cases and shows how this contributes to diagnosis. We will concentrate on shoulder, hip and knee, as these are the most popular joints in clinical examinations.

Examination
The Apley technique of Look, Feel and Move has long been established and forms the foundation of joint examination. This can be applied to any joint with some basic rules and observations. Along with this general OSCE niceties are to be observed: introduce yourself to the patient, ask their name and obtain consent to carry out the intended examination, wash your hands before and after the examination and finally thank the patient at the end before summarising your findings to the examiner.

1. Look
   1.1. Skin
      1.1.1. Scars: previous operations or trauma.
      1.1.2. Colour: redness, bruising.
      1.1.3. Skin pathology: psoriasis, eczema.
   1.2. Shape
      1.2.1. Muscle wasting: asymmetrical muscle bulk (can be measured).
      1.2.2. Swelling(s): effusion, bony growth.
   1.3. Position
      1.3.1. Are there flexion, hyperextension, varus or valgus deformities? Remember it is not fixed until it is proven on movement of the joint.

2. Feel
Ask if the patient is tender anywhere before you start to feel, this limits exacerbation of their pain on palpation.
   2.1. Temperature: compare with opposite joint using the back of the same hand.
   2.2. Define swelling: effusion, bony hard e.g. osteophyte, soft e.g. synovial thickening.
   2.3. Tenderness: important to be looking at the patient at this point as not to miss a painful expression, also know your anatomy to precisely locate the point of tenderness.

3. Move
   3.1. Active: this must be assessed before passive movement to allow observation of any limitation due to pain and not to overstep this mark on passive examination.
      3.1.1. For all joints remember planes of movement: extension and flexion, adduction and abduction, external and internal rotation (these can be applied to most joints).
      3.1.2. Measure the degree of movement, preferably with a goniometer, and compare with the opposite side.
      3.1.3. Note what limits movement, is pain the prohibiting factor or does the patient experience painless limited movement?
   3.2. Passive: after active movement, appraisal of what causes the patient pain is possible and avoided if possible during passive movement.
      3.2.1. As for active movement assess plains of movement.
      3.2.2. If the patient has painless limited movement, can the joint be passively moved beyond this point (e.g. ruptured tendon)?
3.2.3. While assessing the range of movement place your hand over the joint in question and feel for crepitus.

3.3. **Power:** this can be objectively assessed using the MRC grading.

3.3.1. Again try and establish a grade for power in all plains of movement.

3.3.2. It is especially important to compare power with the opposite joint, to reveal a localised or generalised muscle weakness.

3.3.3. Remember if there is pain on resisted movement this will impair the strength assessment and must be stated during the exam.

### MRC Grading of Muscle Power

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
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<tbody>
<tr>
<td>0</td>
<td>Total paralysis</td>
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<tr>
<td>1</td>
<td>Contraction with no movement</td>
</tr>
<tr>
<td>2</td>
<td>Movement but not against gravity</td>
</tr>
<tr>
<td>3</td>
<td>Movement against gravity but easily overcome</td>
</tr>
<tr>
<td>4</td>
<td>Stronger but less than normal</td>
</tr>
<tr>
<td>5</td>
<td>Full power</td>
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4. **Special Tests**

This is the only section of the examination where specificity to each joint is needed. There are a number of specific tests for each joint that help in diagnosis, only those felt to aid common diagnosis will be covered in the appropriate sections.

5. **Imaging**

This may be included as part of the examination station (e.g. an X-ray at the end of the examination) or could form a station in its own right. There are various forms of imaging, but at the undergraduate level it is would be unfair to show anything other than plain X-rays.

5.1. State the date, and identify the patients name, their DOB may be noted as this could help with the differential diagnosis (e.g. instability in the young and degenerative osteoarthritis in the old).

5.2. State the views and the focus (e.g. “A-P of pelvis and hips and a lateral of the right hip”). Also note if they are adequate, has part of the join been missed off? With pathology of any joint look for erosive or degenerative changes along with loose bodies within the joint.

<table>
<thead>
<tr>
<th>Degenerative changes</th>
<th>Erosive changes</th>
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<tbody>
<tr>
<td>Joint space narrowing (due to cartilage thinning)</td>
<td>Periarticular osteoporosis</td>
</tr>
<tr>
<td>Subarticular sclerosis</td>
<td>Marginal erosions</td>
</tr>
<tr>
<td>Bone cysts</td>
<td>Deformity</td>
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<tr>
<td>Osteophytes</td>
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5.3. Remember *say what you see*, but try and use anatomical terminology (e.g. superior, inferior) and try not to point.
Shoulder Examination: Case Based

Case 1
21yr old male, gives history of shoulder ‘coming out’.
1. **Look**: Scar over anterior glenohumeral joint line extending to the axilla and slight wasting of deltoid.
2. **Feel**: normal.
3. **Move**: Full range of painless movement that was thought to be beyond the normal range, external rotation was especially noted being more than 90°. Power was 5/5.
4. **Special Tests**: Both were found to be positive.
   4.1. Sulcus Sign: indicative of multidirectional instability.
   4.1.1. Apply axial traction on the arm on the adducted arm, the sign is positive when a prominent depression is observed below the acromion.
   4.2. Apprehension sign: may be positive for anterior dislocations (95% of all dislocations).
   4.2.1. Passively elevate the arm into abduction (90°), in external rotation and cautiously extend, if positive the patient tenses in apprehension of dislocation.
5. **Imaging**: Plain A-P and lateral X-rays of right shoulder, only feature of note was an irregular lateral border of the humeral head (Hill-Sachs lesion).

**Diagnosis**: Anterior instability. The scar is typical of operative open stabilisation and the wasting of deltoid may be secondary to axillary nerve damage from recurrent dislocations. In this case there was an excessive range of movement consistent with ligamentous laxity predisposing to dislocation. Special tests confirmed the suspicions of laxity and possible anterior instability. The Hill-Sachs lesion is secondary to recurrent dislocation damaging the humeral head leaving a ‘crater’ lesion.

Case 2
63yr old female, gives history of painful left shoulder.
1. **Look**: Swelling over the lateral left clavicle and generalise wasting of ipsilateral supraspinous and infraspinous muscles compared to the opposite side.
2. **Feel**: Warm and tender hard bony swelling over the left acromioclavicular joint.
3. **Move**: Full range of painless internal and external rotation but abduction and flexion were both limited to 90° by pain. Power was 5/5.
4. **Special Test**: Was found to be positive.
   4.1. Scarf test: positive for acromioclavicular joint pathology, usually osteoarthritis.
   4.1.1. The patients arm is elevated to 90° flexion and hyper-adducted across the chest, if positive tenderness is localised to the acromioclavicular joint and not the posterior glenohumoral joint, which may be due to posterior capsule tenderness.
5. **Imaging**: Both A-P and lateral show typical signs of degenerative changes of the left acromioclavicular joint.

**Diagnosis**: Osteoarthritis of the left acromioclavicular (AC) joint. The swelling over the AC joint is consistent with osteophyte formation. Wasting of the muscles is likely to be due to chronic limitation of movement due to pain. Limitation of movement above 90° is typical; at this point the scapular begins to increase its rotation and hence movement at the AC joint occurs resulting in pain. The Scarf test causes compression at the pathological AC joint and secondary tenderness was observed. The X-ray confirms the clinical signs found during the examination.
Case 3
50yr old female, with 6-month history of a painful left shoulder that has subsided recently leaving a 'stiff joint'.
1. **Look**: Slight generalise wasting of ipsilateral muscles compared to the opposite side.
2. **Feel**: Slight tenderness over anterior glenohumoral joint line.
3. **Move**: Painless limitation of all movements especially external rotation. The majority of movement was scapular in origin.
4. **Special Test**: None
5. **Imaging**: Both A-P and lateral show decreased density of the humeral head.

**Diagnosis**: Adhesive capsulitis. The history is of typical age and the pattern; a painful shoulder for 6 months followed by a 'stiff' or 'frozen' shoulder again usually lasting for 6 months. During this ‘stiff’ period there is little pain. Muscle wasting occurs secondary to the earlier pseudoparalysis (due to pain) and current stiffness. Movement mainly occurs via scapular rotation as the glenohumeral joint is ‘frozen’ allowing little or no movement to occur. External rotation is generally affected the most relative to other plains of movement. X-ray features are consistent with adhesive capsulitis.

![Diagram of shoulder movements and diagnoses](image)

Case 4
73yr old male, gives long history of painful right shoulder. He recalls having an examination in the past and the ‘Doc’ remarked he had ‘painful arc’. However, a few weeks ago after lifting his grandchild movement was suddenly drastically reduced.
1. **Look**: The right shoulder seemed to be elevated and there was wasting of supraspinous and infraspinous muscles compared to the opposite side.
2. **Feel**: Localised tenderness at the tip of the acromion.
3. **Move**: Painless limitation of flexion, internal and external rotation was observed. Abduction was severely limited to 15° and a shrugging of the shoulder was needed to obtain this movement i.e. scapular elevation. A full range of painless passive movement was obtained on passive movement and crepitus was felt. There was global weakness 4/5 and only 3/5 for abduction.
4. **Special Test**: Only drop arm sign was positive.
   4.1. Painful arc: indicative of chronic tendinitis.
      4.1.1. The patient actively abducts the arm; pain is characteristically experienced between 60° and 120°.
   4.2. Neer’s impingement sign: also indicative on chronic tendinitis
      4.2.1. Place your ipsilateral hand on the patient’s shoulder e.g. right hand onto right shoulder. Elevate the arm, in a plain between abduction and flexion, with the other hand, while holding the scapular in position. Tenderness experienced by the patient signifies a positive impingement sign.
   4.3. Drop arm sign: observe in rotator cuff tears.
      4.3.1. Patient’s arm is passively abducted to 90° and the patient can to retain this position using deltoid, *the abduction paradox*. When lowering the arm in abduction it suddenly drops, try and follow the movement in anticipation ready to catch the dropping arm so as not to cause the patient pain.

5. **Imaging**: A-P showed up riding of the humeral head and calcification just superior to the greater tuberosity.

**Diagnosis**: A complete tear of the rotator cuff. The history of a painful arc was probably due to chronic tendinitis, secondary to impingement. This led to weakening of the cuff and upon sudden strain it has torn. The shoulder seemed to be elevated, which may be due to unopposed deltoid contraction. Muscle wasting signifies that there has been a chronic problem, before this acute episode obtained from the short history. The tenderness at the tip of the acromion is typical, but not always present in rotator cuff pathology. Global weakness and limited movement especially on abduction is likely to be due to rotator cuff pathology. The positive drop arm sign certainly substantiates the diagnosis of a complete rotator cuff tear. Complete rupture of the rotator cuff results in unopposed deltoid contraction and moves the humeral head superiorly (up-riding). Calcification above the greater tuberosity is probably secondary to the chronic tendinitis.

**Notes**
A patient with a painful shoulder, but on examination all signs are normal think of referred pain usually from the neck, and hence examine the cervical region. Osteoarthritis of the glenohumeral joint is rare and usually secondary to another pathology e.g. rheumatoid arthritis, rotator cuff pathology. Hence there would be multiple signs on examination and it would be unfair to enrol such patients for an OSCE station, but for such a patient just use your basic technique and say what you see!
Hip Examination: Case Based

Case 1
68yr old male, gives a history of pain localised in his right groin, mainly after walking for a short period, especially at the end of the day.

1. **Look**: 20cm scar over the lateral surface of the LEFT hip. However, the RIGHT hip revealed no abnormality, other than slight wasting of the gluteal muscles. He was also noted to have a marked limp; his right leg seemed shorter than his left. Limb length, there was an apparent shortening of the right leg by 3cm (measured from xiphisternum to medial malleolus), but real length confirmed equal length of both legs (anterior superior iliac crest to medial malleolus).

2. **Feel**: normal.

3. **Move**: Full range of painless movement at the left hip. There was global, but painless, reduction in movement of the right hip, especially internal rotation (0°) and abduction (-15°). Power was 5/5, except flexion, extension and abduction of the right hip being 4/5.

4. **Special Tests**: Both were found to be positive: Trendelenburg test on the LEFT hip and Thomas test on the RIGHT hip.

   4.1.1. Ask the patient to stand on each leg in turn, support them if needed. Note the pelvis, it should remain level, or rise slightly, on lifting the ipsilateral leg. If the pelvis drops the test is positive.

4.2. Thomas test: to reveal a fixed flexion deformity.
   4.2.1. Passively flex one hip to its maximum, while placing a hand behind the patients back (lumbar region). Once the lumbar lordosis is obliterated note whether the contralateral knee which should remain on the bed, if not there is a fixed flexion deformity of that side (NOT the side which you have moved into full flexion). Repeat on opposite side.

5. **Imaging**: Plain A-P and lateral X-rays of hips and pelvis, revealed a total hip replacement of the left hip, and obliteration of the joint space, subchondral cysts and sclerosis of the right hip with marginal osteophytes.

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**Trendelenberg’s Test**

Patient stands on one leg - to test the hip abductors of the weight bearing side

- Pelvis normally rises slightly on lifted side
- Positive test - pelvis falls on lifted side

Trunk tilts to affected side to maintain centre of gravity

weak abductors or disturbed hip pivot

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**Diagnosis:** Osteoarthritis of the right hip. The mechanical pain is characteristic of osteoarthritis. The large scar over the left hip is typical of a total hip replacement (this age and sex likely to be due to osteoarthritis), so what has occurred on one side may well be occurring on the other. Rarely is there wasting due to lack of use, but the gluteal muscles seem to be affected first, so try and remember to look before the patient sits on the bed. His limp is due to fixed adduction, which causes secondary adaptive rotation of the pelvis, causing scoliosis and the apparent leg shortening. Osteoarthritis is typically painless on movement, and the first movements that tend to be lost are external rotation and abduction. The positive Trendelenburg test on the left hip is likely to be secondary to weakness of the abductors which may have been damaged during his total hip replacement, other cause include: dislocation/subluxation of the hip or shortening of the femoral neck or any painful arthropathy of the hip. Remember: Sound Side Sags! Thomas’ test also revealed fixed flexion, in combination with abduction, which is typical of osteoarthritis. The X-ray signs virtually seal the diagnosis.

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**Thomas’ Test**

Fixed flexion deformity of right hip- compensated for by increased lumbar lordosis. Allows bottom of pelvis to tilt backwards: legs can then be flat on couch or vertical when standing

- Increased lumbar lordosis

Flexion of normal hip to eliminate lumbar lordosis results in flexion of abnormal hip

- angle of fixed flexion deformity
Case 2
14yr old male complains of acute onset of pain in his right knee, which has progressed to involve his groin.
1. Look: Obese child, who is prepubescent. Walks with a limp. The leg is externally rotated and 2cm shorter than his left.
2. Feel: Marked tenderness around the right hip, but not hot or erythematous. The right knee was non-tender.
3. Move: Full range of painless at the right knee. However, there was severe pain elicited when moving the right hip, with global reduction in range of movement. Power was not tested due to the pain.
4. Special Test: Was found to be positive. Trendelenburg test: as above.
5. Imaging: Plain A-P and lateral X-rays of hips and pelvis, revealed symmetrical epiphyseal plates. Upon drawing Trethowan’s lines, the line pasted though the femoral head on the left, but the line remained superior to the right femoral head.

Diagnosis: Slipped upper femoral epiphysis. Although uncommon and virtually confined to pubertal children, boys more so, it is essential to spot. With the correct treatment, which may involve prophylactic pinning of the opposite side, will save the hip and prevent severe secondary morbidity. The acute onset of pain is likely to be due to an acute on chronic slip. The location of the pain in this patient is not unusual, many children present with pain referred to the knee secondary to hip pathology, which needs to be ruled out. The hip is described as ‘irritable’ with reduction in range of move (limited by pain), but they can normally weight bear. However, if they cannot weight bear or it is hot or erythematous, a septic arthritis is a possibility. Trethowan’s line, is simply a line drawn along the superior surface of the femoral neck (on an A-P X-ray), which should pass through the femoral head, if it does not, passing superiorly, it indicates there has been slippage of the femoral head.

Notes
Congenital dislocation of the hip: The incidence is approx 2:1000, and is more common in girls. Although, rarely seen in undergraduate exams the ‘special tests’ to assess hip stability seem to be popular with examiners. These two tests are:
1. Ortolani’s test (to identify a dislocated hip)
   1.1. Holding the baby’s thighs, thumbs medially and index finger over the greater trochanter, flex the hips to 90° and gently abduct. If the hip is dislocated there will be resistance to abduction, at that point further abduction with pressure on the greater trochanters may reduce the hip, with a ‘clunk’ feeling.
2. Barlow’s test (to identify a dislocatable hip)
   2.1. Thumbs are placed in the groin and the fingers grasp the thigh. An effort is then made to assess the stability of the joint, abducting and adducting the hips trying to slip the femoral head out of the acetabulum.

Perthes’ disease: It is relatively rare, with an incidence of 1:10,000. Patients are usually between 4-8yrs of age, and it is more common in boys (1:4). This disease is characterised by necrosis of the femoral head (bone death > revascularisation > remodelling). The patient has a limp and complains of pain, and hence the range of movement is limited in all plains of motion. On X-ray the earliest changes is increasing density of the head and joint widening, flattening and lateral displacement may occur. The main differential when faced with a limping child is transient synovitis, but this is really a diagnosis of exclusion, when all else has been excluded.
Case 3
57yr old female, gives a history of pain localised in her left groin, worse on walking and it is especially stiff in the mornings.

1. Look: On shaking hands you note marked ulnar deviation of the fingers and limited functional grip. She has an antalgic gait and also suffers limp, there is extreme difficulty in getting in and out of her chair. Moderate muscle wasting of the left hip, affecting the buttock and to a lesser extent the quadriceps.

2. Feel: Tenderness over the hip joint (the centre of an imaginary triangle between superior anterior iliac crest, greater trochanter and the pubic tubercle).

3. Move: Globally restricted range of movement at the left hip. However, there was good external rotation (45°), but internal rotation was limited to 5°. Power was 4/5 on the left, and 5/5 on the right.

4. Special Tests: Found to be positive (fixed flexion deformity of 15°).
   4.1. Thomas test: to reveal a fixed flexion deformity.

5. Imaging: Plain A-P and lateral X-rays of hips and pelvis, revealed obliteration of the joint space, erosions of bone, periarticular osteoporosis and gross deformity of the left hip.

Diagnosis: Rheumatoid arthritis affecting the left hip. She gives a typical history of an inflammatory arthritis. The handshake points you in the direction before you even look at the hip. The antalgic gait is likely to be due to callosities, secondary to subluxation of the matatarsal phalangeal joints. The limp of course is due to the affected hip. Muscle wasting is more prominent in patients with rheumatoid, due to the inflammatory component, so surgery (arthroplasty) is more for pain relief than functional gain (unlike osteoarthritis). This muscle wasting also results in decreased power. The global restriction of movement is secondary to pain and joint destruction (which accounts for the fixed flexion). The leg is usually held in external rotation, with limited internal rotation (opposite in the shoulder joint). The X-ray features are what you would expect to find with an inflammatory arthropathy. Once the rheumatoid has ‘burned out’ the hip will develop osteoarthritic changes secondary to the joint destruction.

Notes
One thing to exclude at the end of the examination is the possibility pathologies outside of the hip. Quickly examine the lumbar region, considering the possibility of referred pain (many a hip as been replaced to find it was not the source of pain!). A straight leg is a good differentiator; ask the pain exactly where the pain is during the raise (hip = groin, lumbar = flank). Also, arteriopaths may be suffering claudication (similar history to osteoarthritis), with a proximal stenosis e.g. common iliac artery, so check peripheral pulses.
Knee Examination: Case Based

Case 1
27 yr old male, gives a history of severe pain in his left knee after kicking a football with his right foot, a few hours later the knee became swollen. He can no longer straighten the leg.

1. **Look**: There is marked swelling of the left knee. The left knee is held in flexion (can’t diagnose fixed flexion until passively extended).

2. **Feel**: There was diffuse warmth over the left knee. Patella tap and the bulge tests were positive (see special tests). Marked tenderness over the medial joint line.

3. **Move**: Full flexion of both knees, but there was fixed flexion of the left knee (10°), and extension of the right knee to -5°. Power was 5/5 bilaterally.

4. **Special Tests**: Both were found to be positive.
   4.1. Patella tap: to reveal an effusion.
      4.1.1. Compress the suprapatella pouch with your left hand and press the patella down (towards the joint). If the patella can be felt striking the femur the test is positive.
   4.2. Bulge test: to reveal an effusion, but is also positive even if only a little fluid is present unlike the patella tap.
      4.2.1. Sweep your hand superiorly over the medial compartment (pushing the fluid into the suprapatellar pouch) and then interiorly across the lateral compartment (the pushing the fluid out of the suprapatellar pouch into the lateral compartment). The only place the excess fluid can go is under the patella into the medial compartment, which can be seen as a ripple in the on the medial side of the patellar.

5. **Imaging**: Plain A-P and lateral X-rays of left knee is normal

**Displacement test for an effusion**

- Examiner’s left hand compresses suprapatellar pouch
- Right hand massages fluid from medial to lateral compartment and back again
- “Bulge test” as bulge seen when fluid moves after massage

**Diagnosis**: Meniscal tear. The tear has resulted from the twisting action on a partially flexed knee. Typically while kicking a ball. The knee has become locked in partial flexion due to entrapment of the torn segment of the meniscus, acting as a wedge. Invariable the knee becomes swollen several hours later. The trauma causes an inflammatory response, and hence the knee becomes warm, swollen and erythematous. Along with this an inflammatory exudate (effusion) occurs, accounting for the positive tests. X-rays are typically normal. The medial meniscus is torn more often, because of the anatomical attachment to the medial collateral ligament, reducing the potential ‘give’ on stress, where the lateral meniscus is free.
Case 2
62yr old male, gives a history of progressive pain in his right knee, worse at the end of the day. It also hurts to get the knee going again after resting it, and is worse on going down stairs. He has also noticed that on standing the right leg seems bowed. More recently the knee has locked on him, with no indication, and has caused him to fall.

1. **Look**: There is a varus deformity of the right leg. Marked wasting of the quadriceps muscle. There is a swelling in the popliteal fossa

2. **Feel**: Crepitus was felt over the right knee and patellar femoral joints. Patella tap is negative, but and the bulge test was positive (see above). Tenderness over the medial joint line. Pressure on the patella resulted in severe pain. A large cystic mass was palpated in the popliteal fossa (5x5).

3. **Move**: Full range of movement at the left knee. There was a 10° fixed flexion of the right knee and he was only able to flex to 90°. Power was 4+/5 on the right, 5/5 on the left.

4. **Special Tests**: Nil.

5. **Imaging**: Weight bearing plain A-P and lateral X-rays of the right knee revealed obliteration of the medial joint space, with osteophyte formation, subchondral sclerosis and cysts. Also the lateral demonstrated the same changes in the patellofemoral joint. Loose bodies were seen within the joint and posterior to it.

**Diagnosis**
Osteoarthritis of the medial compartment of the right knee and patellofemoral joint.

The varus deformity is common in osteoarthritis, because the medial compartment seems to be affected more, and hence results in deformity and localised tenderness. There tends to be marked muscle wasting of quadriceps, secondary to lack of use (pain), resulting in weakness on extension. This can be demonstrated by measuring the circumference of the thigh 15cm above the patella.

The swelling in the popliteal fossa is likely to be a Bakers cyst. If this should burst the patient will incur severe pain in the calf (differential with a DVT).

The loose bodies seen on X-ray explain the history of the knee locking. These are broken of osteophytes and become wedged within the joint without warning.

The crepitus is simply due to the lack of cartilage, so the examiner feels bone rubbing on bone. Pressure on the patella (at approx 10° flexion) is normally painless, but if the is patellofemoral arthropathy pain is elicited. Also the history of increasing on walking down stairs is typical of patellofemoral arthropathy. Fixed flexion is common and often missed on observation; it is best to lift both legs in the air (to approx 10°) to elicit fixed flexion. The X-ray explains all of the signs and symptoms, with changes typical of osteoarthritis.
Case 3
22yr old male, gives a history of pain in his right knee, while playing football after he was tackled from the side. The force of which was sustained on the outer boarder of the knee, with the leg extended. The pain is relatively mild, but at times the knee just seems to give way, increasing his pain.
1. **Look**: Normal.
2. **Feel**: Marked tenderness over the medial surface of the right knee.
3. **Move**: Full flexion of both knees. Power was 5/5 bilaterally.
4. **Special Tests**: Both suggested damage of ligaments (rupture of the medial co-lateral and anterior cruciate ligament).
   4.1. Medial and lateral co-lateral ligaments: to assess integrity.
      4.1.1. Assessed by stressing the leg in varus and valgus positions. Tuck the patients ankle under your arm, holding the knee at 30° (to remove the stability of the anterior cruciate ligament, which occurs in extension) assess mediolateral movement. If there is excessive mediolateral movement this is likely to be due to damaged ligaments e.g. increased valgus movement = medial ligament damage, or increased varus movement = lateral ligament damage.
   4.2. Cruciate ligaments: to assess integrity.
      4.2.1. Flex both knees to 90°, with patient supine and feet on couch. Observe the knees from one side; noting the proximal tibia, if one has dropped back (sag sign) it is indicative of a posterior cruciate tear. Now grasp the proximal tibia, placing your fingers into the popliteal fossa and your thumbs onto the tibial tuberosity. Gentle rock the tibia back and forth (draw test). If there is excessive anterior movement = anterior ligament damage, or excessive posterior movement = posterior ligament damage. Lachman test is very similar, but is done at 20° flexion, with one hand on the thigh and the other on the upper leg (very difficult unless your hands are massive).
5. **Imaging**: Plain A-P and lateral X-rays of right knee is normal

**Diagnosis**: Rupture of medial co-lateral and anterior cruciate ligaments. The history is crucial, with the leg in extension the anterior cruciate ligament is taut and hence the lateral force onto the knee ruptured the medial co-lateral and anterior cruciate. This was confirmed on special tests. Pain can be a relatively minor problem, with the main complaint being the sudden giving way of the joint. Little is observed on inspection and nothing is seen on X-ray as it ligamentous injury, which doesn’t show up on X-ray (unless there as been an avulsion at the insertion of the ligament).

**Notes**
It is very important at the end of every knee exam to exclude hip pathology, as referred pain is extremely common. Nothing too elaborate, just a quick internal and external rotation at the hip joint, with the patient supine flex the hip to 90° and knee to 90° and rotate.

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