Rheumatology

For 5th stage

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## Sources

- Macleod's clinical examination, 13th edition
- Davidsons Principles and Practice of Medicine 22 edition
- American College of Rheumatology
- www.amc.edu
- www.rheumors.com
- www.arthritis.co.za
- www.mjdrdypu.org
- www.patient.info
- www.rheumresearch.org
- www.pamf.org
- www.nice.org.uk/
Part 1: Rheumatologic History

Use the patient history form, from American College of Rheumatology.
www.muhadharaty.com/lecture/3336

Structure of a joint and surrounding tissues:

- Bone
- Articular cartilage
- Capsule
- Ligamentous thickening of capsule
- Joint space
- Synovium
- Fibrocartilage pad
- Muscle
- Tendon
- Tendon sheath
- Bursa
- Periosteum
- Blood vessels & nerves
- Skin and subcutaneous tissue

Ask the patient about:

1- Main symptoms of the musculoskeletal system.
2- Past medical or surgical history:
   o Ask if there have been any previous attacks of the symptoms diagnosed in the past.
   o Diabetes mellitus, steroid therapy, osteoporosis, fractures, ischemic heart disease, stroke and obesity ➔ all could lead to musculoskeletal problems.
3- Familial history:
   o Ask about inflammatory arthritis, psoriasis.
   o Conditions linked to HLA B27 ➔ Ankylosing spondylitis, Reactive arthritis, Psoriatic arthritis, Enteropathic arthritis.
4- Drug history:
   o Steroids ➔ Osteoporosis, myopathy, osteonecrosis, infection.
   o Statins ➔ Myalgia, myositis, myopathy.
   o ACEI ➔ Myalgia, arthralgia, positive antinuclear antibody.
   o Antiepileptics ➔ Osteomalacia, arthralgia.
   o Immunosuppressants ➔ Infections.
Quinolones ➔ Tendinopathy, tendon rupture.

5- Environmental, occupational histories.

6- Ethnic groups:
   - Sickle cell disease may present with bone and joint pain in African patients.
   - Osteomalacia is more common in Asian patients.
   - Bone and joint tuberculosis is more common in African and Asian patients.

7- Sexual history:
   - Sexually transmitted disease may cause musculoskeletal symptoms ➔ reactive arthritis, gonococcal arthritis, HIV infection and hepatitis B.

8- Social history:
   - Alcohol ➔ Trauma, gout, myopathy, rhabdomyolysis, neuropathy.
   - Smoking ➔ Lung cancer with bony metastases, hypertrophic pulmonary osteoarthropathy, rheumatoid arthritis.
   - Drugs of misuse ➔ Trauma, hepatitis B, HIV.
   - Diet ➔
     - Vitamin deficiencies ➔ rickets/osteomalacia (vitamin D), scurvy (vitamin C).
     - Anorexia nervosa ➔ osteoporosis
     - Obesity ➔ osteoarthritis, diabetes mellitus, Charcot joint.

9- Mental health:
   - Many ill effects are aggravated by anxiety or depression.
   - Disability, pain and social isolation may well lead to depression.

**Symptoms related to the musculoskeletal system:**

1- **Pain:** "SOCRATES"

**Site**
- From joint (arthralgia), muscles (myalgia), ligaments, tendons, tendon sheaths, bursa.
- One joint is a monoarthritis, 2–4 joints oligoarthritis, >4 is polyarthritis.

**Onset**
- Pain from traumatic injury ➔ is usually immediate and is exacerbated by movement or haemarthrosis.
- Pain from inflammatory arthritis ➔ develop over 24 hours, or more insidiously.
- Pain from Gout and pseudogout ➔ causes acute extreme pain which develops quickly, often overnight.
- Pain from Joint sepsis ➔ develop over a day or two.

**Character**
- Bone pain ➔ penetrating and characteristically worse at night.
  - Localized pain ➔ suggests tumor, osteomyelitis (infection), benign bone tumor.
- Diffuse pain → generalized bony conditions such as osteomalacia.
- Muscle pain → described as 'stiffness', poorly localized, aggravated by use of the affected muscle(s), associated with muscle weakness in some conditions.
- Fracture pain → sharp and stabbing, aggravated by attempted movement or use, and relieved by rest and splintage.

**Radiation**
- Prolapsed intervertebral disc lead to pain in the leg.
- Carpal tunnel syndrome lead to pain in the hand.
- Neck pain radiates to the shoulder or over the top of the head.
- Hip pain is usually felt in the groin, but may radiate to the thigh or knee.

**Alleviating factors/associated symptoms**
- Pain caused by a mechanical problem is worse on movement and eases with rest.
- Pain due to inflammation is worse first thing in the morning and eases with movement.
- Pain from a septic joint is present both at rest and with movement.

**Timing (frequency, duration and periodicity of symptoms)**
- Pain for several years → chronic pain syndrome.
- Pain for several weeks → inflammatory arthritis.
- Flitting pain starting in one joint and moving to others over a period of days → rheumatic fever or gonococcal arthritis.
- Intermittent pain with resolution between episodes → palindromic rheumatism.

**Exacerbating factors**
- Exercise.
- Cold weather.
- Heavy work.

**Severity**
- The most severe joint pain occurs in septic and crystal arthritis.

2- **Stiffness:**
- Inflammatory arthritis → presents with early-morning stiffness that takes at least 30 minutes to wear off with activity.
- Mechanical arthritis → has stiffness after rest which lasts only a few minutes on movement.

3- **Joint swelling and deformity:**
- Establish the site, extent and time course of any swelling.
• Joint swelling may be due to inflammation of the synovial lining, increase in synovial fluid, hypertrophy of the bone or swelling of the structures surrounding the joint.
• Vascular structures (bone and ligament) injury ➔ bleeding into the joint or soft tissues produces tense swelling within minutes.
• Avascular structures (menisci, articular cartilage) injury ➔ it can take hours or days to produce a significant effusion.

4- Functional impairments
• Joint Locking:
  o Locking is an incomplete range of movement at a joint because of an anatomical block.
  o Could be due to mechanical obstruction ➔ a loose body or torn meniscus within the joint.
  o The patient is characteristically able to ‘unlock’ the joint by trick maneuvers.
  o Pseudo-locking is a loss of range of movement due to pain.
• Triggering: is a block to extension, which then gives suddenly when extending a finger from a flexed position. In adults it usually affects the ring or middle fingers.

5- Systemic manifestations
• Weight loss.
• Reduction in appetite.
• Fatigability.
• Poor concentration,
• Sweats and chills, particularly at night.
• Feeling ill

6- Extra-articular feature
• Rashes, weight loss, low-grade fever, malaise, headache, jaw pain on chewing, scalp tenderness, Raynaud’s phenomenon, dryness of mouth and eyes, dyspnea.
• Gastrointestinal problems, mouth ulcers, dysphagia, abdominal pain, diarrhea, bloody stool.

7- Others:
• Instability.
• Sensory disturbance.
• Warmth.
• Erythema ➔ is common in infective, traumatic and crystal induced conditions and may be mildly present in inflammatory arthritis.
And the common causes of erythema are acute gout, acute septic arthritis, acute psoriatic arthritis, inflamed overlying skin.
• Weakness ➔ suggests joint, neurological or muscle disease/ the problem may be focal or generalized.
• Fatigue ➔ Midday fatigue is a frequent complaint in inflammatory arthritis. Depression is also a frequent cause of fatigue.
• Cracking and clicking of joints ➔ it is related to nitrogen bubbles "popping" into synovial fluid with negative pressure. This is usually a benign phenomenon and does not aggravate disease or progressive degeneration.
• Crepitus ➔ may be felt especially with mechanical change or cartilage irregularity.

Common causes of arthralgia:
• Infective ➔ Viral (rubella, mumps), Bacterial (staphylococci, tuberculosis), Fungal.
• Post-infective ➔ Rheumatic fever, reactive arthritis.
• Inflammatory ➔ Rheumatoid arthritis, SLE, ankylosing spondylitis, systemic sclerosis.
• Degenerative ➔ Osteoarthritis.
• Tumor ➔ Primary (osteosarcoma, chondrosarcoma), Metastatic (from lung, breast, prostate), Systemic tumor effects (hypertrophic pulmonary osteoarthropathy).
• Crystal formation ➔ Gout, pseudogout.
• Trauma ➔ road traffic accidents
• Others ➔ Chronic pain disorders (fibromyalgia), benign joint hypermobility syndrome.

Common causes of myalgia:
• Infective ➔ Viral (Coxsackie, cytomegalovirus), Bacterial (Streptococcus pneumonia, Mycoplasma), Parasitic (Schistosomiasis, toxoplasmosis).
• Traumatic ➔ Tears, hematoma, rhabdomyolysis.
• Inflammatory ➔ Polymyalgia rheumatica, myositis, dermatomyositis.
• Drugs ➔ Alcohol withdrawal, statins, triptans.
• Metabolic ➔ Hypothyroidism, hyperthyroidism, Addison’s disease, Vit D deficiency.
• Neuropathic.
Almost all adults with arthritis have arthralgia, but only a minority of patients with arthralgia have arthritis.

Shooting pain is often caused by mechanical impingement of a peripheral nerve or nerve root.

Charcot joint grossly abnormal joints is pain free, due to neurological involvement in diabetes mellitus, leprosy, and syphilis which cause loss of joint sensation.

Chronic pain syndrome is defined as pain present for more than 3 months. It is due to pain pathway sensitization and is commonly associated with sleep disorders, psychological stress and depression.

Causes of Monoarthritis Staphylococcus aureus infection, Traumatic, Osteoarthritis, gout, pseudogout, Rheumatoid arthritis.

Causes of Oligoarthritis Mycobacterium tuberculosis infection, Osteoarthritis, Sarcoidosis, reactive arthritis, psoriatic arthritis, ankylosing Spondylitis, Rheumatoid arthritis.

Causes of Polyarthritis rubella or mumps infection, Rheumatic fever, Osteoarthritis, gout, Rheumatoid arthritis, SLE, psoriatic arthritis, Hypertrophic pulmonary osteoarthropathy.
Part 2: Physical examination

Ask – Look – Feel – Move

Ask:

- Do you have any pain or stiffness in your muscles, joints or back?
- Do you have difficulty dressing yourself?
- Do you have difficulty walking up and down stairs?
- If all three replies are negative, the patient is unlikely to have a significant musculoskeletal problem.
- If the patient answers positively, carry out a more detailed assessment.

Look:

- Always expose the joint above and below the one in question.
- Look at the skin, subcutaneous tissues, nail, soft tissue, and bony outline of each area.
- Examine the overall appearance for pallor, rash, skin tightening and hair changes.
- Look for:
  - Swelling.
  - Redness in joints or tendons.
  - Skin changes: Examine for psoriasis, Raynaud's phenomenon, ulceration of skin and rashes.
  - Wasting of regional muscles
  - Deformity or contracture.

Feel:

- Feel for warmth, swelling, stability and deformity.
- Palpate the margins of each joint.
- Synovial thickening is felt as a "soft spongy" texture with the additional presence of fluid identified by fluctuant swelling.
- Each joint is palpated in turn and presence or absence of synovial thickening is recorded.

Move:

- Assess if a deformity is reducible or fixed.
- Assess active before passive movement.
- Do not cause the patient additional pain.
• **Active movement:** The patient utilizes his own muscles and contractile structures to move a particular joint through its range of movement. This tests the joint as well as the contractile structures.

• **Passive movement:** Here the patient is encouraged to relax and the examiner moves the joint through its accepted range of movement. By ensuring that the joint muscles are relaxed, this checks the actual joint capsule itself. The joint range of movement may be found to be reduced. This suggests age-indeterminate involvement of the joint. Reproduction of the pain on passive movement confirms the joint as source of the complaint. If the pain is not reproduced by movement within the capsular pattern, then the cause lies elsewhere.

• **Resisted movement:** This isolates the cause to a particular tendon or bursa. The joint is made to relax then force is applied by the patient against resistance of the examiner. Reproduction of the pain confirms the source to be the contractile soft tissue structure.

**Findings:**

- Eyes ➔ Dryness, iritis, conjunctivitis or episcleritis; note the color of the sclera (pallor in anemia).
- Ear helix ➔ subcutaneous tophus (gout).
- Mouth ➔ Mouth ulcers, telangiectasia, vasculitic spots.
- Neck ➔ Lymphadenopathy e.g. collar stud abscess of tuberculosis.
- Axilla ➔ Lymphadenopathy.
- Forearm and elbow ➔ rheumatoid nodules on the extensor surfaces, olecranon bursa.
- Wrists ➔ Tendon thickening, hypertrophic pulmonary osteoarthropathy.
- Hands ➔ Deformity, wasting of the intrinsic muscles, calcific deposits (systemic sclerosis).
- Fingernails ➔ Pitting, onycholysis, dilated nail fold capillaries (SLE, systemic sclerosis, dermatomyositis) and clubbing.
- Chest examination ➔ cervical rib, apical lung cancer (Pancoast’s tumour), pulmonary fibrosis.
- Abdominal examination ➔ Hepato- and splenomegaly.
- Rectal and urethral examinations ➔ enteropathic and reactive arthritis.
- Urine ➔ Proteinuria and microscopic hematuria in connective tissue disease.
- Subcutaneous tissues ➔ Gouty tophi, rheumatoid nodules, xanthomata.
- Skin ➔ Face (butterfly rash of SLE), scalp, elbows, knees, trunk, and natal cleft (psoriasis), shins (erythema nodosum). Rashes of rubella, parvovirus B19, Henoch–Schönlein purpura and drug reactions.
GALS examination:

- GALS state for gait, arms, legs, and spine.
- It is rapid musculoskeletal, neurological and functional assessment.
- Watch this video ➔ www.muhadharaty.com/lecture/1189
- Check this website ➔ www.geekymedics.com/gals-assessment
- Record the result as follow:

<table>
<thead>
<tr>
<th>A normal screen</th>
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<tbody>
<tr>
<td>G ✓   A ✓   M ✓</td>
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<tr>
<td>A ✓   ✓   ✓</td>
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(A = appearance; M = movement)

1- Introduction:

- Wash hands.
- Introduce yourself.
- Explain examination.
- Gain consent.
- Expose patient's chest, upper & lower body.
- Ask if patient has any pain anywhere before you begin.
- Demonstrate actions to the patient rather than simply telling him what to do.

2- The 3 important questions to ask:

- Do you have any pain in your muscles, joints or back?
- Are you able to dress yourself completely without any difficulty?
- Are you able to walk up and down the stairs without difficulty?

3- Gait:

- Is the patient demonstrating a normal heel strike / toe off gait?
- Is each step of normal height? – Increased stepping height is noted in foot drop
- Is the gait smooth & symmetrical?
- Abnormalities ➔ antalgia / waddling / festinant / broad based / high stepping.

4- Arms:

- Firmly press the midpoint of each supraspinatus to detect hyperalgesia.
- Ask patient to place hands behind head – abduction & external rotation of the glenohumeral joint.
- Pronation – “turn your palms downwards”.
- Supination – “turn your palms up”.
- Test the elbow flexion and extension.
• Palms – assess muscle bulk of the thenar and hypothenar eminences.
• Swelling/deformity of wrists & hands – may suggest rheumatoid arthritis.
• Inspect the dorsum of the hands and check for full finger extension at the MCP, PIP and DIP joints.
• Show him how to make a ‘prayer sign’, bending the wrist back as far as possible. Put the backs of the hands together in a similar fashion. This tests wrist flexion and extension.
• Power grip – “grip my fingers tightly”.
• Precision grip – “touch each finger in turn to your thumb”.
• Squeeze Metacarpophalangeal joint – note any tenderness – often present in inflammatory arthropathy (e.g. RA).

5- Legs:

• Perform Thomas’s test for fixed flexion deformity on both hips.
• Hip passive flexion.
• Hip passive internal rotation.
• Palpate each knee for warmth and swelling.
• Patella tap – if present indicates presence of inflammation or a large effusion?
• Feel for crepitus in the patellofemoral joint and knee.
• Soles – callus formation or ulcer may suggest a gait abnormality.
• Squeeze Metatarsal joint – tenderness may indicate inflammatory arthropathy.

6- Spine:

• Look for straightness of the spine, muscle bulk, symmetry in the legs and trunk, swelling, deformity, other abnormality.
• Stand beside the patient. Ask him to bend down and try to touch his toes. This highlights any abnormal spinal curvature or limited hip extension. If he can put his hands flat to the floor, he may have hypermobility.
• Lumbar flexion – place 2 fingers on lumbar spine – as patient bends – fingers should move apart.
• Thoracolumbar rotation – Stand behind the patient, hold the pelvis, and ask him to turn from side to side without moving his feet.
• Lateral lumbar flexion – Ask him to slide the hand down the lateral aspect of the leg towards the knee.
• Cervical flexion and extension – "look up at the ceiling and then down at the floor".
• Lateral flexion of cervical spine – “touch your ear to your shoulder”.
• Temporomandibular Joint – “move your jaw side to side”.

7- To complete the examination:

• Thank patient.
• Wash hands.
• Summarize findings.

8- Important things to look for: "from www.geekymedics.com"

• Front:
  o Shoulder bulk- deltoids
  o Elbow extension – assess carrying angle – 5-15 degrees
  o Quadriceps bulk
  o Knee swelling / deformity
  o Foot arches – observe for evidence of flat feet (pes planus) or high arched feet (pes cavus)
  o Mid-foot/ Forefoot deformity

• Behind
  o Shoulder muscle bulk – wasting may suggest joint pathology
  o Spinal alignment – S-shaped curvature noted in scoliosis
  o Iliac crest alignment – pelvic tilt may suggest hip abductor weakness / paralysis
  o Gluteal muscle bulk – wasting of gluteal muscles suggests reduced mobility (prolonged sitting)
  o Popliteal swellings – baker’s cyst / popliteal aneurysm (pulsatile)
  o Hind-foot abnormalities

• Side
  o Cervical lordosis – assess for hyperlordosis – spondylolisthesis / osteoporosis / discitis
  o Thoracic kyphosis – normal is 20-45º – hyperkyphosis (>45º) – vertebral #/ Scheuermann’s kyphosis
  o Lumbar lordosis – assess for hyperlordosis – common causes include obesity / tight lower back muscles
  o Assess degree of knee flexion / hyperextension

Notes:
• Compare one limb with the opposite side.
• In suspected systemic disease, examine all joints and fully examine all systems.
• Use standard terminology to describe joint limb positions and movement.
• Valgus: the distal part deviates away from the midline
• Varus: the distal part deviates towards the midline.
• You need a tape measure, tendon hammer, goniometer (a protractor for measuring the range of joint movement), stethoscope and blocks for assessing leg length discrepancy.
• Gait include stance and swing phases ➔ the stance phase is from foot-strike to toe-off, when the foot is on the ground and load bearing. The swing phase is from toe-off to foot-strike, when the foot clears the ground. When both feet are on the ground this is double stance.
• An antalgic gait is one altered to reduce pain.
• Patients with limb-length discrepancy may walk on tiptoe on the shorter side, with compensatory hip and knee flexion on the longer side.
Part 3: The spine

Definitions:

- **Scoliosis** ➔ lateral curvature of the spine.
- **Kyphosis** ➔ curvature of the spine in the sagittal (anterior–posterior) plane, with the apex posterior.
- **Lordosis** ➔ curvature of the spine in the sagittal (anterior–posterior) plane, with the apex anterior.
- **Gibbus** ➔ a spinal deformity caused by an anterior wedge deformity localised to a single vertebra, producing an increase in forward flexion.
- **Spondylosis** ➔ degenerative change in the spine.
- **Spondylolysis** ➔ a defect in the pars interarticularis of a vertebral arch.
- **Spondylolisthesis** ➔ one vertebra slipping anteriorly on an inferior vertebra.
- **Retrolisthesis** ➔ one vertebra slipping posteriorly on an inferior vertebra.

Common spinal problems:

- Mechanical back pain.
- Prolapsed intervertebral disc.
• Spinal stenosis.
• Ankylosing spondylitis.
• Compensatory scoliosis from leg length discrepancy.
• Cervical myelopathy.
• Pathological pain/deformity ➔ osteomyelitis, tumors, myeloma.
• Osteoporotic vertebral fracture resulting in kyphosis (or rarely lordosis).
• Cervical rib.
• Scoliosis.
• Spinal instability ➔ spondylolisthesis.

Examination of the spine

– www.muhadharaty.com/lecture/1186
– www.muhadharaty.com/lecture/1192

1- Introduction:

• Wash hands.
• Introduce yourself.
• Confirm patient details – name / DOB.
• Explain examination.
• Gain consent.
• Expose patient’s upper body.
• Position patient standing.
• Ask if the patient has any pain anywhere before you begin.

2- Inspection:

Front

• Posture of head and neck ➔ symmetry / abnormal position.
• Symmetry of shoulders ➔ note any misalignment.

Side

• Cervical lordosis ➔ assess for hyperlordosis – spondylolisthesis / osteoporosis / discitis.
• Thoracic kyphosis ➔ normal is 20-45º – hyperkyphosis (>45º) – vertebral # / Scheuermann’s kyphosis.
• Lumbar lordosis ➔ assess for hyperlordosis – common causes include obesity / tight lower back muscles.
• Noting any deformity ➔ rib hump or abnormal curvature.

Behind
• Scars ➔ can provide clues as to previous surgery / trauma.
• Wasting ➔ paraspinal muscles / back muscles – may suggest chronic immobility.
• Scoliosis ➔ lateral curvature of the spine – resembles an “S” shape.
• Soft-tissue abnormalities ➔ a hairy patch or lipoma that might overlie a congenital abnormality like spina bifida.

3- Feel:

Cervical
• Feel the midline spinous processes from the occiput to T1.
• Feel the paraspinal soft tissues.
• Feel the supraclavicular fossae for cervical ribs or enlarged lymph nodes.
• Feel the anterior neck structures, including the thyroid.
• Note any tenderness in the spine, trapezius, interscapular and paraspinal muscles.

Thoracic
• Feel the midline spinous processes from T1 to T12.
• Feel for increased prominence of one or more posterior spinal processes, implying anterior wedge-shaped collapse of the vertebral body – often related to osteoporosis.
• Feel the paraspinal soft tissues for tenderness.

Lumber
• Palpate the spinous processes and paraspinal tissues.
• Note the overall alignment and focal tenderness.
• The L4/5 interspinous space is palpable at the level of the iliac crests.
• After warning the patient, lightly percuss the spine with your closed fist and note any tenderness.

4- Move:  
ROM = range of movement

Cervical
• Assess active movements:
  o Flexion – “touch your chin to your chest” – normal ROM 0-80°
Extension – “look up at the ceiling” – normal ROM 0-50º
Lateral flexion – “touch your ear to your shoulder” – normal ROM 0-45º
Rotation – “turn your head to the left & then to the right” – normal ROM 0-80º

- Perform passive movements if reduced ROM on active movement
- Assess if pain/stiffness/muscle spasm is the restricting factor
- Perform a neurological assessment of the upper and lower limbs.

Thoracic
- Ask the patient to sit with his arms crossed.
- Ask him to twist round both ways and look at you.

Lumber
- Flexion – “touch your toes, keeping your legs straight”.
  Extension -“lean backwards as far as possible” – normal ROM 10-20º.
- Lateral flexion – “slide your left hand down the outer aspect of your left leg as far as possible, keeping your legs straight” – repeat the test using the right hand/leg.

5- Special tests of the spine:

Schober’s test – tests the range of motion in lumbar spine
- Identify position of the posterior superior iliac spine (PSIS) – “dimples of Venus”
- Mark the skin in the midline 5cm below PSIS
- Mark the skin in the midline 10cm above PSIS
- Ask the patient to touch their toes – full lumbar flexion
- Measure the distance between the two lines (started at 15cm)
- Normally the distance between the two marks should increase to >20cm.
- Reduced range of motion can indicate conditions such as ankylosing spondylitis.

Sciatic stretch test – (Straight leg raise)
- Holding the ankle, raise the leg (passively flexing the hip) – keeping the knee straight
- Normal ROM is approximately 80-90º of passive hip flexion.
- Once the hip is flexed as far as the patient is able, dorsiflex the foot.
- The test is positive if the patient experiences pain in the posterior thigh / buttock.
- If this causes pain in lower back /thigh/ buttocks, it suggests sciatic nerve root impingement.
- This is most commonly due to a prolapsed intervertebral disc.

Femoral nerve stretch test L2–4
- Position patient prone.
- Flex knee.
• Extend hip.
• Plantar-flex foot.
• Positive test = pain felt in thigh/inguinal region.

Tibial nerve stretch tests L4–5, S1–3

• With the patient supine, flex the hip to 90°.
• Extend the knee. In this position the tibial nerve ‘bowstrings’ across the popliteal fossa.
• Press over either of the hamstring tendons, and then over the nerve in the middle of the fossa.
• The test is positive if pain occurs when the nerve is pressed, but not the hamstring tendons.

Flip test for functional overlay

• Ask the patient to sit on the end of the couch with the hips and knees flexed to 90°.
• Examine the knee reflexes.
• Extend the knee, as if to examine the ankle jerk.
• A patient with nerve root impingement will lie back.

The sacroiliac joints

• Compressing the pelvis or pressing down on the sacrum with the heel of your hand with the subject lying prone may produce pain if these joints are inflamed.

6- To complete the examination:

• Thank patient.
• Say you would:
  o Perform a full neurovascular examination of all 4 limbs.
  o Take plain radiographs of the spine if indicated.
  o Perform further imaging if indicated – MRI / CT.
• Wash hands.
• Summarize findings.

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Notes on cervical spine:

• The most common symptoms are pain and difficulty turning the head and neck.
• Neck pain is usually felt posteriorly but may be referred to the head, shoulder, arm or interscapular region.
• Cervical disc lesions cause radicular pain in one or other arm.
• Spinal cord compression (cervical myelopathy) ➔ then lower limb weakness, difficulty walking, loss of sensation and sphincter disturbance.
• Be particularly careful when examining patients with rheumatoid arthritis, as atlantoaxial instability can lead to spinal cord damage when the neck is flexed.
• In patients with neck injury, never move the neck.
• Check neurological function in the limbs and X-ray to assess bony injury.

Notes on thoracic spine:
• Presenting symptoms in the thoracic spine ➔ localized spinal pain, pain radiating round the chest wall, symptoms of paraparesis, including sensory loss, leg weakness, and loss of bladder or bowel control.
• Disc lesions ➔ pain radiating around the chest (girdle pain), mimicking cardiac or pleural disease.
• Osteoporotic vertebral fractures ➔ may not complain of pain, but lose height and have deformity (increased kyphosis).
• Vertebral collapse due to malignancy ➔ may have associated spinal cord compression.
• Intra-thoracic causes (myocardial ischemia or infarction, esophageal or pleural pain, aortic aneurysm) ➔ poorly localized thoracic pain.

Notes on lumber spine:
• Low back pain is extremely common. Most is ‘mechanical’, and due to degenerative disease.
• Radicular back pain due to nerve root compression.
• Important spinal conditions are acute disc protrusion, spinal stenosis, ankylosing spondylitis, osteoporotic fracture, infection and tumors.
• Infection and tumors are associated with fever or weight loss.
• Insidious onset of backache and stiffness in an adolescent or young adult suggests inflammatory disease of the sacroiliac joints and lumbar spine, e.g. ankylosing spondylitis.
• Acute onset of low back pain in a young adult, often associated with bending or lifting, is typical of acute disc protrusion (slipped disc).
• Acute back pain in the middle-aged, elderly or those with risk factors, e.g. steroid therapy, may be due to osteoporotic fracture.
• Consider malignant disease involving a vertebral body in patients with unremitting spinal pain of recent onset, disturbing sleep. Other clues are a previous history of cancer, and systemic symptoms or weight loss. Tumors rarely affect intervertebral discs.
Part 4: Upper limbs

Hand and wrist:
www.muhadharaty.com/lecture/1188

Dorsum

- Scars
- Deformity ➔ Bouchard’s nodes (PIP), Heberden’s nodes (DIP) – OA.
- Skin changes ➔ psoriatic plaques.
- Muscle wasting.
- Nails ➔ pitting & onycholysis – psoriasis.
- Swan neck deformity ➔ DIP hyperflexion with PIP hyperextension – RA.
- Z-thumb ➔ hyperextension of the IP joint, fixed flexion & subluxation of the MCP joint.
- Boutonnières deformity ➔ PIP flexion with DIP hyperextension – RA.
- Vasculitis of the fingers ➔ most commonly detected in the nail folds.

Palm

- Scars ➔ carpal tunnel release surgery.
- Swelling.
- Skin color ➔ erythema / necrosis.
- Deformity ➔ dupuytren’s contracture.
- Thenar/ hypothenar wasting ➔ carpal tunnel syndrome.
- Small muscle wasting ➔ especially of the interossei in inflammatory arthritis.
- Elbows ➔ psoriatic plaques or rheumatoid nodules.

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14.21 Examples of visible abnormalities of the hands

<table>
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<tr>
<th>Abnormality</th>
<th>Appearance and consistency</th>
<th>Typical site</th>
<th>Associated disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heberden’s nodes</td>
<td>Small bony nodules</td>
<td>Distal interphalangeal joints</td>
<td>Osteoarthritis</td>
</tr>
<tr>
<td>Bouchard’s nodes</td>
<td>Small bony nodules</td>
<td>Proximal interphalangeal joints</td>
<td>Osteoarthritis</td>
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<tr>
<td>Rheumatoid nodules</td>
<td>Fleshy and firm</td>
<td>Extensor surface of knuckles</td>
<td>Rheumatoid arthritis</td>
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<tr>
<td>Tophi</td>
<td>White subcutaneous</td>
<td>Juxta-articular</td>
<td>Gout</td>
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<tr>
<td>Calcific deposits</td>
<td>White subcutaneous</td>
<td>Finger pulp</td>
<td>Systemic sclerosis, dermatomyositis</td>
</tr>
<tr>
<td>Dilated capillaries</td>
<td>(Use magnifying glass)</td>
<td>Nail folds</td>
<td>Systemic sclerosis, dermatomyositis, systemic lupus erythematosus</td>
</tr>
</tbody>
</table>
2- Feel:

Elbows

- Palpate elbow & arm for nodules / tenderness

Palm

- Thenar/hypothenar bulk ➔ wasting is noted in ulnar/median nerve lesions.
- Temperature ➔ warm joints in inflammatory / septic arthritis.
- Tenderness.
- Feel for crepitus ➔ Place your index finger across the fully extended fingers and ask the patient to open and close the fingers.
- Palmar thickening ➔ Dupuytren’s contracture – familial / T2DM / liver cirrhosis.
- Radial pulse ➔ palpate pulses to ensure adequate arterial supply to the hand.

Dorsum

- Palpate joints of the hand & wrist ➔ Assess for tenderness / sponginess / irregularities / warmth ➔ Wrist, MCP joint (metatarsophalangeal joint), PIP joint (proximal interphalangeal joint), DIP joint (distal interphalangeal joint).
- MCP squeeze ➔ often tender in RA / other inflammatory arthropathies.
- Anatomical snuffbox ➔ tenderness may suggest scaphoid fracture.
- Hard swellings are bony; soft swelling suggests synovitis.

Sensation

- Median nerve ➔ thenar eminence.
- Ulnar nerve ➔ hypothenar eminence.
- Radial nerve ➔ first dorsal web space.

3- Move:

Active movements

- Ask the patient to make a fist, and then extend his fingers fully.
- Insert your index and middle finger from the thumb side into the patient’s palm and ask him to squeeze them as hard as possible to test grip.

Passive movements

- Assess each of the following movements passively first, feeling for crepitus & noting any pain.
- Then carry out active movements (patient does the movements independently).
- Wrist extension – “put palms of your hands together & extend wrists fully” – ROM 90°.
- Wrist flexion – “put backs of your hands together & flex wrists fully” – ROM 90°.
- Finger flexion – “make a fist”.
- Finger extension – “open your fist & splay your fingers”.


• Prayer sign – "put your palms together and extend your wrists fully" (normal is 90° of extension).
• Reverse prayer sign – "put the backs of your hands together and flex your wrists fully" (normal 90° of flexion).

4- Motor assessment:
• Ask the patient to carry out the following movements against resistance.
• This is a screening test to quickly assess the 3 major nerves of hand.
• Wrist / finger extension (against resistance) ➔ radial nerve.
• Finger abduction (against resistance) – index finger ➔ ulnar nerve.
• Thumb abduction (against resistance) ➔ median nerve.
  – Paper sign ➔ radial nerve.
  – Scissors sign ➔ ulnar nerve.
  – Stone sign - rock sign ➔ median nerve.
  – ‘OK’ sign ➔ anterior interosseous nerve branch from median nerve.

5- Function:
• Power grip ➔ squeeze my fingers with your hands.
• Pincer grip ➔ place your thumb & index finger together & don’t let me separate them.
• Pick up small object ➔ small coin.

=================================================================================

Elbow:

Front
• At the overall alignment of the extended elbow.
• Scars ➔ suggestive of previous injury / surgery.
• Swelling / erythema of the joint ➔ may suggest acute injury / inflammatory arthritis / infection.
• Carrying angle ➔ 11-13 degrees – females tend to have more significant carrying angles than males.

Side
• Scars / Swelling / bruising / Erythema / rash / tophi.
• Fixed flexion deformity ➔ often post traumatic.
• Olecranon bursitis ➔ the swelling overlying the olecranon is often most noticeable from this angle.
• Swelling of synovitis between the lateral epicondyle and olecranon.

Back
• Rheumatoid nodules ➔ firm lumps on the elbow / olecranon – indicate systemic rheumatoid disease.
• Psoriatic plaques ➔ well defined pink / red elevated lesions with silvery scale.

2- Feel:
• Temperature ➔ a particularly warm joint may indicate inflammatory arthritis or infection.
• Palpate the joint lines ➔ including the epicondyles & olecranon for any localised tenderness.
• Bursae ➔ fluid-filled sacs which are usually soft, but if acutely inflamed or infected may be firm.
• Bony contours, sponginess, tenderness.

3- Move:
• Assess each of the movements of the elbow joint actively & passively.
• Elbow flexion - extension ➔ normal range is 0 – 145° ➔ range less than 30–110° will cause functional problems.
• Pronation ➔ 85°.
• Supination ➔ 90°.
• When moving the joint passively assess for crepitus.

4- Special tests:
Medial epicondylitis – “Golfers Elbow”
• Ask the patient to actively flex the wrist whilst the elbow is flexed.
• Localized pain over the medial epicondyle and may be referred down the flexor aspect of the arm ➔ suggests a diagnosis of medial epicondylitis.

Lateral epicondylitis – “Tennis Elbow”
• Ask the patient to actively extend the wrist whilst the elbow is flexed.
• Localized pain over the lateral epicondyle and may be referred down the extensor aspect of the arm ➔ suggests a diagnosis of lateral epicondylitis.
Shoulder:
www.muhadharaty.com/lecture/1187

1- Look:

Anterior

- Scars ➔ previous surgery / trauma.
- Asymmetry of the shoulder girdle ➔ scoliosis / arthritis / trauma.
- Swelling ➔ inflammatory joint disease / effusion.
- Muscle wasting ➔ deltoids – axillary nerve injury / chronic joint disease.

Lateral

- Scars ➔ previous surgery / trauma.
- Muscle wasting ➔ deltoid.
- Alignment of shoulder girdle ➔ misalignment – dislocation / scoliosis.

Posterior

- Scars ➔ previous surgery / trauma.
- Trapezius ➔ assess symmetry / wasting.
- Para-vertebral muscles ➔ note any swelling / wasting.
- Scapula ➔ assess size, position, symmetry – e.g. winged scapula (long thoracic nerve injury).

2- Feel:

- Assess temperature of shoulder joints ➔ warmth may suggest inflammatory arthropathy/infection.
- Palpate the various components of the shoulder girdle (any swelling / tenderness):
  - Sterno-clavicular joint
  - Clavicle
  - Acromio-clavicular joint
  - Coracoid process – 2cm inferior & medial to the clavicular tip
  - Head of humerus
  - Greater tuberosity of humerus
  - Spine of scapula

3- Move:

Compound movements (screening)

- Compound movements are often used as a rapid screening tool for shoulder joint pathology as they test a number of the rotator cuff muscles in one go. If the patient
experiences pain or is unable to perform these movements you would then proceed to perform a more detailed examination of the shoulder joint.

- Put your hands behind your head ➔ external rotation + abduction
- Put your hands as far up your back as you can ➔ internal rotation + adduction

**Full shoulder examination**

- **Flexion** ➔ ask the patient to raise their arms forwards until they points upwards – 150°-170°.
- **Extension** ➔ ask patient to keep their arm straight and extend it behind them – 40°.
- **Abduction** ➔ ask the patient to lift their arm away from their sides as far as possible – 160°-180°.
- **Adduction** ➔ ask the patient to bring their arm across the trunk to the opposite side – 30°-40°.
- **External rotation** ➔ ask patient to hold their elbow to their body flexed at 90° and then move their forearm outwards in an arc-like motion – 70°.
- **Internal rotation** ➔ with the patient’s elbow flexed at 90° (arm by their side) ask them to place their hand behind their back and reach as far up the spine as they can manage – Average = T5.

**Assess the movement of the Scapula**

- Ask the patient to abduct their shoulder.
- Simultaneously palpate the inferior pole of the scapula.
- Assess the degree and smoothness of movement of the scapula.
- Normally 50-70% of movement occurs at the glenohumeral joint.
- If the glenohumeral joints movement is reduced due to injury / inflammation then the majority of abduction will occur via increased scapula movement over the chest wall.

**Passive movement**

- Ask the patient to fully relax and allow you to move their arm for them.
- Warn them that should they experience any pain to let you know immediately.
- Repeat the above movements passively – feel for any crepitus during movement of the joint.

**4- Special tests:**

**Supraspinatus assessment**

- Ask the patient to abduct their shoulder from the neutral position against resistance.
The Painful Arc (Impingement syndrome)

- Passively abduct the patient’s arm to its maximum point of abduction.
- Ask the patient to lower their arm slowly back to a neutral position.
- Impingement / supraspinatus tendonitis typically causes pain between 60-120° of abduction.

External rotation against resistance

- Position the patient’s arm with the elbow flexed at 90° and the shoulder flexed at 30° (reducing contribution of deltoid).
- Ask the patient to externally rotate their shoulder whilst you apply light resistance.
- Pain on resisted external rotation suggests infraspinatus / teres minor tendonitis.
- Loss of power suggests a torn infraspinatus / teres minor ligament.

Internal rotation against resistance (“Gerber lift off test”)

- Ask the patient to place the dorsum of their hand on their lower back.
- Apply light resistance to the hand (pressing it towards their back).
- Ask the patient to move their hand off their back.
- An inability to do this (loss of power) indicates damage to subscapularis (ligamentous tear).

Bicipital tendonitis

- Palpate the bicipital tendon in its groove, noting any tenderness.
- Ask the patient to supinate the forearm, and then flex the arm against resistance. Pain occurs in bicipital tendonitis.
Part 5: Lower limbs

Hip joint: www.muhadharaty.com/lecture/1191

1- Look:

Inspect patient from all angles

- Front ➔ scars / pelvic tilt / quadriceps wasting / foot deformity.
- Side ➔ assess lumbar lordosis – normal / hyperlordosis.
- Behind ➔ scoliosis / gluteal wasting / pelvic tilt.
- Look for ➔ scars, sinuses, dressings or skin changes around the hip.

Gait

- Observe patient from behind, the side and in front.
- Assess speed / smoothness / turning.
- Note any evidence of antalgic gait or trendelenburg gait.
- Assess the patient’s footwear – unequal sole wearing – abnormal gait.

2- Feel:

- Ask patient to lay down on a bed.
- Palpate the tissues overlying the hip joint for tenderness / warmth – inflammation / infection.
- Palpate greater trochanter ➔ tenderness (often indicative of trochanteric bursitis).
- Tenderness over the lesser trochanter and ischial tuberosity is common in sporting injuries.

3- Move:

Active movements

- Place your hand under the lumbar spine to detect masking of hip movement by the pelvis / lumbar spine.
- Flexion ➔ “bring your knee towards your chest” – normal ROM is 120°.

Passive movements

- Flexion ➔ assess the degree of flexion in each hip individually – normal ROM is 120°
- Internal rotation ➔ This can be assessed with the hip & knee joint flexed at 90° / Rotate the foot laterally / Normal ROM 40°.
• External rotation ➔ This can be assessed with the hip & knee joint flexed at 90° / Rotate the foot medially / Normal ROM 45°.
• Abduction ➔ whilst stabilising the contralateral iliac crest, use your other hand abduct the hip until you feel the pelvis begin to tilt – normal ROM is 45°.
• Adduction ➔ whilst stabilising the contralateral iliac crest, use your other hand to adduct the patient’s leg across the midline as far as possible – normal ROM is 30°.
• Hip extension (passive):
  o Position patient prone.
  o Place a hand on the pelvis to assess for movement.
  o Lift one leg at a time to assess range of extension.
  o Normal ROM is 0-20°.

4- Special tests:

Assess leg length

• Ask the patient to lie supine and stretch both legs out as far as possible equally to eliminate any soft-tissue contracture/ abnormal posture.
• Measure apparent leg length ➔ umbilicus to the tip of medial malleolus.
• Measure true leg length ➔ ASIS to the tip of medial malleolus.
• Confirm any limb length discrepancy by ‘block testing’ ➔ Ask the patient to stand with both feet flat on the ground. Raise the shorter leg using a series of blocks of graduated thickness until both iliac crests feel level.

Thomas’s test

• Place hand under patient’s spine.
• Passively flex both legs (hips/knees) as far as you are able to.
• Your hand should detect that the lumbar lordosis is now flattened.
• Ask patient to fully extend the hip you are assessing: Incomplete extension suggests a fixed flexion deformity at the hip joint.
• Repeat the test to assess the contralateral hip joint.

= DO NOT PERFORM ON PATIENTS WITH HIP REPLACEMENTS – can cause dislocation!

Trendelenburg’s test

• Place hands on the iliac crests on either side of the pelvis.
• Ask the patient to stand on one leg for 30 seconds.
• Observe your hands to see which moves up or down.
• Normally the iliac crest on the side with the foot off the ground should rise up.
• Repeat the test on the opposite side.
• The test is deemed positive (abnormal) if the pelvis falls on the side with the foot off the ground.
• This abnormal result suggests weak hip abductors on the contralateral side of the pelvis.

Knee joint: [link](www.muhadharaty.com/lecture/1190)

1- Look:

Gait
• Is the patient demonstrating a normal heel strike / toe off gait?
• Is each step of normal height? – increased stepping height is noted in foot drop.
• Is the gait smooth & symmetrical?
• Any obvious abnormalities? – antalgia / waddling / broad based / high stepping.

Anteriorly
• Scars ➔ previous surgery / trauma.
• Swellings ➔ effusions / inflammatory arthropathy / septic arthritis / gout.
• Asymmetry / leg length discrepancy.
• Valgus or varus deformity.
• Quadriceps wasting ➔ suggests chronic inflammation / reduced mobility.

Posteriorly
• Scars.
• Asymmetry.
• Popliteal swellings ➔ Baker’s cyst / Popliteal aneurysm.

2- Feel:
• Ask the patient to lay on the bed.
• Assess temperature – ↑ temperature may suggest inflammation / infection.
• Palpate the quadriceps tendon – whilst leg extended – synovitis.

Palpate the knee joint
Palpate the following with the knee flexed at 90°:
• Patella ➔ palpate the borders for tenderness / effusion.
- Tibial tuberosity ➔ tenderness may suggest Osgood Schlatter disease.
- Head of the fibula ➔ irregularities / tenderness.
- Tibial & Femoral joint lines ➔ irregularities / tenderness.
- Collateral ligaments ➔ both the medial and lateral.
- Popliteal fossa ➔ feel for any obvious collection of fluid (e.g. a Baker’s cyst).
- Measure quadriceps circumference & compare ➔ 20cm above tibial tuberosity.

**Patella tap (can detect larger effusions)**
- Empty the suprapatellar pouch by sliding your left hand down the thigh to the patella.
- Keep your left hand in position and use your right hand to press downwards on the patella with your fingertips.
- If fluid is present you will feel a distinct tap as the patella bumps against the femur.

**Sweep or bulge or ripple test (useful for detecting small effusions)**
- Empty the suprapatellar pouch with one hand whilst also emptying the medial side of the joint using an upwards wiping motion.
- Now release your hands and do a similar wiping motion downwards on the lateral side of the joint.
- Watch for a bulge or ripple on the medial side of the joint.
- The appearance of a bulge or ripple on the medial side of the joint suggests the presence of an effusion.

**3- Move:**

**Active**
- This involves the patient performing the movement. Ensure you observe for restricted range of movement and signs of discomfort.
- Knee flexion ➔ normal ROM 0-140º – “Move your heel as close to your bottom as you can manage”.
- Knee extension ➔ “Straighten your leg out as best as you are able to”.

**Passive**
- This involves the patient relaxing and allowing you to move the joint freely. It’s important to feel for crepitus as you move the joint and observe any restriction of movement.
- Knee flexion & extension.
- Hyperextension ➔ elevate both legs by the heels – note any hyperextension (<10º is normal.

**4- Special tests:**

**Anterior/Posterior drawer test**
• Flex the patient’s knee to 90º.
• Inspect for evidence of posterior sag as this can give a false +ve anterior drawer sign.
• Rest your forearm down the patient’s lower leg to fix its position.
• Wrap your hands around the proximal tibia with your fingers around the back of the knee.
• Position your thumbs over the tibial tuberosity.
• Ask the patient to keep their legs as relaxed as possible (tense hamstrings can mask pathology).
• Pull the tibia anteriorly — significant movement suggests anterior cruciate laxity /rupture
• Push the tibia posteriorly — significant movement suggests posterior cruciate laxity /rupture
• With healthy cruciate ligaments there should be little or no movement noted.

The patellar apprehension test

• With the patient’s knee fully extended, push the patella laterally and flex the knee slowly. If the patient actively resists flexion, this suggests previous patellar dislocation or instability.

Meniscal provocation test (test for meniscal tears)

• **Medial meniscus**
  • Passively flex the knee to its full extent.
  • Externally rotate the foot and abduct the upper leg at the hip, keeping the foot towards the midline (creating a varus stress at the knee).
  • Extend the knee smoothly. In medial meniscus tears a click or clunk may be felt or heard, accompanied by discomfort.

• **Lateral meniscus**
  • Passively flex the knee to its full extent.
  • Internally rotate the foot and adduct the leg at the hip (creating a valgus stress at the knee).
  • Extend the knee smoothly. In tears of the lateral meniscus, a click or clunk may be felt or heard, accompanied by discomfort.

Collateral ligaments

• **Lateral collateral ligament (LCL)**
  • Extend the patient’s knee fully.
  • Hold the patient’s ankle between your elbow and side.
  • Place your right hand along the medial aspect of the knee.
  • Place your left hand on the lower limb (e.g. calf or ankle).
• Push steadily outward with your right hand while supplying an opposite force with the left.
• If the LCL is damaged your hand should detect the lateral aspect of the joint opening up.

**Medial collateral ligament (MCL)**

• Extend the patient’s knee fully.
• Hold the patient’s ankle between your elbow and side.
• Place your right hand along the lateral aspect of the knee.
• Place your left hand on the lower limb (e.g. calf or ankle).
• Push steadily inward with your right hand while supplying an opposite force with the left.
• If the MCL is damaged your hand should detect the medial aspect of the joint opening up.

**Notes**

• If after this assessment the knee appears stable you can further assess the collateral ligaments by repeating this test with the knee flexed at 30°. At this position the cruciate ligament are not taught so minor collateral ligament laxity can be more easily detected.
• With healthy collateral ligaments there should be no abduction or adduction possible. If abduction/adduction is possible, it suggests laxity / rupture of the corresponding collateral ligament.

**Squat test**

• Ask the patient to squat, keeping his feet and heels flat on the ground.
• If he cannot do this, there is incomplete knee flexion on the affected side.
• This may be caused by a tear of the posterior horn of the menisci.

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**Ankle and foot:**

**1- Look:**

**Gait**

• Is the patient demonstrating a normal heel strike / toe off gait?
• Is each step of normal height? – increased stepping height is noted in foot drop.
• Is the gait smooth & symmetrical?
• Hallux rigidus ➔ loss of movement at the MTP joints.
Front

- Symmetry of feet / ankles.
- Toe alignment ➔ hallux valgus of the big toe may be noted.
- Bunions ➔ located at the 1st MTP joint.
- Toe clawing?
- Scars ➔ suggestive of previous injury / surgery.
- Calluses ➔ may indicate foot / gait deformity or poorly fitting footwear.
- Splay foot ➔ has widening at the level of the metatarsal heads, often associated with MTP joint synovitis.
- Swelling / erythema of the foot or ankle ➔ may suggest injury / inflammatory arthritis / infection.
- Examine the patients shoes ➔ evidence of asymmetrical wearing may indicate abnormal gait.

Side

- Foot arches ➔ observe for evidence of flat feet (pes planus) or high arched feet (pes cavus).
- If patient has flat feet ask to stand on tip toes ➔ supple flat feet will correct / rigid flat feet will not.

Back

- Foot / Ankle symmetry ➔ heel alignment – valgus or varus deformity?
- Achilles tendon ➔ any obvious deformity / discontinuity / erythema?
- Examine the ankle and foot for scars, sinuses, swelling, bruising, callosities (an area of thickened skin at a site of repeated pressure), nail changes, edema, deformity.

2- Feel:

- Ask the patient to lay on a bed.
- Assess temperature & compare between legs ➔ ↑ temperature may indicate inflammatory pathology.
- Assess pulses in both feet ➔ posterior tibial & dorsalis pedis.
- Palpate the achilles tendon ➔ assess for thickening or swelling.

Palpate the joints / bones

- Work distal to proximal ➔ assess for tenderness / swelling / irregularity.
- Squeeze MTP joints ➔ observe patients face for discomfort.
- Tarsal joint.
- Ankle joint.
- Subtalar joint.
- Medial / lateral malleoli.
• Proximal fibula.

3- Move:

• Assess each of the following movements actively & passively (feeling for crepitus)
• Foot plantiflexion ➔ “push your toes downwards, like pushing a car pedal” – 30-40 °
• Foot dorsiflexion ➔ “point your toes towards your head” – 12-18 °
• Foot inversion ➔ grasp ankle with one hand & heel with the other – turn sole towards midline.
• Foot eversion ➔ grasp ankle with one hand & heel with the other – turn sole away from midline.
• Midtarsal joints ➔ hold ankle with one hand whilst moving the tarsus up/down then & side to side.
• Toe flexion ➔ “curl up your toes”.
• Toe extension ➔ “point your toes towards your head”.
• Toe adduction ➔ “hold this paper between your toes & don’t let me pull it away”.
• Toe abduction ➔ “spread out your toes as far as you can”.

4- Special tests:

Thomson’s (Simmond’s) test

• Simmond's test is used to assess for rupture of the achilles tendon.
• Ask patient to kneel on a chair with their feet hanging off the edge.
• Squeeze each calve in turn.
• Normally the foot should plantarflex.
• If the achilles tendon is ruptured there will be no movement of the foot.
Part 6: Investigations in Rheumatology

Hematological tests:
- Full blood count → Anemia (inflammatory arthritis), Neutrophilia (acute gout), Leukopenia (SLE, Felty’s syndrome).
- Erythrocyte sedimentation rate (ESR).
- Plasma viscosity.
- C-reactive protein.

Urinalysis:
- Protein → rheumatoid arthritis and other chronic arthropathies.
- Blood → Glomerular disease (SLE, vasculitis).

Biochemical:
- Urea and creatinine ↑ → secondary amyloid in rheumatoid arthritis.
- Uric acid May be ↑ → gout.
- Calcium ↓ → osteomalacia; normal in osteoporosis.
- Alkaline phosphatase ↑ → Paget’s disease, metastases, osteomalacia, immediately after fractures.
- Angiotensin-converting enzyme ↑ → sarcoidosis.
- Urinary albumin : creatinine ratio → Glomerular disease (vasculitis, SLE).

Serological:
- IgM rheumatoid factor ↑ → rheumatoid arthritis.
- Anticyclic citrullinated peptides (ACPA) → rheumatoid arthritis.
- Antinuclear factors ↑ → SLE, but it is low in other connective tissue diseases and rheumatoid arthritis.
- Anti-Ro, Anti-La → Sjögren’s syndrome.
- Anti-dsDNA, Anti-Sm → SLE.
- Anti-RNP → Mixed connective tissue disease.
- Antineutrophil cytoplasmic antibodies → Granulomatosis with polyangiitis, polyarteritis nodosa, Churg–Strauss vasculitis.
Imaging:

- Plain radiography (X-rays) ➔ Fractures, erosions, joint space, calcification, deformity, abnormal density, excess bone fragments.
- Ultrasonography ➔ effusion, synovitis, cartilage breaks, enthesitis, erosions, detection of bursae, tendon pathology, osteophytes.
- Isotope bone scan ➔ Paget’s disease, bone tumors.
- MRI ➔ For joint structure and soft-tissue imaging.
- CT scanning ➔ scans of thorax for pulmonary fibrosis.
- Dual-energy X-ray absorptiometry (DXA) ➔ osteoporosis.

Joint aspiration:

- Polarised light microscopy ➔ positively birefringent (rhomboidal crystals contain calcium), negatively birefringent (needle-shaped crystals contain urate).
- Bacteriology ➔ Raised white cell count in infection.
- Biopsy and histology Synovitis ➔ rheumatoid arthritis and other inflammatory arthritis.

X-ray abnormalities in selected rheumatic diseases:

- Rheumatoid arthritis ➔ Periarticular osteoporosis, Bone erosions, Joint space narrowing.
- Osteoporosis ➔ Osteopenia, Vertebral fractures, Non-vertebral fractures.
- Paget’s disease ➔ Bone expansion, Abnormal trabecular pattern, Osteolysis, Osteosclerosis, Pseudofractures.
- Spondyloarthritis ➔ Sacroiliitis, Syndesmophytes, Ligament calcification, Squaring of vertebral bodies.
- Osteoarthritis ➔ Joint space narrowing, Osteophytes, Subchondral sclerosis, Peaking of tibial spines, Subchondral cysts.
Part 7: Important information

Causes of acute monoarthritis:
- Septic arthritis
- Gout
- Pseudogout
- Reactive arthritis
- Trauma
- Haemarthrosis
- Seronegative spondyloarthritis: Psoriatic arthritis, Ankylosing spondylitis, Enteropathic arthritis.
  - Less common: Erythema nodosum, Rheumatoid arthritis, Juvenile idiopathic arthritis.

Causes of polyarthritis:
- Rheumatoid arthritis
- Viral arthritis
- Osteoarthritis
- Psoriatic arthritis
- Ankylosing spondylitis
- Enteropathic arthritis
- SLE
  - Less common: Juvenile idiopathic arthritis, chronic gout, Chronic sarcoidosis.

Risk factors for NSAID-induced ulcers:
- Age > 60 years
- Past history of peptic ulcer
- Past history of adverse event with NSAID
- Concomitant corticosteroid use
- High-dose or multiple NSAID
- High-risk NSAID

Causes of osteomalacia and rickets:
- Vitamin D deficiency ➔ Classical, Gastrointestinal disease
- Failure of 1,25 vitamin D synthesis ➔ Chronic renal failure, Vitamin D-resistant rickets type I (autosomal recessive)
- Defects in phosphate and pyrophosphate metabolism ➔ Hypophosphataemic rickets (X-linked dominant), Autosomal dominant hypophosphataemic rickets, Autosomal recessive hypophosphataemic rickets, Tumour-induced hypophosphataemic Osteomalacia, Hypophosphatasia
- Iatrogenic and other ➔ Bisphosphonate therapy, Aluminium, Fluoride
### 25.54 Criteria for diagnosis of rheumatoid arthritis*

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<th>Criterion</th>
<th>Score</th>
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</tr>
<tr>
<td>Normal CRP and ESR</td>
<td>0</td>
</tr>
<tr>
<td>Abnormal CRP or ESR</td>
<td>1</td>
</tr>
</tbody>
</table>

Patients with a score ≥ 6 are considered to have definite RA.

*European League Against Rheumatism/American College of Rheumatology 2010 Criteria. (ACP A = anti-citrullinated peptide antibodies; CRP = C-reactive protein; ESR = erythrocyte sedimentation rate; RF = rheumatoid factor)

### 25.55 Extra-articular manifestations of rheumatoid disease

- **Systemic**
  - Fever
  - Weight loss
  - Fatigue
  - Susceptibility to infection
- **Musculoskeletal**
  - Muscle-wasting
  - Tenosynovitis
  - Bursitis
  - Osteoporosis
- **Haematological**
  - Anaemia
  - Thrombocytosis
  - Eosinophilia
- **Lymphatic**
  - Felty’s syndrome (see Box 25.56)
  - Splenomegaly
- **Nodules**
  - Sinuses
  - Fistulae
- **Ocular**
  - Episcleritis
  - Scleritis
  - Scleromalacia
  - Keratoconjunctivitis sicca
- **Vasculitis**
  - Digital arteritis
  - Ulcers
  - Mononeuritis multiplex
  - Visceral arteritis
- **Cardiac**
  - Pericarditis
  - Myocarditis
  - Endocarditis
  - Conduction defects
  - Coronary vasculitis
  - Granulomatous aortitis
- **Pulmonary**
  - Nodules
  - Pleural effusions
  - Fibrosing alveolitis
  - Bronchiolitis
  - Caplan’s syndrome
- **Neurological**
  - Cervical cord compression
  - Compression neuropathies
  - Peripheral neuropathy
  - Mononeuritis multiplex
- **Amyloidosis** (p. 86)

### 25.56 How to calculate the DAS28 score

- Count the number of tender joints
- Count the number of swollen joints
- Measure the ESR
- Ask the patient to rate global activity of arthritis during the past week from 0 (no symptoms) to 100 (very severe)
- Enter data into an online calculator¹ or work out using a formula²

1. [www.4s-dawn.com/DAS28](http://www.4s-dawn.com/DAS28).
2. DAS28 = 0.56 × square root (tender joints) + 0.28 × square root (swollen joints) + 0.70 × log₁₀(ESR) + 0.014 (global activity score)

### 25.57 Investigations and monitoring of rheumatoid arthritis

#### To establish diagnosis
- Clinical criteria
- ESR and CRP
- Ultrasound or MRI
- Rheumatoid factor and anti-citrullinated peptide antibodies

#### To monitor disease activity and drug efficacy
- Pain (visual analogue scale)
- Early morning stiffness (minutes)
- Joint tenderness
- Joint swelling
- DAS28 score
- ESR and CRP
- Ultrasound

#### To monitor disease damage
- X-rays
- Functional assessment

#### To monitor drug safety
- Urinalysis
- Full blood count
- Urea, creatinine and liver function tests
25.52 Emergency management of suspected septic arthritis

Admit patient to hospital
Perform urgent investigations
• Aspirate joint
  Send synovial fluid for Gram stain and culture
  Use imaging guidance if required (e.g. for hip)
• Send blood for culture, routine biochemistry and haematology, including ESR and CRP
• Consider sending other samples (sputum, urine, wound swab) for culture, depending on patient history, to determine primary source of infection
Commence intravenous antibiotic
• Flucloxacillin 2 g 4 times daily
  If penicillin-allergic, give clindamycin 450–600 mg 4 times daily
  If at high risk of Gram-negative sepsis (elderly, frail, recurrent urinary tract infection), add a cephalosporin (cefoxaxime 1.5 g 3 times daily)
Relieve pain
• Oral and/or intravenous analgesics
• Consider local ice-packs
Aspirate joint
• Perform serial needle aspiration to dryness (1–3 times/day or as required)
• Consider arthroscopic drainage if needle aspiration difficult
Arrange physiotherapy
• Early regular passive movement, progressing to active movements once pain controlled and effusion not re-accumulating

25.43 Causes of hyperuricaemia and gout

<table>
<thead>
<tr>
<th>Diminished renal excretion</th>
<th>Drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased renal tubular reabsorption*</td>
<td>Thiazide and loop diuretics</td>
</tr>
<tr>
<td>Renal failure</td>
<td>Low-dose aspirin</td>
</tr>
<tr>
<td>Lead toxicity</td>
<td>Ciclosporin</td>
</tr>
<tr>
<td>Lactic acidosis</td>
<td>Pyrazinamide</td>
</tr>
<tr>
<td>Alcohol</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Increased intake</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Red meat</td>
<td>Offal</td>
</tr>
<tr>
<td>Seafood</td>
<td></td>
</tr>
</tbody>
</table>

Over-production of uric acid

- Myeloproliferative and lymphoproliferative disease
- Psoriasis
- High fructose intake
- Glycogen storage disease (p. 450)

*Usually genetically determined (see text).
(HPR1 = hypoxanthine guanine phosphoribosyl transferase)

25.67 Diagnostic criteria for ankylosing spondylitis and axial spondyloarthritis

Axial spondyloarthritis

- Sacroiliitis on MRI only
- Bilateral sacroiliitis on X-ray, even if changes are mild
- Unilateral sacroiliitis on X-ray if changes are definite

Ankylosing spondylitis

- Back pain > 3 mths which has four of the following characteristics:
  1. improved by exercise
  2. not relieved by rest
  3. insidious onset
  4. night pain
  5. age at onset < 40
- Good response of back pain to NSAID
- Family history of spondyloarthritis
- History of inflammatory bowel disease

Clinical examination

<table>
<thead>
<tr>
<th>Arthritis</th>
<th>Limitation of lumbar spine movement in sagittal and frontal planes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enthesitis</td>
<td></td>
</tr>
<tr>
<td>Uveitis</td>
<td></td>
</tr>
<tr>
<td>Dactylitis</td>
<td></td>
</tr>
<tr>
<td>Psoriasis</td>
<td></td>
</tr>
</tbody>
</table>

Investigations

| HLA-B27-positive | Elevated CRP |

Axial spondyloarthritis is diagnosed when there is sacroiliitis on MRI plus one other feature on history, clinical examination or investigation. The diagnosis can also be made in patients who are HLA-B27-positive with two or more clinical features in the absence of sacroiliitis.

Ankylosing spondylitis can be diagnosed when X-ray evidence of sacroiliitis occurs with one other feature on history or clinical examination.
25.65 Extra-articular features of ankylosing spondylitis
- Anterior uveitis (25%) and conjunctivitis (20%)
- Prostatitis (80% men): usually asymptomatic
- Cardiovascular disease
  - Aortic incompetence
  - Mitral incompetence
  - Cardiac conduction defects
  - Pericarditis
- Amyloidosis
- Atypical upper lobe pulmonary fibrosis

25.69 Revised American Rheumatism Association criteria for systemic lupus erythematosus

<table>
<thead>
<tr>
<th>Feature</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malar rash</td>
<td>Fixed erythema, flat or raised, sparing the nasolabial folds</td>
</tr>
<tr>
<td>Discoid rash</td>
<td>Erythematous raised patches with adherent keratotic scarring and follicular plugging</td>
</tr>
<tr>
<td>Photosensitivity</td>
<td>Rash due to unusual reaction to sunlight</td>
</tr>
<tr>
<td>Oral ulcers</td>
<td>Oral or nasopharyngeal ulceration, which may be painless</td>
</tr>
<tr>
<td>Arthritis</td>
<td>Non-erosive, involving two or more peripheral joints</td>
</tr>
<tr>
<td>Serositis</td>
<td>Pleuritis (history of pleuritic pain or rub, or pleural effusion) or pericarditis (rub, ECG evidence or effusion)</td>
</tr>
<tr>
<td>Renal disorder</td>
<td>Persistent proteinuria &gt; 0.5 g/day or cellular casts (red cell, granular or tubular)</td>
</tr>
<tr>
<td>Neurological disorder</td>
<td>Seizures or psychosis, in the absence of provoking drugs or metabolic derangement</td>
</tr>
<tr>
<td>Haematological disorder</td>
<td>Haemolytic anaemia or leucopenia (&lt; 4 × 10^9/L) or lymphopenia (&lt; 1 × 10^9/L) or thrombocytopenia (&lt; 100 × 10^9/L) in the absence of offending drugs</td>
</tr>
<tr>
<td>Immunological disorder</td>
<td>Anti-DNA antibodies in abnormal titre or presence of antibody to Sm antigen or positive antiphospholipid antibodies</td>
</tr>
<tr>
<td>ANA disorder</td>
<td>Abnormal titre of ANA by immunofluorescence</td>
</tr>
</tbody>
</table>

A person has SLE if any 4 out of these 11 features are present serially or simultaneously.

*On two separate occasions.

25.71 Clinical features of systemic vasculitis

<table>
<thead>
<tr>
<th>Systemic</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Malaise</td>
<td>Weight loss with arthralgia and myalgia</td>
</tr>
<tr>
<td>Fever</td>
<td></td>
</tr>
<tr>
<td>Night sweats</td>
<td></td>
</tr>
<tr>
<td>Rashes</td>
<td></td>
</tr>
<tr>
<td>Palpable purpura</td>
<td>Ulceration</td>
</tr>
<tr>
<td>Pulp infarcts</td>
<td>Livido reticularis</td>
</tr>
<tr>
<td>Ear, nose and throat</td>
<td></td>
</tr>
<tr>
<td>Epistaxis</td>
<td>Deafness</td>
</tr>
<tr>
<td>Recurrent sinusitis</td>
<td></td>
</tr>
<tr>
<td>Respiratory</td>
<td></td>
</tr>
<tr>
<td>Haemoptysis</td>
<td>Poorly controlled asthma</td>
</tr>
<tr>
<td>Cough</td>
<td></td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td></td>
</tr>
<tr>
<td>Abdominal pain (due to mucosal inflammation or enteric ischaemia)</td>
<td>Mouth ulcers</td>
</tr>
<tr>
<td></td>
<td>Diarrhoeae</td>
</tr>
<tr>
<td>Neurological</td>
<td></td>
</tr>
<tr>
<td>Sensory or motor neuropathy</td>
<td></td>
</tr>
</tbody>
</table>

25.75 Secondary causes of osteoporosis and osteoporotic fractures

<table>
<thead>
<tr>
<th>Endocrine disease</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypogonadism</td>
<td>Hyperparathyroidism</td>
</tr>
<tr>
<td>Hyperthyroidism</td>
<td>Cushing’s syndrome</td>
</tr>
<tr>
<td>Inflammatory disease</td>
<td>RA</td>
</tr>
<tr>
<td>Inflammatory bowel disease</td>
<td></td>
</tr>
<tr>
<td>Analecting spondylitis</td>
<td></td>
</tr>
<tr>
<td>Drugs</td>
<td></td>
</tr>
<tr>
<td>Corticosteroids</td>
<td>Thiazoldinediones</td>
</tr>
<tr>
<td>Gonadotrophin releasing hormone (GNRH) agonists</td>
<td>Sedatives</td>
</tr>
<tr>
<td>Aromatase inhibitors</td>
<td>Anticonvulsants</td>
</tr>
<tr>
<td>Thyroxine over-replacement</td>
<td>Alcohol intake &gt; 3 U/day</td>
</tr>
<tr>
<td>Gastrointestinal disease</td>
<td>Heparin</td>
</tr>
<tr>
<td>Malabsorption</td>
<td>Chronic liver disease</td>
</tr>
<tr>
<td>Lung disease</td>
<td></td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease</td>
<td>Cystic fibrosis</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td></td>
</tr>
<tr>
<td>Myeloma</td>
<td></td>
</tr>
<tr>
<td>Homocystinuria</td>
<td></td>
</tr>
<tr>
<td>Anorexia nervosa*</td>
<td></td>
</tr>
<tr>
<td>Highly trained athletes*</td>
<td></td>
</tr>
<tr>
<td>HIV infection</td>
<td></td>
</tr>
<tr>
<td>Gaucher’s disease</td>
<td>Systemic mastocytosis</td>
</tr>
<tr>
<td></td>
<td>Immobilisation</td>
</tr>
<tr>
<td></td>
<td>Body mass index &lt; 18</td>
</tr>
<tr>
<td></td>
<td>Heavy smokers</td>
</tr>
<tr>
<td></td>
<td>Autoantibodies to osteoprotegerin (OPG)</td>
</tr>
</tbody>
</table>

*Hypogonadism also plays a role in osteoporosis associated with these conditions.

25.83 Primary tumours of the musculoskeletal system

<table>
<thead>
<tr>
<th>Cell type</th>
<th>Benign</th>
<th>Malignant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Osteoblast</td>
<td>Osteoid osteoma</td>
<td>Osteosarcoma</td>
</tr>
<tr>
<td>Chondrocyte</td>
<td>Chondroma</td>
<td>Chondrosarcoma</td>
</tr>
<tr>
<td>Fibroblast</td>
<td>Fibroma</td>
<td>Fibrosarcoma</td>
</tr>
<tr>
<td>Bone marrow cell</td>
<td>Eosinophilic granuloma</td>
<td>Ewing’s sarcoma</td>
</tr>
<tr>
<td>Endothelial cell</td>
<td>Haemangioma</td>
<td>Angiosarcoma</td>
</tr>
<tr>
<td>Osteoclast precursor</td>
<td>Giant cell tumour</td>
<td>Malignant giant cell tumour</td>
</tr>
</tbody>
</table>

25.85 Rheumatological manifestations of malignancy

- Polyarthritis
- Dermatomyositis and polymyositis
- Hypophysatae mic osteomalacia
- Hypertrophic osteoarthropathy
- Vasculitis, connective tissue disease
- Raynaud’s syndrome
- Polymyalgia rheumatlia-like syndrome