Musculoskeletal System

General Principles

To know about :

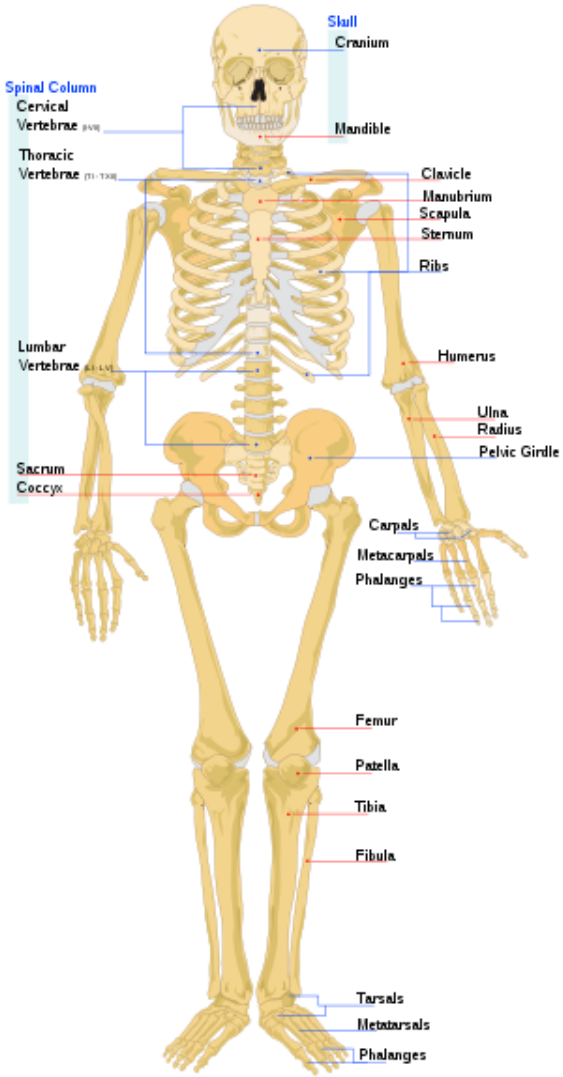
- **Gross anatomy**
- **Common presenting symptoms**
- **Extra-articular symptoms**
- **Completing the History "Past Medical, Surgical, Drug, Family, Social , environmental and occupational histories".**
- **Physical examination.**

- LOOK, FEEL, MOVE, SPECIAL TESTS.
- Observe the general appearance.
- Do NOT cause additional pain.
- Compare both sides.
- Active before passive movements.
- Use the standard terminology.

The Human Skeleton

How many bones?

206 Bones: **126 Appendicular**
80 Axial



Gross Anatomy

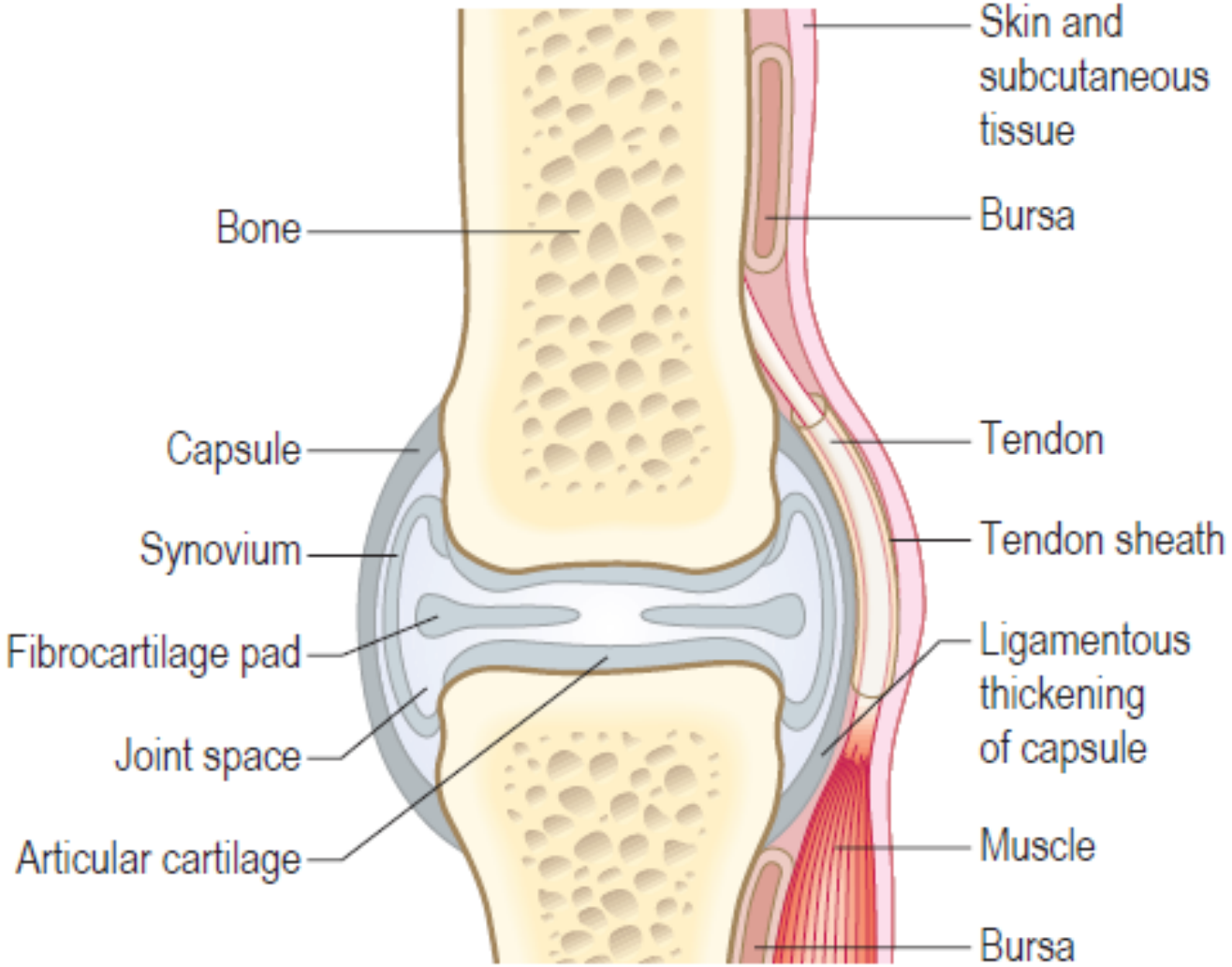


Fig. 13.1 Structure of a joint and surrounding tissues.

History Taking

Common presenting symptoms

- Pain
- Stiffness
- Swelling
- Erythema and warmth
- Locking and triggering
- Extra-articular symptoms

Pain

- Site
- Onset
- Character
- Radiation
- Associated symptoms
- Timing
- Exacerbating and relieving factors
- Severity

Site

- The involved Component :

  Joint , Muscles ,Bone, Tendons and Ligaments

- Local or multiple involvement

Pain may be localised and suggest the diagnosis, such as a red, hot, tender first metatarsophalangeal joint in gout or swelling of several joints suggesting an inflammatory arthritis.

13.1 Common causes of arthralgia (joint pain)

Infective

- Viral, e.g. rubella, parvovirus B19, mumps, hepatitis B, chikungunya
- Bacterial, e.g. staphylococci, *Mycobacterium tuberculosis*, *Borrelia*
- Fungal

Postinfective

- Rheumatic fever
- Reactive arthritis

Inflammatory

- Rheumatoid arthritis
- Systemic lupus erythematosus
- Ankylosing spondylitis
- Systemic sclerosis

Degenerative

- Osteoarthritis

Tumour

- Primary, e.g. osteosarcoma, chondrosarcoma
- Metastatic, e.g. from lung, breast, prostate
- Systemic tumour effects, e.g. hypertrophic pulmonary osteoarthropathy

Crystal formation

- Gout, pseudogout

Trauma

- e.g. Road traffic accidents

Others

- Chronic pain disorders, e.g. fibromyalgia (usually diffuse pain)
- Benign joint hypermobility syndrome

13.2 Causes of muscle pain (myalgia)

Infective

- Viral: Coxsackie, cytomegalovirus, echovirus, dengue
- Bacterial: *Streptococcus pneumoniae*, *Mycoplasma*
- Parasitic: schistosomiasis, toxoplasmosis

Traumatic

- Tears
- Haematoma
- Rhabdomyolysis

Inflammatory

- Polymyalgia rheumatic
- Myositis
- Dermatomyositis

Drugs

- Alcohol withdrawal
- Statins
- Triptans

Metabolic

- Hypothyroidism
- Hyperthyroidism
- Addison's disease
- Vitamin D deficiency

Neuropathic

Onset

- Immediate : traumatic type
- Quickly and overnight : crystal type
- Within 24 hours : Inflammatory type
- More than 24 hours : septic type

Character :

- Localized pain : tumor ,osteomyelitis , osteonecrosis
- Diffuse pain: eg: osteomalacia

- Bone pain: penetrating, deep and boring mainly at night
- Muscle pain: stiffness and aching mainly with movement
- Nerve pain : shooting caused by peripheral nerve or nerve root impingement
- Fracture pain: sharp and stabbing , ⇧ by movement and relieved by rest
- Progressive pain: eg: degenerative type Osteoarthritis
- Constant with diurnal variation : eg: Fibromyalgia (chronic pain syndrome)

Radiation :

Pain from nerve compression radiates to the distribution of that nerve or nerve root such as :

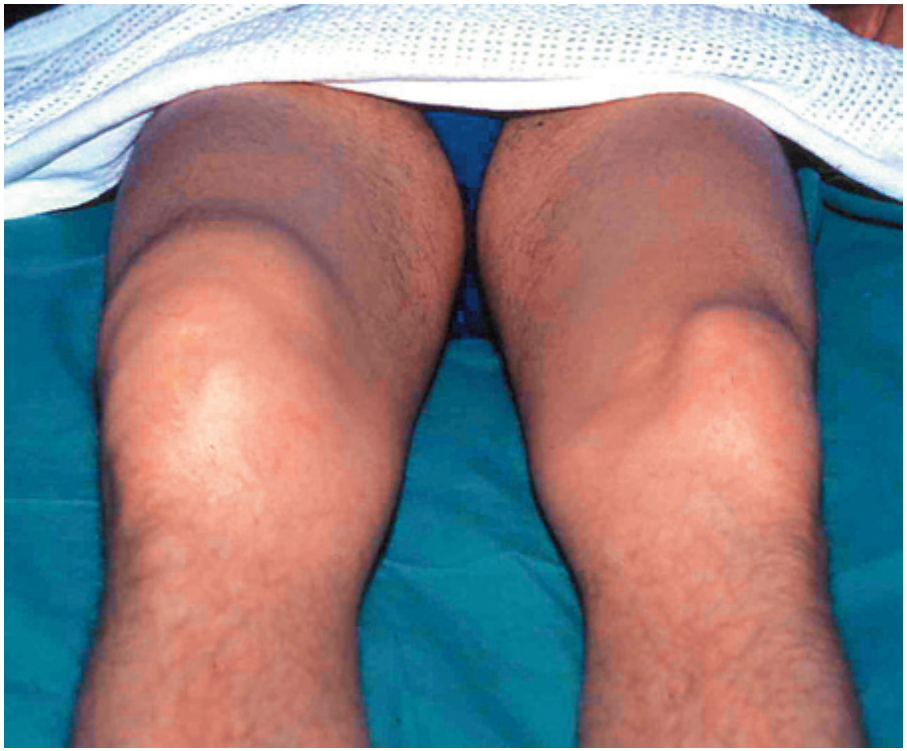
- **Lower leg pain** in inter-vertebral disc prolapse.
- **Hand pain** in carpal tunnel syndrome.
- **Neck pain** radiates to the shoulder or scalp.
- **Hip pain** is usually felt in the groin but may radiate to the thigh or knee.

Radiation

13.3 Common patterns of referred and radicular musculoskeletal pain	
Site where pain is perceived	**Site of pathology**
Occiput	C1, 2
Interscapular region	C3, 4
Tip of shoulder, upper outer aspect of arm	C5
Interscapular region or radial fingers and thumb	C6, 7
Ulnar side of forearm, ring and little fingers	C8
Medial aspect of upper arm	T1
Chest	Thoracic spine
Buttocks, knees, legs	Lumbar spine
Lateral aspect of upper arm	Shoulder
Forearm	Elbow
Anterior thigh, knee	Hip
Thigh, hip	Knee

Associated Symptoms:

- Swelling
- Redness



Timing : Frequency ,duration and periodicity of symptoms

- Intermittent with resolution between episodes
  ➡ palindromic rheumatism.

- Flitting pain over a period of days ➡ rheumatic fever and gonoccocal arthritis

- Several weeks of early-morning stiffness ➡ inflammatory arthritis.

- Several years of pain with normal examination ➡ Fibromyalgia.

Exacerbating /Relieving factor :

Worsen at rest ➡ inflammatory arthritis

Worsen with exercise ➡ osteoarthritic derangement

Both ➡ Septic joint

Severity :

- Severe pain ➡ Trauma , Crystal and septic arthritis
- Disproportionate pain to examination :
  - Acute : Compartment syndrome
  - Chronic : complex regional pain syndrome

- Pain free but severe deformity:
  (neurological involvement)
  eg: DM, Syphillis
  Charcot join (severe form)

Neurological involvement in diabetes mellitus, leprosy (Hansen's disease), syringomyelia and syphilis (tabes dorsalis) may impair joint sensation, reducing pain despite obvious pathology on examination. Grossly abnormal joints may even be pain-free (Charcot joints). Partial muscle tears are painful; complete rupture may be less so.

Patterns of joint involvement

Definitions :

Monoarthritis : one Joint

Oligoarthritis : 2-4 Joints

Polyarthritis : > 4 Joints

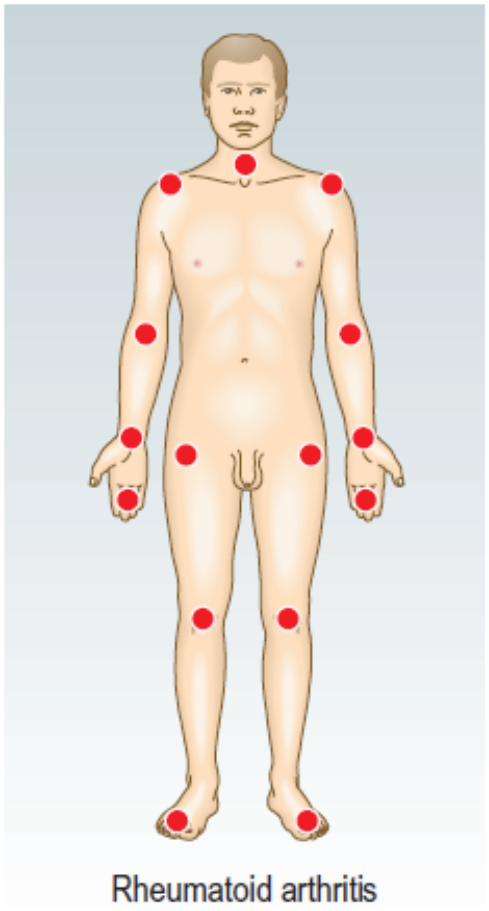
Notes :

Hand and feet small joint ➡ Inflammatory arthritis

Medium or large joint ➡ Degenerative and seronegative arthritis

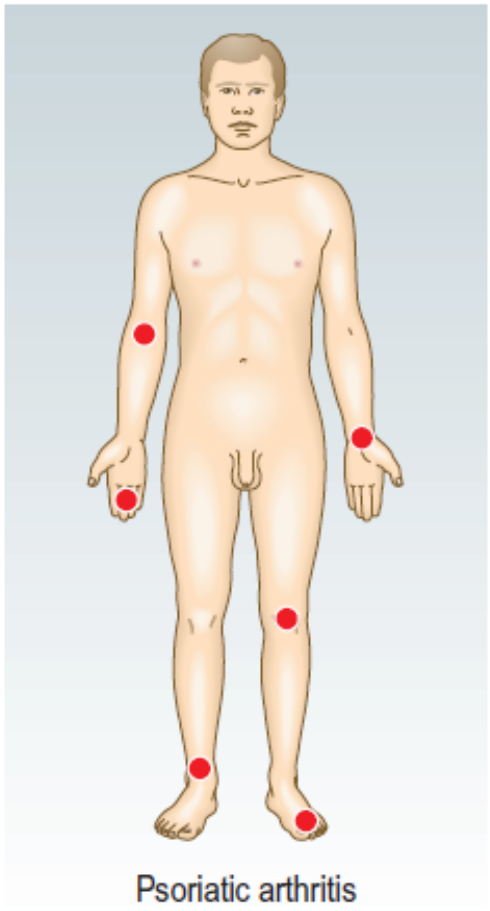
DIP and CMC joint of the thumb ➡ Nodal arthritis

Contrasting patterns of joint involvement in polyarthritis.



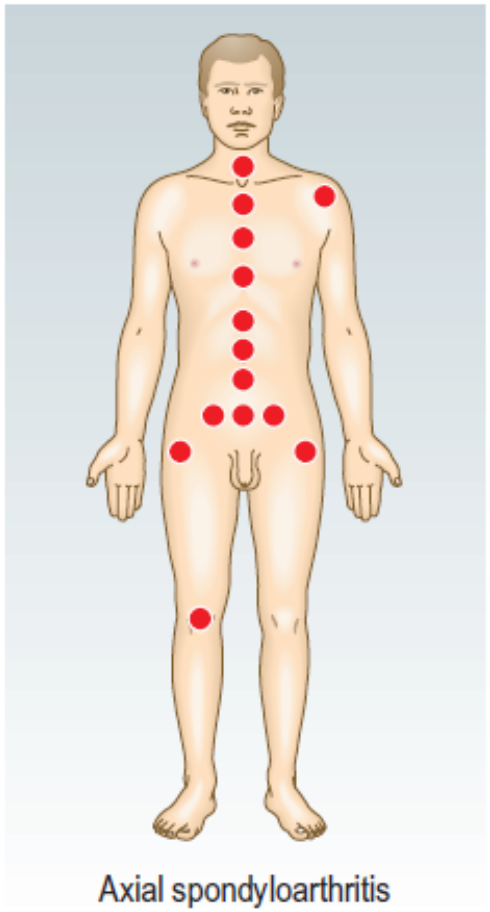
Rheumatoid arthritis

A



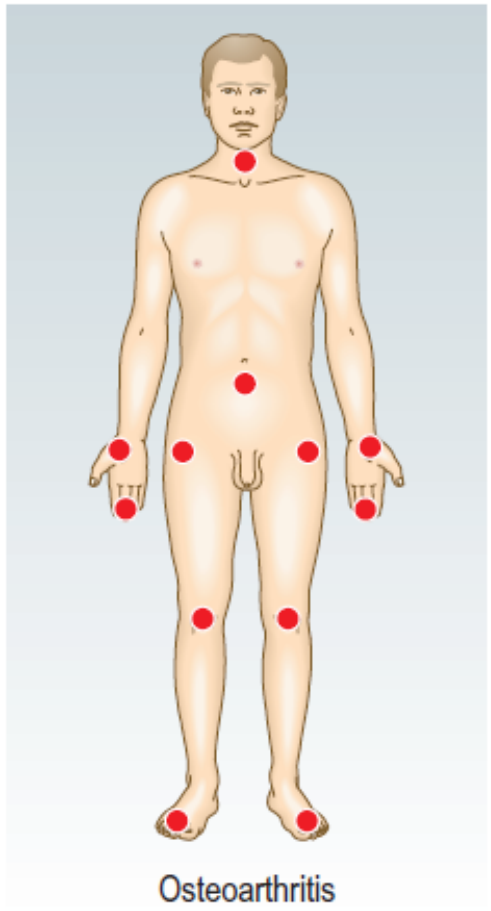
Psoriatic arthritis

B



Axial spondyloarthritis

C



Osteoarthritis

D

Stiffness :

Ask if is it:

- Restricted range of movement?
- Difficulty moving, but with a normal range?
- Painful movement?
- Localized to a particular joint or more generalized?

Inflammatory type: early morning stiffness for 30 minutes which wears off with activity

Mechanical type : stiffness after rest

Polymyalgia rheumatica : mainly shoulder and pelvic stiffness.

Swelling :

This occurs when vascular structures such as bone or ligament are injured, and is worse in the presence of anticoagulants or bleeding

Rapid over 30min ➡ haemarthrosis

Over few hours (marked swelling) ➡ Septic joint

marked swelling, tenderness, redness and extreme reluctance to move the joint actively or passively.

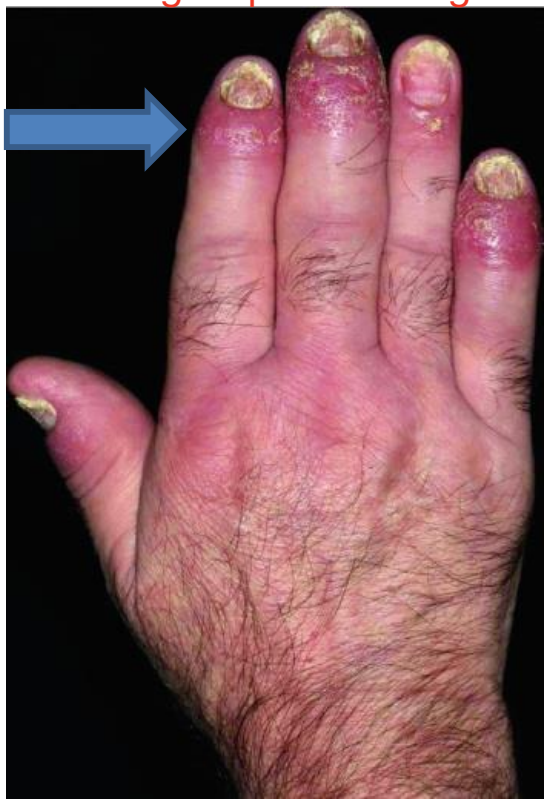
Over hours to days ➡ traumatic effusion (meniscus and cartilaginous)

N.B : - Corticosteroids and NSAID modify these features

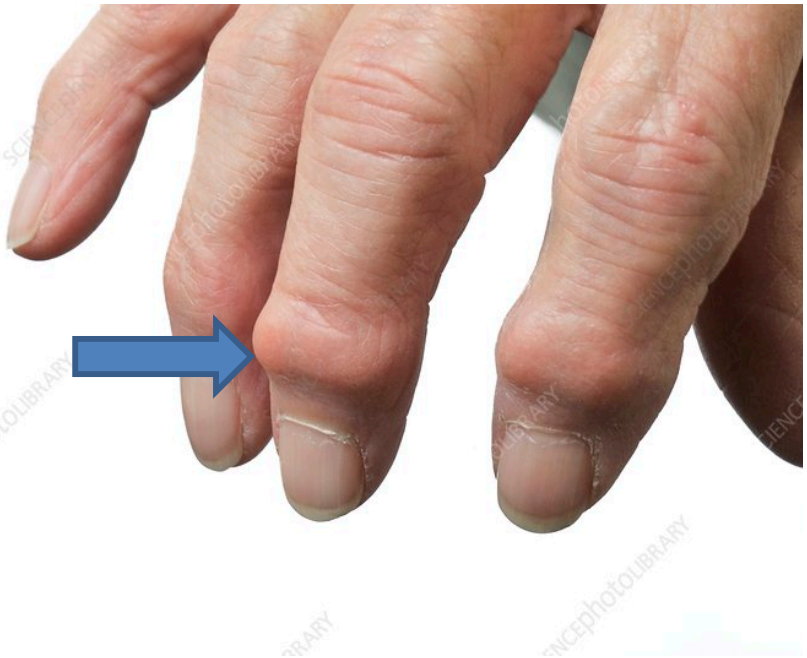
- Crystal- induced arthritis starts overnight and on early morning

Erythema and warmth : almost in all types of arthritis

Erythema (redness) occurs in infective, traumatic and crystal-induced conditions, and mild erythema may be present in inflammatory arthritis. All affected joints will be warm. Erythema associated with DIP joint swelling helps to distinguish DIP joint psoriatic arthritis from the Heberden's nodes of osteoarthritis.



Psoritic arthritis



Heberden's nodes of Osteoarthritis

Weakness:

Joint disorder ➡ Pain or structure disruption

Nerve disorder ➡ entrapment eg : CTS

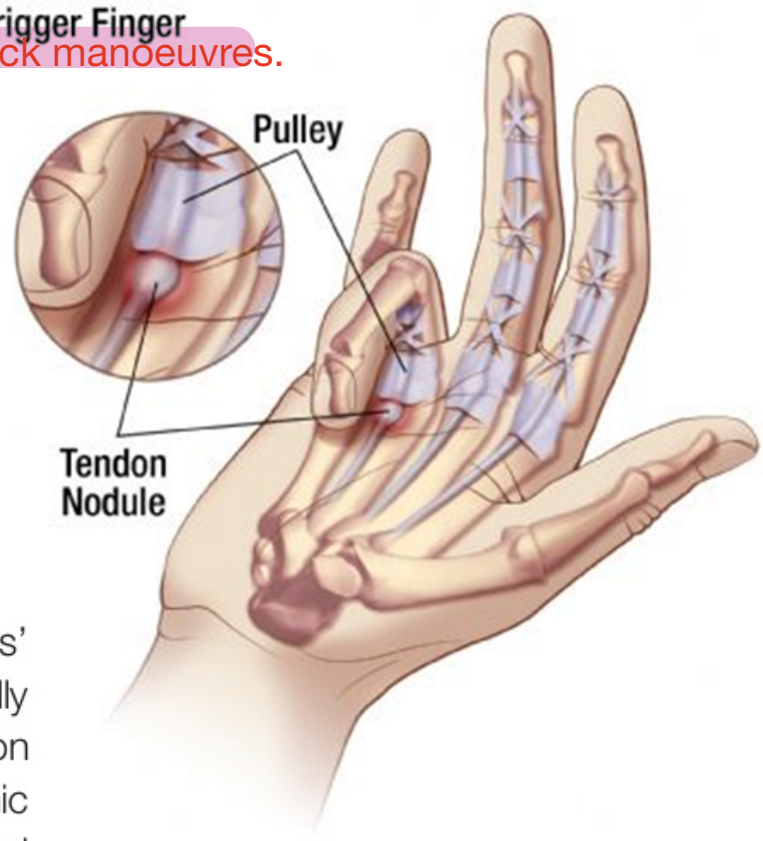
Muscle disorder ➡ widespread with pain and fatigue such as in myositis, and with a rash, as in dermatomyositis.

N.B : **proximal muscle weakness can be caused by endocrine disorders** hypothyroidism or excess of glucocorticoids.

Locking and triggering :

such as a loose body or torn meniscus, within the joint.
The patient is characteristically able to 'unlock' the joint by trick manoeuvres.

- True locking (incomplete range of motion) : mechanical causes
- Pseudo-locking: due to pain
- Triggering (block to extension of finger which gives suddenly forced extension)



Triggering is a block to extension of a finger, which then 'gives' suddenly when extending from a flexed position. In adults it usually affects the ring or middle fingers and results from nodular tendon thickening or fibrous thickening of the flexor sheath due to chronic low-grade trauma, which may be occupational or associated with inflammatory arthritis. Triggering can be congenital, in which case it usually affects the thumb.

Extra-articular symptoms

Patients may present with extra-articular features of disease (Box 13.5) that they may not connect with musculoskeletal problems.

Ask about:

- Rashes: occur with psoriasis, vasculitis and erythema nodosum. Ask whether they are photosensitive (SLE, Box 13.6).
- Weight loss, low-grade fever and malaise: associated with rheumatoid arthritis and SLE. High-spiking fevers in the evening, accompanied by a rash, occur in adult-onset Still's disease.
- Headache, jaw pain on chewing (claudication) and scalp tenderness: features of temporal arteritis.

Connective tissue disease may present with multiple extra-articular features:

- Raynaud's phenomenon.
- Sicca symptoms (dryness of mouth and eyes).

- Rashes.
- Gastrointestinal problems, including dysphagia and mouth ulcers.
- Respiratory problems, including dyspnoea from interstitial lung disease, or pleural pain or effusions associated with rheumatoid arthritis or connective tissue disease.
- Back pain and stiffness or arthritis associated with abdominal pain, diarrhoea, bloody stool and mouth ulcers: may suggest arthritis associated with inflammatory bowel disease.

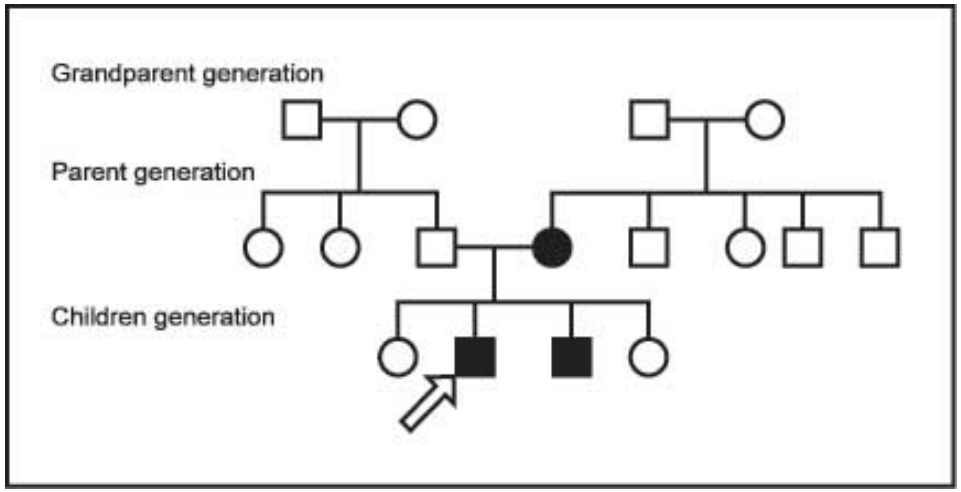
13.5 Extra-articular signs in rheumatic conditions

Condition	Extra-articular signs
Rheumatoid arthritis	Rheumatoid nodules, palmar erythema, episcleritis, dry eyes, interstitial lung disease, pleural ± pericardial effusion, small-vessel vasculitis, Raynaud's phenomenon, low-grade fever, weight loss, lymphadenopathy, splenomegaly, leg ulcers
Psoriatic arthritis	Psoriasis, nail pitting, onycholysis, enthesitis, dactylitis
Reactive arthritis	Urethritis, mouth and/or genital ulcers, conjunctivitis, iritis, enthesitis (inflammation of tendon or ligament attachments), e.g. Achilles enthesitis/plantar fasciitis, rash (keratoderma blenorrhagica)
Axial spondyloarthritis	Inflammatory bowel disease, psoriasis, enthesitis, iritis, aortic regurgitation, apical interstitial fibrosis
Septic arthritis	Fever, malaise, source of sepsis, e.g. skin, throat, gut
Gout	Tophi, signs of renal failure or alcoholic liver disease
Sjögren's syndrome	'Dry eyes' (keratoconjunctivitis sicca), xerostomia (reduced or absent saliva production), salivary gland enlargement, Raynaud's phenomenon, neuropathy
Systemic lupus erythematosus	Photosensitive rash, especially on face, mucocutaneous ulcers, alopecia, fever, pleural ± pericardial effusion, diaphragmatic paralysis, pulmonary fibrosis (rare), Raynaud's phenomenon, lymphopenia
Systemic sclerosis	Skin tightening (scleroderma, see Fig. 3.30C), telangiectasia, Raynaud's phenomenon, calcific deposits in fingers, dilated nail-fold capillaries, pulmonary fibrosis
Adult-onset Still's disease	Rash, fever, hepatomegaly, splenomegaly
Other	Erythema nodosum of shins in sarcoidosis, viral rashes, drug rashes

- Past medical history : previous attacks , DM ….
- Drug history :

13.7 Drugs associated with adverse musculoskeletal effects	
Drug	**Possible adverse musculoskeletal effects**
Glucocorticoids	Osteoporosis, myopathy, osteonecrosis, infection
Statins	Myalgia, myositis, myopathy
Angiotensin-converting enzyme inhibitors	Myalgia, arthralgia, positive antinuclear antibody
Antiepileptics	Osteomalacia, arthralgia
Immunosuppressants	Infections
Quinolones	Tendinopathy, tendon rupture

Family history :



- First degree relative : inflammatory type
- Variable polygenic fashion : osteoarthritis, osteoporosis and gout
- HLA B27: spondyloarthritis
- Single gene defect : Marfan’s syndrome , Ehlers-Danlos syndrome

Social , environmental and occupational history :

- How does the condition affect the patient's activities of daily living, such as washing, dressing and toileting?

- Can they use the stairs and do they need walking aids? Ask about functional independence, especially cooking, shopping and housework.

- Ask about current and previous occupations. Is the patient working full- or part-time, on sick leave or receiving benefits?

- Has the patient had to take time off work because of the condition and is their job at risk?

Ask about :

- Smoking
- High alcohol intake
- Certain ethnic groups (SCD , osteomalacia,TB)
- A sexual history (STD)

SCD : sickle cell disease

STD: sexual transmitted diseases

Physical examination

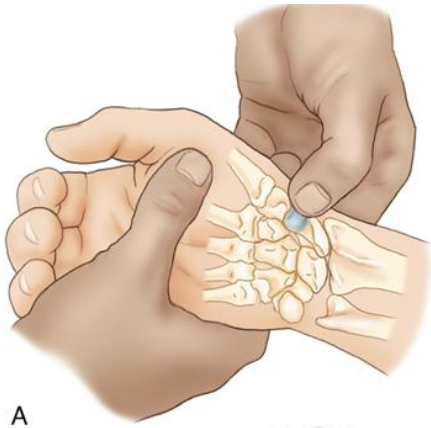
1) Examine the patient's overall appearance for features such :
   - Pallor, rash, skin tightening and hair changes.
   - Special postures
   - Weight loss ,muscle loss , fever and lymphoadenopathy

2) Use Look , Feel and move method

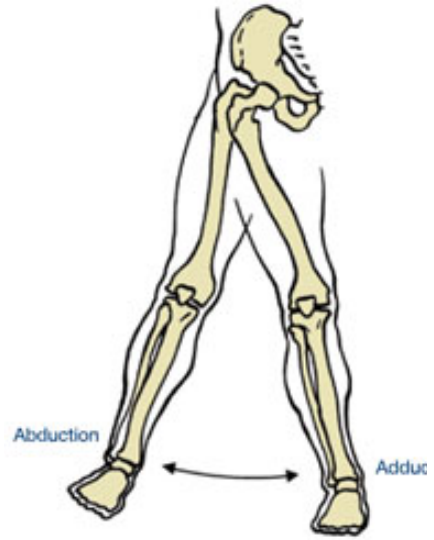
Physical examination

- Look (inspect for any deformity and abnormality)

- Feel (palpate each structure)



- Move (active and passive)



- Look at the skin, subcutaneous tissues and bony outline of each area.

- Before palpating, ask the patient which area is painful or tender. Feel for warmth, swelling, stability and deformity. Assess if deformity is reducible or fixed

- Assess active before passive movement.

- Compare one limb with the opposite side.

- Always expose the joint above and below the affected one


Abduction
Lateral rotation
Adduction
Medial rotation
Abduction
Lateral rotation
Adduction
Medial rotation
Flexion
Extension
Extension
Flexion
Elevation
Depression
Extension
Flexion
Flexion
Extension
Extension
Flexion
Pronation
Supination
C. Machado M.D.
Retrusion
Protrusion
Flexion
Extension
Circumduction
Eversion
Inversion
Dorsiflexion
Plantarflexion

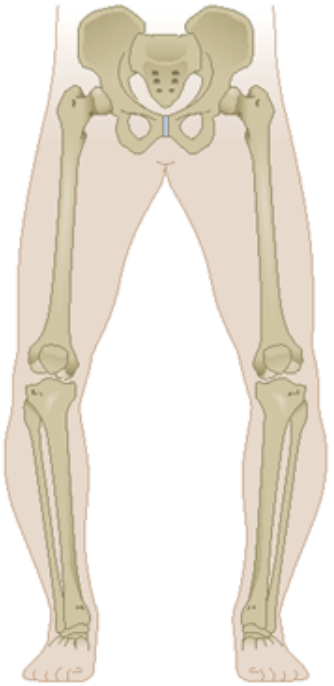
- flexion: bending at a joint from the neutral position
- extension: straightening a joint back to the neutral position
- hyperextension: moving beyond the normal neutral position (indicating a torn ligament or underlying ligamentous laxity, such as benign joint hypermobility syndrome)
- adduction: moving towards the midline of the body (finger adduction is movement towards the axis of the limb)
- abduction: moving away from the midline.

To describe altered limb position due to joint/bone deformity, use:

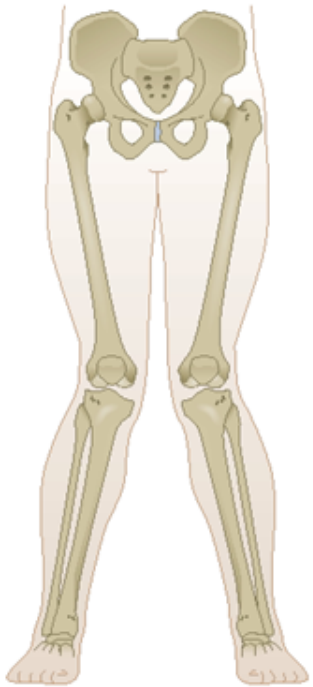
- valgus: the distal part deviates away from the midline
- varus: the distal part deviates towards the midline.

In the wrist and hand, use:

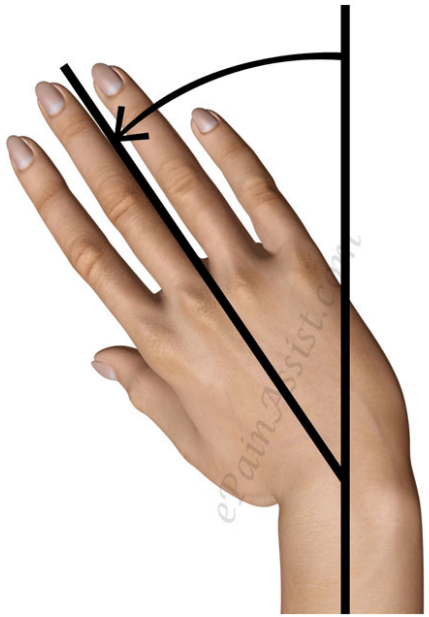
- radial deviation: the distal part deviates towards the radial side
- ulnar deviation: the distal part deviates towards the ulnar side.

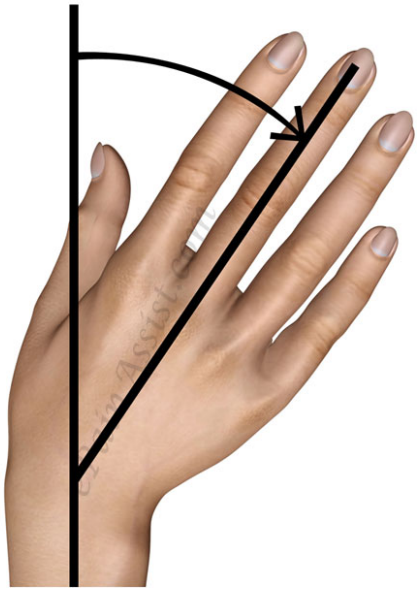


Varus



Knock knees (valgus)





Radial Diviation **Ulnar Diviation**

Skin, nail and soft tissues :

General hints

The skin and related structures are common sites of associated lesions. The skin changes of psoriasis may be hidden, in the umbilicus, natal cleft or scalp (p. 286), for example. The rash of SLE is found across the cheeks and bridge of nose. Nail pitting and onycholysis occur in psoriasis (p. 24).

Small, dark-red spots due to capillary infarcts occur in rheumatoid arthritis, SLE and systemic vasculitis. Common sites are the nail folds (Fig. 13.5, often seen in rheumatoid arthritis), and the lower legs in systemic vasculitis (p. 288).

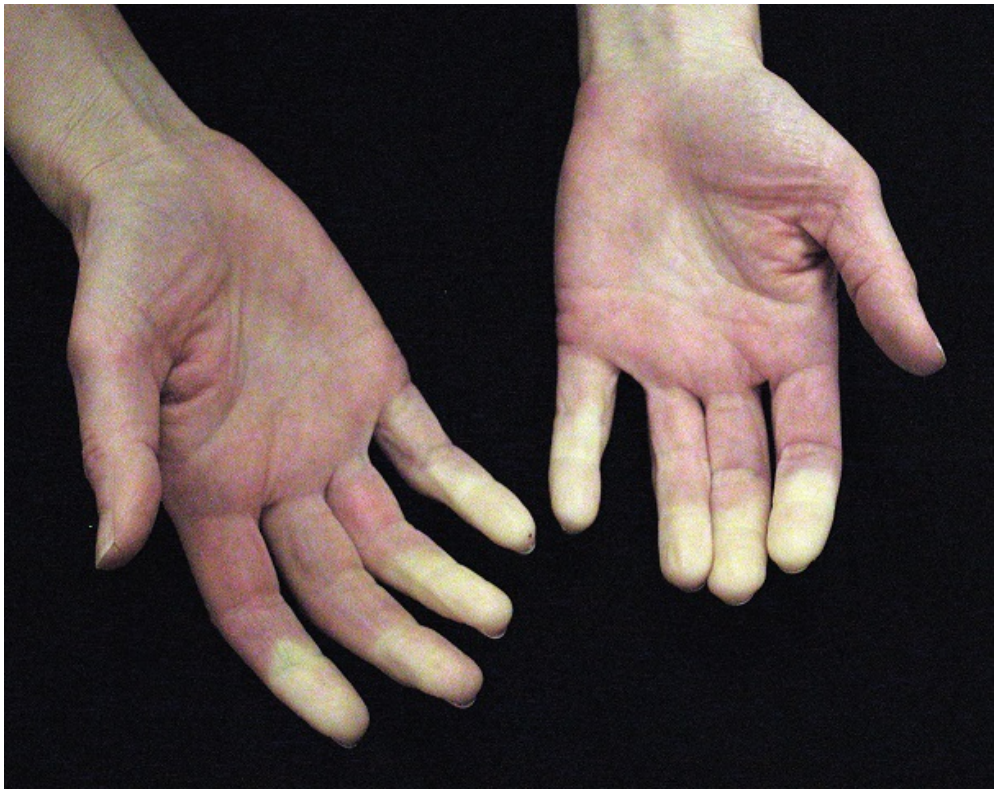
Psoriasis :

- Systemic sclerosis:

In systemic sclerosis, the thickened, tight skin produces a characteristic facial appearance (see Fig. 3.30C). In the hands, flexion contractures, calcium deposits in the finger pulps (Fig. 13.6) and tissue ischaemia leading to ulceration may occur. The telangiectasias of systemic sclerosis are purplish, blanch with pressure and are most common on the hands and face. In the fingers, the pallor of Raynaud's phenomenon, pulp atrophy or ulceration may be evident.

Systemic lupus erythematosus:

Reynaud's phenomenon :



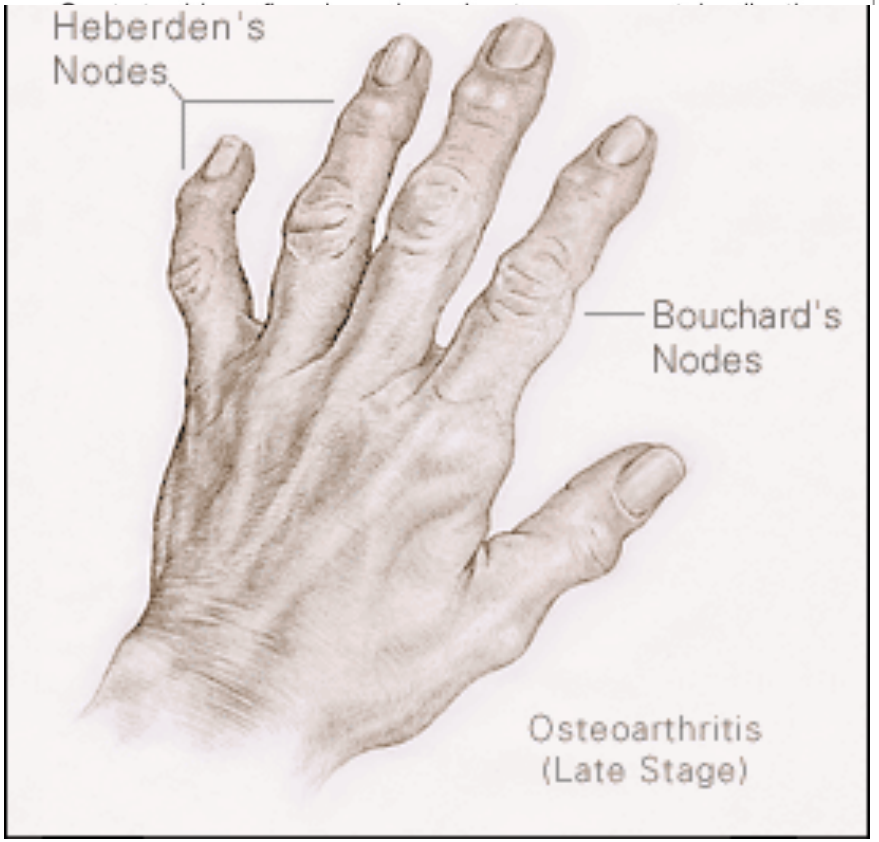
Reactive arthritis :

Reactive arthritis is associated with conjunctivitis, urethritis, circinate balanitis (painless superficial ulcers on the prepuce and glans) and superficial mouth ulcers.

Nodules

Osteoarthritis

Bony nodules in osteoarthritis affect the lateral aspects of the DIP joints (Heberden's nodes) or the proximal interphalangeal (PIP) joints (Bouchard's nodes, Fig. 13.8). They are smaller and harder than rheumatoid nodules.

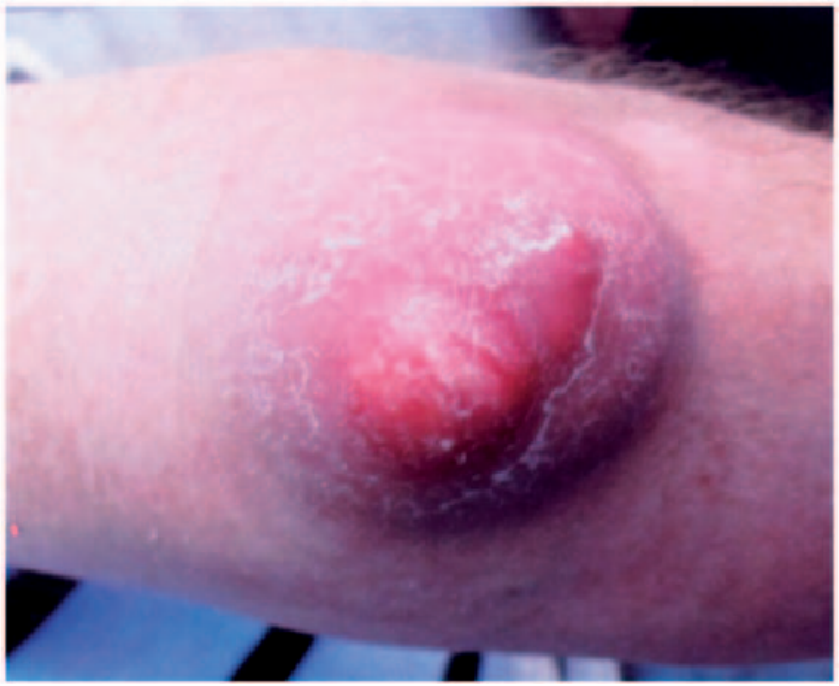


Rheumatoid arthritis

The firm, non-tender, subcutaneous nodules of rheumatoid arthritis most commonly occur on the extensor surface of the forearm (Fig. 13.7), sites of pressure or friction such as the sacrum or Achilles tendon, or in the lungs. Multiple small nodules can occur in the hands. Rheumatoid nodules are strongly associated with a positive anti-cyclic citrullinated peptide (anti-CCP) antibody or rheumatoid factor.

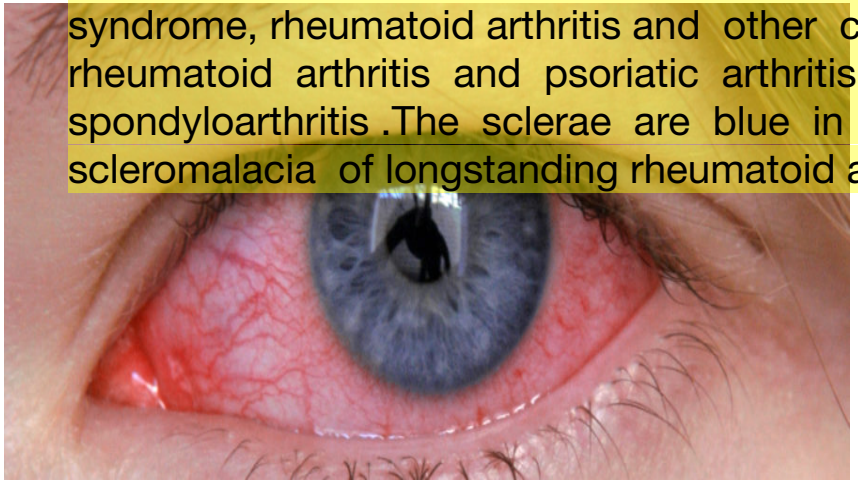
- Gout Tophi (Monosodium urate monohydate)

Gouty tophi are firm, irregular subcutaneous crystal collections (monosodium urate monohydrate). Common sites are the olecranon bursa, helix of the ear and extensor aspects of the fingers hands, knees and toes. If superficial, they may appear white, and may ulcerate, discharge crystals and become secondarily infected.

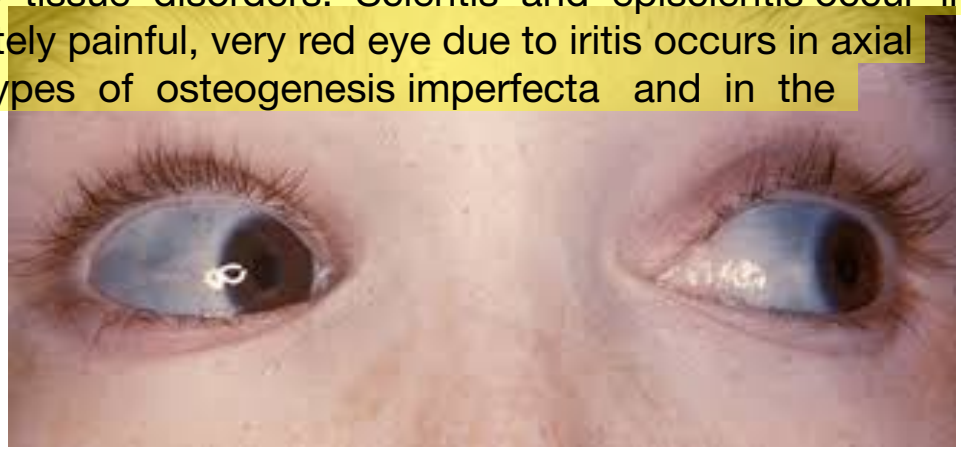


- Eye presentations:

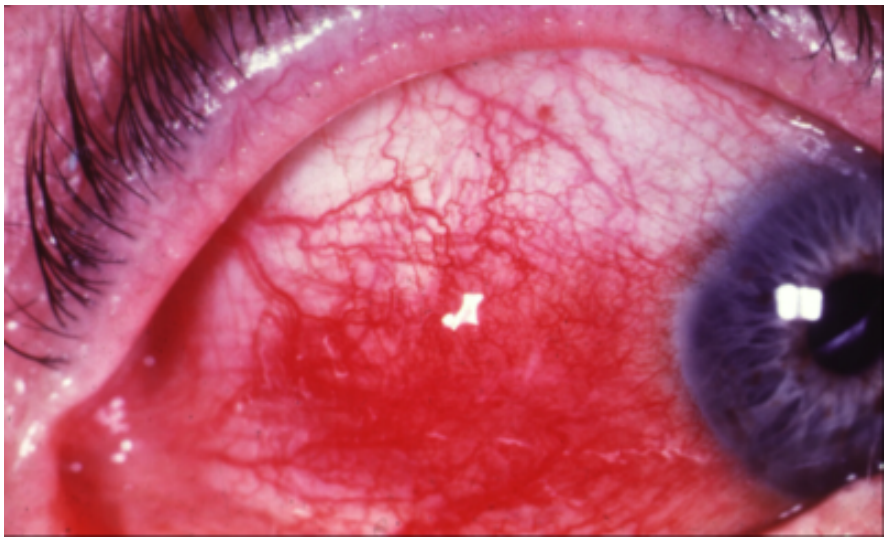
Redness of the eyes may be due to conjunctivitis in reactive arthritis or ‘dry eyes’ in Sjögren’s syndrome, rheumatoid arthritis and other connective tissue disorders. Scleritis and episcleritis occur in rheumatoid arthritis and psoriatic arthritis. An acutely painful, very red eye due to iritis occurs in axial spondyloarthritis .The sclerae are blue in certain types of osteogenesis imperfecta and in the scleromalacia of longstanding rheumatoid arthritis.



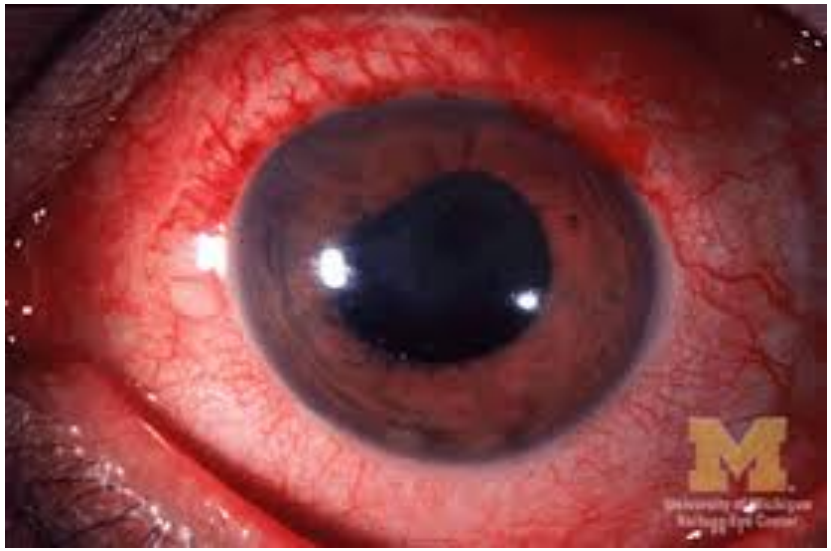
Reactive arthritis



Osteogenesis imperfecta



Rheumatoid and psoriatic arthritis



axial spondyloarthritis

Spine

The spine is divided into the cervical, thoracic, lumbar and sacral segments. Most spinal diseases affect multiple segments, causing altered posture or function of the whole spine. Spinal disease may occur without local symptoms, presenting with referred pain, neurological symptoms or signs in the trunk or limbs.

13.9 Common spinal problems

- Mechanical back pain
- Prolapsed intervertebral disc
- Spinal stenosis
- Ankylosing spondylitis
- Compensatory scoliosis from leg-length discrepancy
- Cervical myelopathy
- Pathological pain/deformity, e.g. osteomyelitis, tumour, myeloma
- Osteoporotic vertebral fracture resulting in kyphosis (or rarely lordosis), especially in the thoracic spine with loss of height
- Cervical rib
- Scoliosis
- Spinal instability, e.g. spondylolisthesis

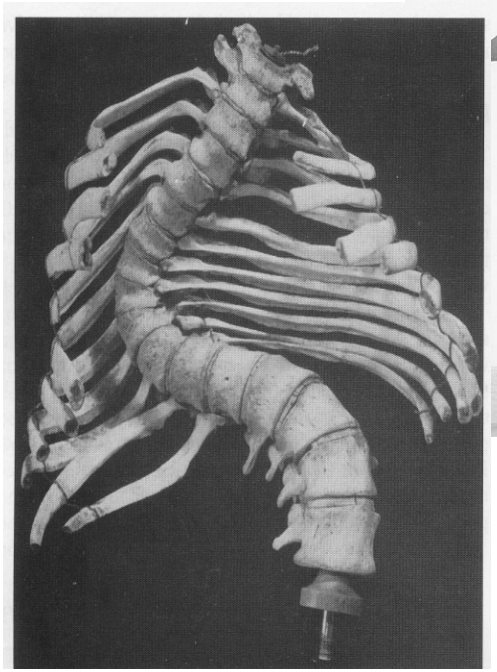
Nomenclature

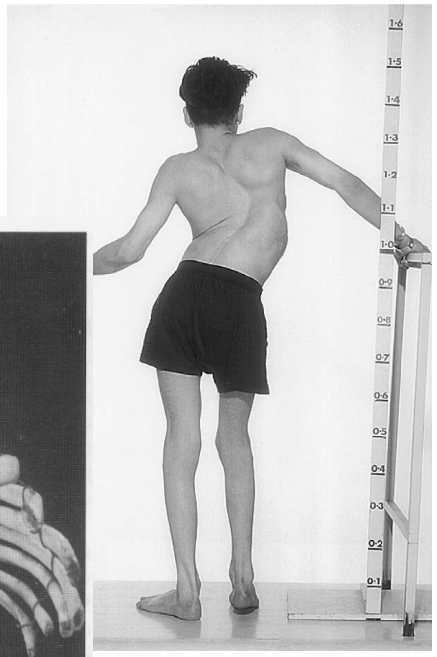
Scoliosis

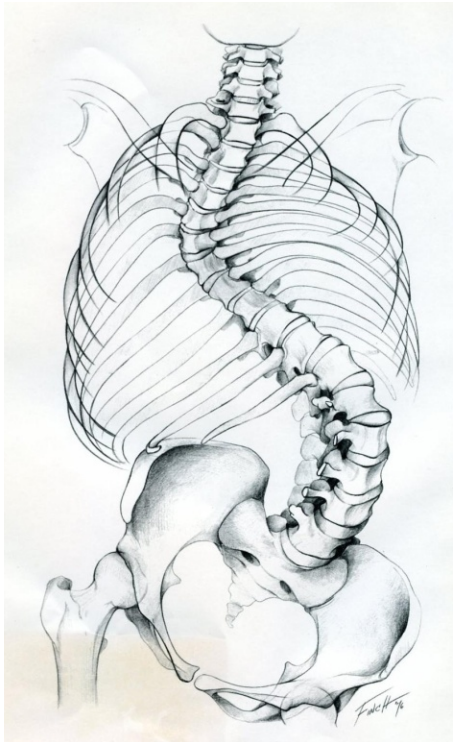
Kyphosis

Lordosis

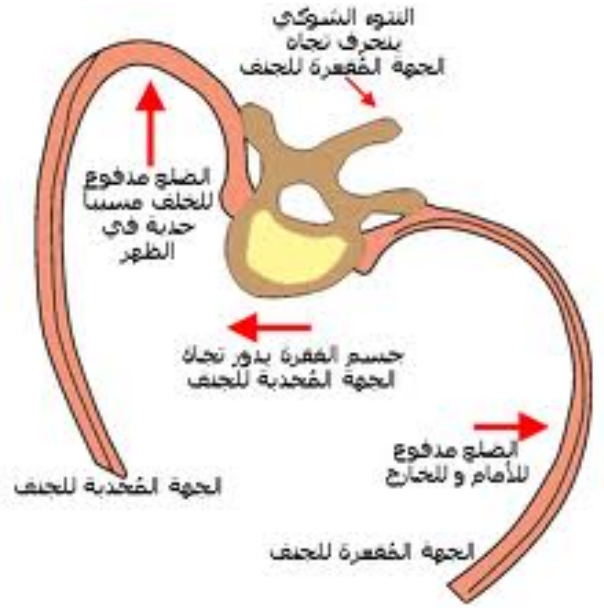
Gibbus







Scoliosis is lateral curvature of the spine



Nomenclature

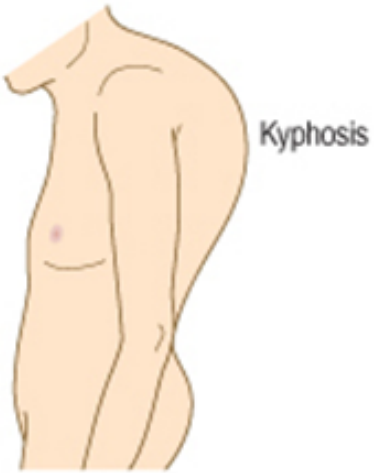
Scoliosis

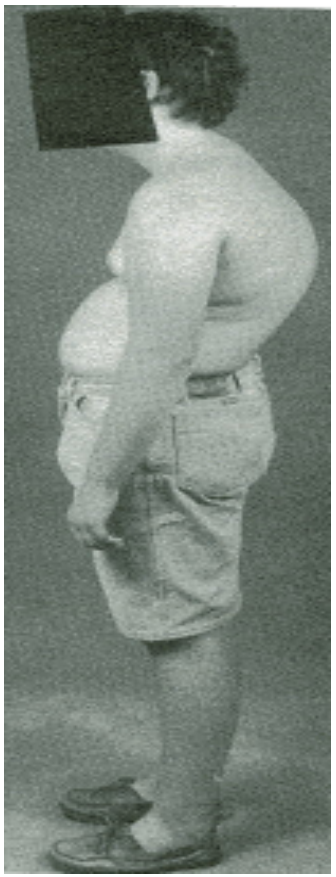
Kyphosis

Lordosis

Gibbus

Kyphosis is curvature of the spine in the sagittal (anterior–posterior) plane, with the apex posterior. The thoracic spine normally has a mild kyphosis.





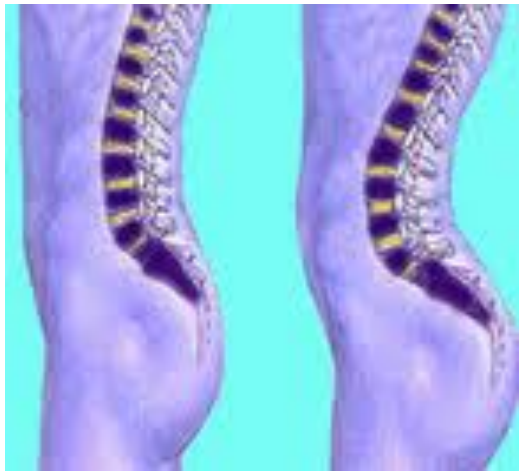
Nomenclature

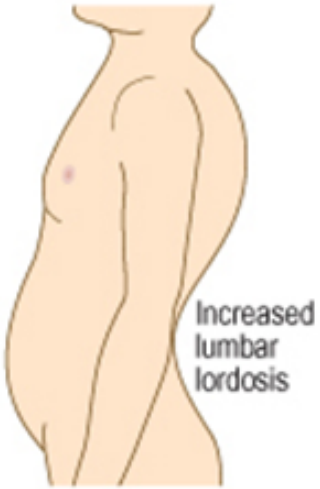
Scoliosis

Kyphosis

Lordosis

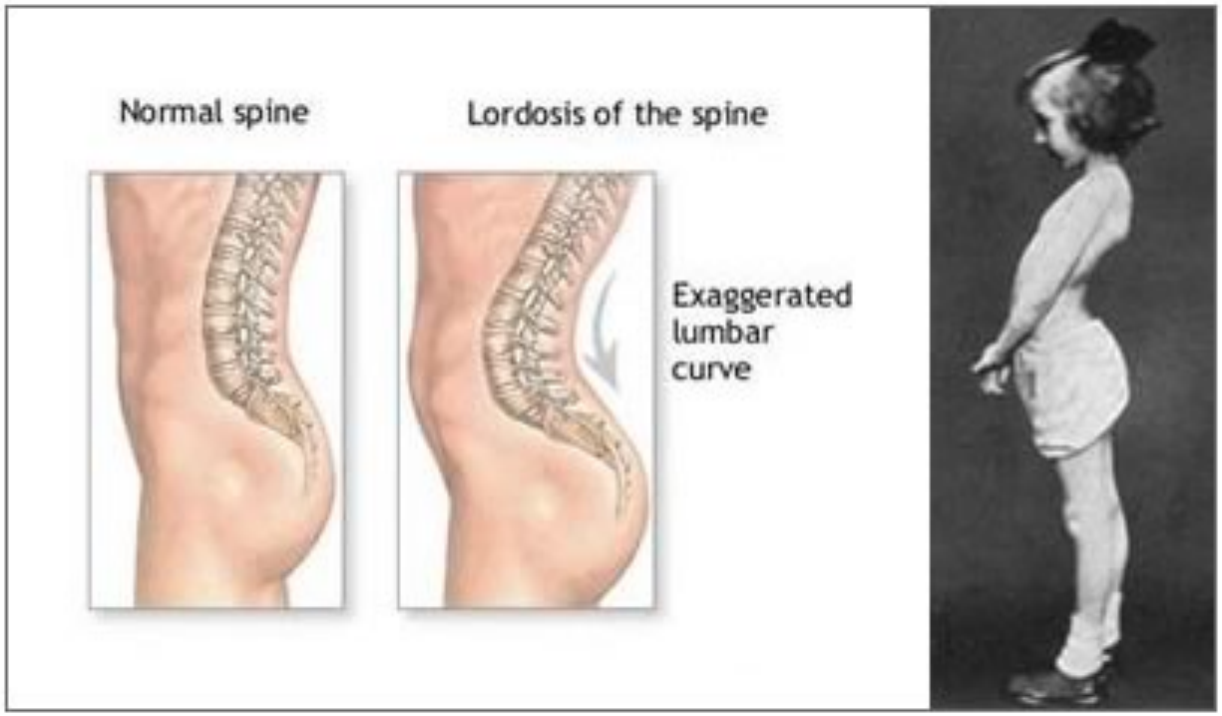
Gibbus





Lordosis is curvature of the spine in the sagittal plane, with the apex anterior

The normal lordosis may be lost in disorders such as ankylosing spondylitis and lumbar disc protrusion.



Nomenclature

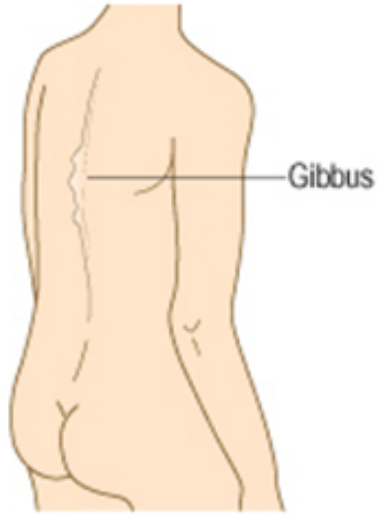
Scoliosis

Kyphosis

Lordosis

Gibbus

Gibbus is a spinal deformity caused by an anterior wedge deformity of a single vertebra, producing localised angular flexion



Cervical Spine

Nodding… Atlanto-occipital joints.
Rotation… Atlantoaxial joint.
Flexion, extension and lateral flexion… Midcervical level.

The neural canal contains the spinal cord and the emerging nerve roots, which pass through exit foramina bounded by the facet joints posteriorly and the intervertebral discs and neurocentral joints anteriorly. The nerve roots, particularly in the lower cervical spine, may be compressed or irritated by lateral disc protrusion or by osteophytes arising from the facet or neurocentral joints. Central disc protrusions may press directly on the cord

History

Pain
Cervical disc lesions (radiculopathy)
Cervical myelopathy
RA… Atlantoaxial instability

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 arm or the other, roughly following the dermatomes of the affected nerve roots (see Box 13.3). If the spinal cord is compromised (cervical myelopathy), upper motor neurone leg weakness, altered sensation and sphincter disturbance may occur.

Causes of abnormal neck posture

Loss of lordosis or flexion deformity
Acute lesions, rheumatoid arthritis, trauma

Increased lordosis
Ankylosing spondylitis

Torticollis (wry neck)
Sternocleidomastoid contracture, trauma
Pharyngeal/parapharyngeal infection

Lateral flexion
Erosion of lateral mass of atlas in rheumatoid arthritis

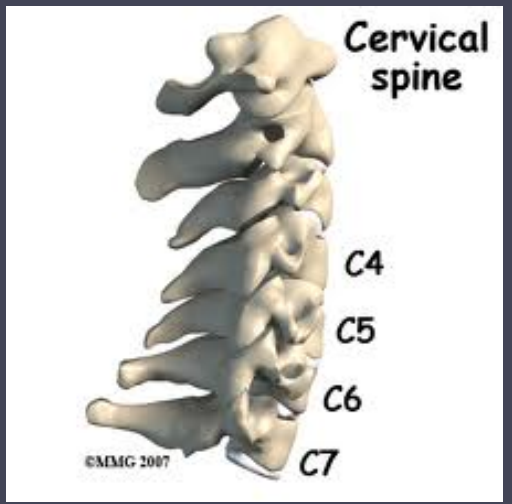
Examination Sequence

Look: Posture
Lordosis
Scars
Swellings
Deformity


Fig 2. Caso 3, durante uma de suas crises de inclinação cefálica lateral, que costumavam apresentar duração de 8 horas.

Feel:

- Spinous processes (T1 most prominent).
- Paraspinal muscles.
- Supraclavicular fossae (cervical rib, LN).
- Anterior neck and thyroid.
- tenderness



Examination Sequence

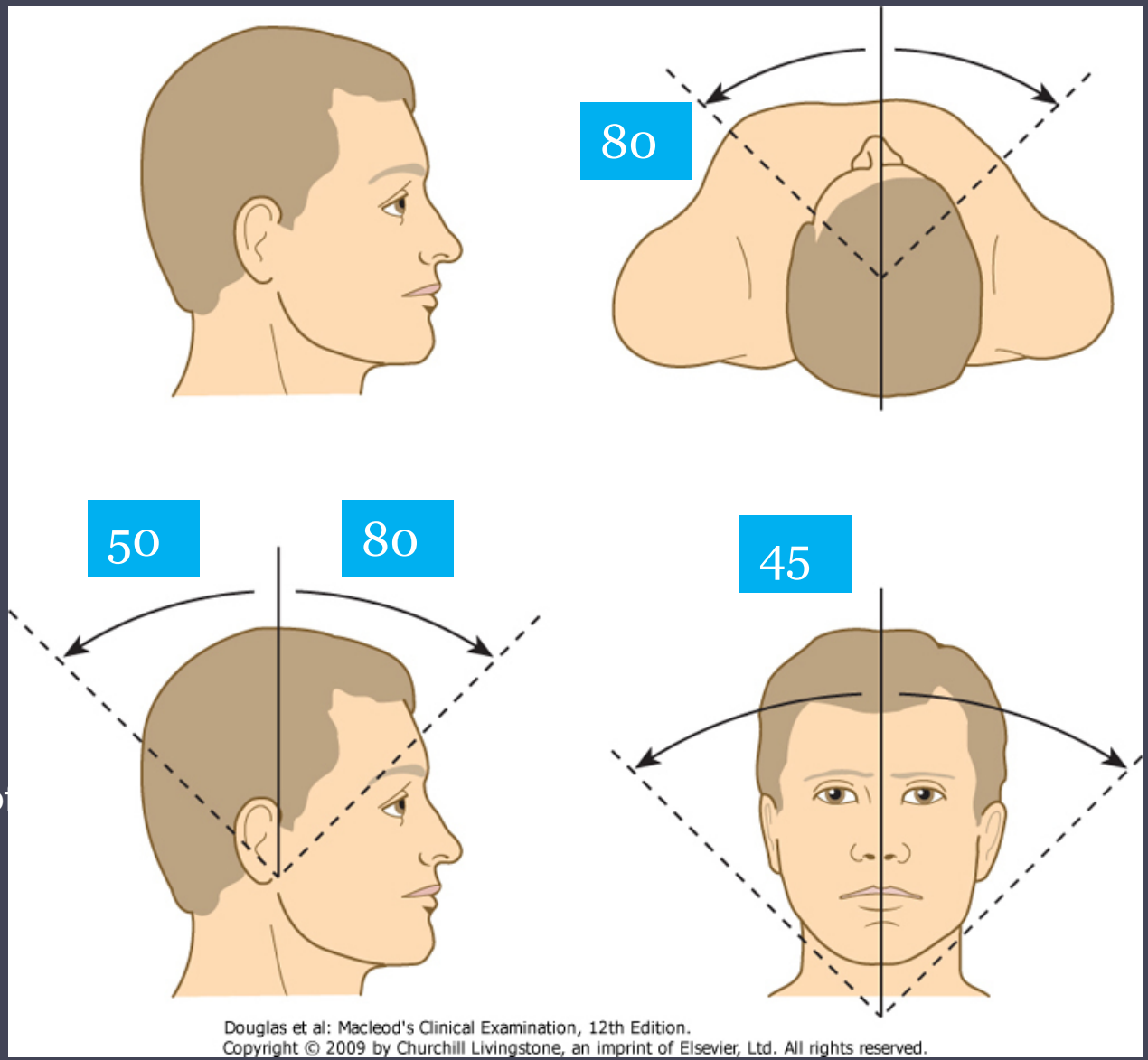
Move:

Active

Passive

UL & LL
(Neurological assessement if pathology is present)

If active movements are reduced, gently perform passive movements. Establish if the end of the range has a sudden or a gradual resistance and whether it is pain or stiffness that restricts movement. Pain or paraesthesiae in the arm on passive neck movement suggests nerve root involvement.



Thoracic Spine

- The least mobile segment of the spine
- Movement: mainly rotational

History:

Presenting symptoms in the thoracic spine are localised spinal pain (Box 13.11), pain radiating round the chest wall or, less frequently, signs of cord compression: upper motor neurone leg weakness (paraparesis), sensory loss, and loss of bladder or bowel control. Disc lesions are rare but may cause pain radiating around the chest that mimics cardiac or pleural disease. Osteoporotic vertebral fractures may present with acute pain, or painless loss of height with increased kyphosis.

Vertebral collapse due to malignancy may cause cord compression. Infection causes acute pain, often with systemic upset or fever. With poorly localised thoracic pain, consider intrathoracic causes, such as myocardial ischaemia or infarction, oesophageal or pleural pain, and aortic aneurysm.

Causes of thoracic spine pain

Adolescents and young adults

- Scheuermann's disease
- Ankylosing spondylitis
- Disc protrusion (rare)

Middle-aged and elderly

- Degenerative change
- Osteoporotic fracture

Any age

- Tumour
- Infection

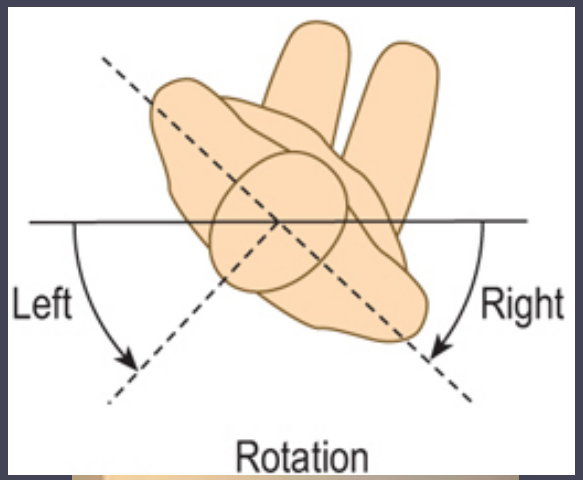
Examination Sequence

Look: Posture, Scars, Hair patch, Deformity, wasting

Feel:

- Spinous processes (T1-T12).
- Paraspinal soft tissue

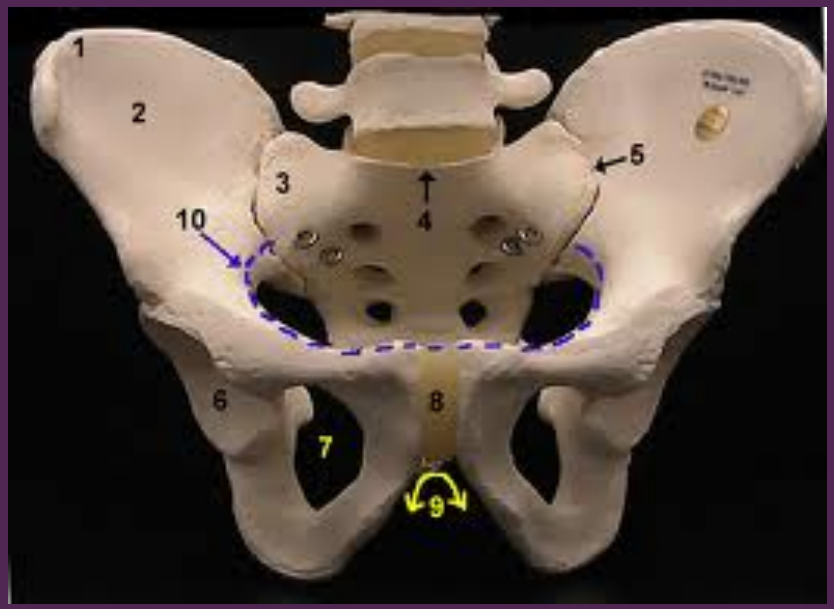
Move: Rotation



Lumbar Spine

Anatomy:

- Spinous processes of L4/5 are level with the pelvic brim.

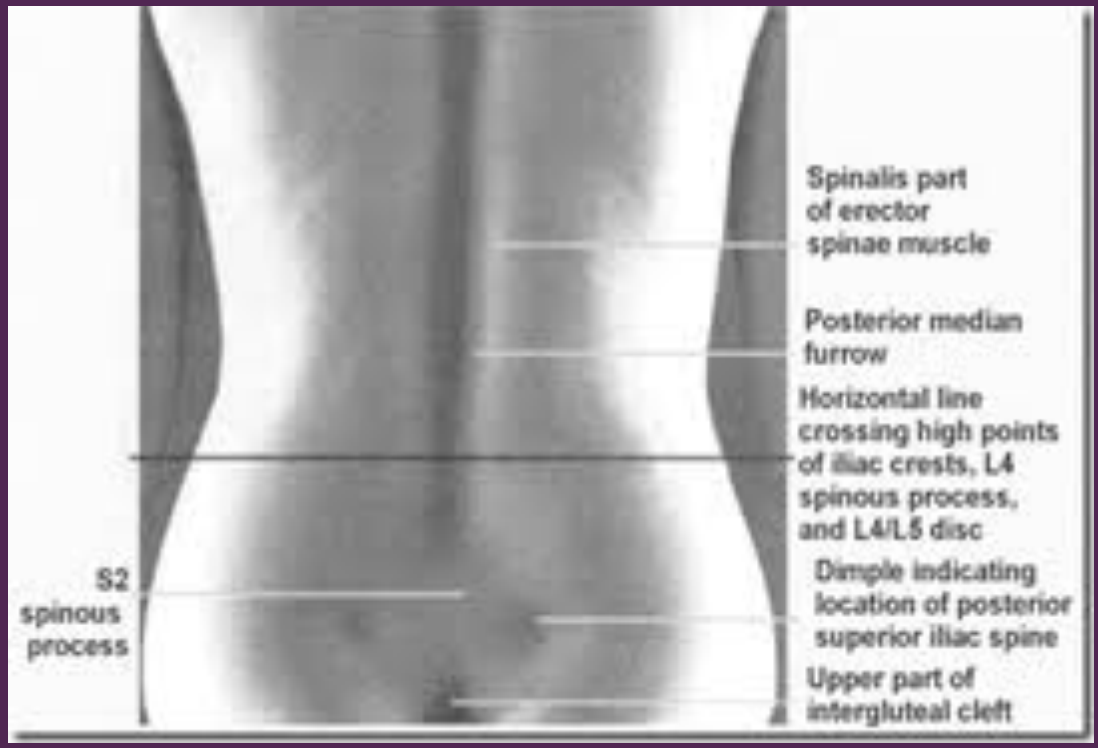


- The spinal cord ends at the L2 level.

Lumbar Spine

Anatomy:

- The 'dimples of Venus‘ overlie the sacroiliac joints.



- Movements

The principal movements are flexion, extension, lateral flexion and rotation.
In flexion, the upper segments move first, followed by the lower segments, to produce a smooth lumbar curve.
However, even with a rigid lumbar spine, patients may be able to touch their toes if their hips are mobile.
In the adult, the spinal cord ends at L2. Below this, only the spinal nerve roots may be injured by disc protrusion.

History…

Pain:

- Low back pain
- Radicular pain
- Buttock pain
- Groin pain

Radicular pain caused by sciatic nerve root compression radiates down the posterior aspect of the leg to the lower leg or ankle (sciatica). Groin and thigh pain in the absence of hip abnormality suggests referred pain from L1–2.

Mechanical

- After standing too long or sitting poor position
- Worse at end of day and improve on resting

1. **Acute disc prolapse** : acute onset , young age , increased by coughing and straining.

2. **Osteoporotic fractures**: acute onset , middle aged and elderly , comorbidites, increased by movement , localized

Acute back pain in the middle-aged, elderly or those with risk factors, such as glucocorticoid therapy, may be due to osteoporotic fracture. This is eased by lying, exacerbated by spinal flexion and not usually associated with neurological symptoms.

3. **Degenerative disc disease** : chronic, intermittent , associated with stiffness but < 30 mins Pain and stiffness are relieved by gentle activity but recur with, or after, excessive activity.

4. **Lumbosacral canal stenosis** :diffuse pain in buttocks and thighs with numbness , relieved by rest and spinal flexion, increased by spinal extension

Non-mechanical

- **Inflammatory**: insidious onset, worst at morning , stiffness lasts at least 30 mins after activity.

- **Infectious** : acute, progressive , not related to activity , associated with constitutional symptoms

Acute onset of severe progressive pain, especially when associated with malaise, weight loss or night sweats, may indicate pyogenic or tuberculous infection of the lumbar spine or sacroiliac joint. The infection may involve the intervertebral discs and adjacent vertebrae, and may track into the psoas muscle sheath, presenting as a painful flexed hip or a groin swelling.

- **Malignancy**: insidious onset , unremitting pain, weight loss , sleep disturbance ,

History…

- Mechanical
- Inflammatory
- Acute pain: young, elderly, constitutional symptoms

- Unremitting pain
- Intermittent pain
- Claudication
- Emergencies

Cauda equina syndrome

- Cauda equina syndrome occurs when a central disc prolapse, or other space-occupying lesion, compresses the cauda equina.
- There are features of sensory and motor disturbance,
- including diminished perianal sensation and bladder function disturbance.
- The motor disturbance may be profound, as in paraplegia.
- Cauda equina syndrome is neurosurgical emergency.

13.12 'Red flag' and 'yellow flag' features for acute low back pain

'Red flag' features

Features that may indicate serious pathology and require urgent referral

History

- Age <20 years or >55 years
- Recent significant trauma (fracture)
- Pain:
  - Thoracic (dissecting aneurysm)
  - Non-mechanical (infection/ tumour/pathological fracture)
- Fever (infection)
- Difficulty in micturition
- Faecal incontinence
- Motor weakness
- Sensory changes in the perineum (saddle anaesthesia)
- Sexual dysfunction, e.g. erectile/ejaculatory failure
- Gait change (cauda equina syndrome)
- Bilateral 'sciatica'

Past medical history

- Cancer (metastases)
- Previous glucocorticoid use (osteoporotic collapse)

System review

- Weight loss/malaise without obvious cause, e.g. cancer

'Yellow flag' features

Psychosocial factors associated with greater likelihood of long-term chronicity and disability

- A history of anxiety, depression, chronic pain, irritable bowel syndrome, chronic fatigue, social withdrawal
- A belief that the diagnosis is severe, e.g. cancer. Faulty beliefs can lead to 'catastrophisation' and avoidance of activity
- Lack of belief that the patient can improve leads to an expectation that only passive, rather than active, treatment will be effective
- Ongoing litigation or compensation claims, e.g. work, road traffic accident

Examination Sequence

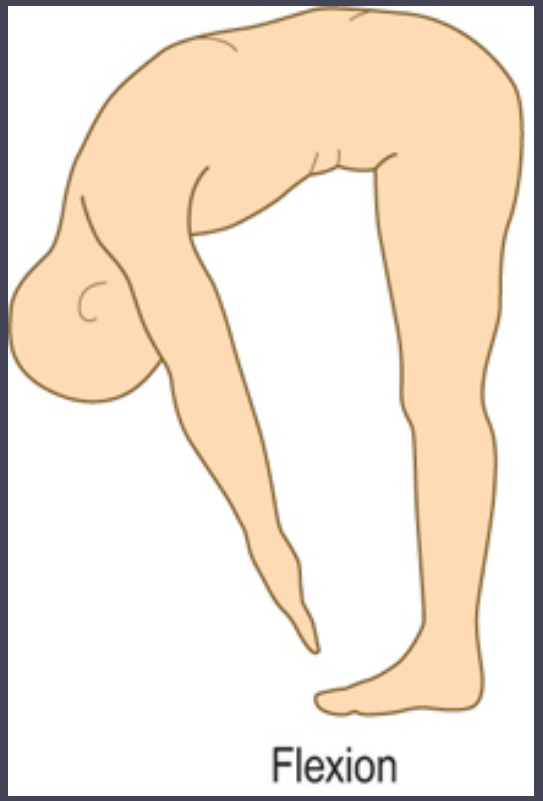
Look: Deformity
Soft Tissue
Scars, Rash
Muscle wasting
Hair patch
lordosis

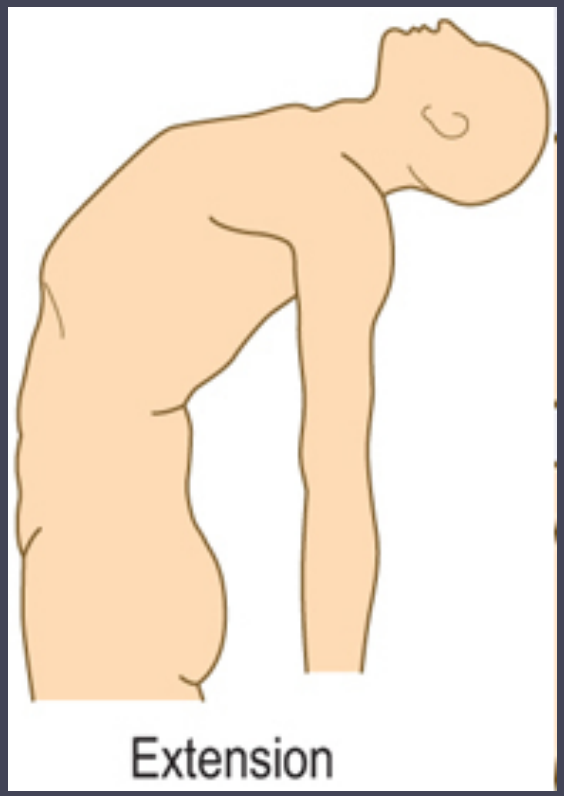
Feel:

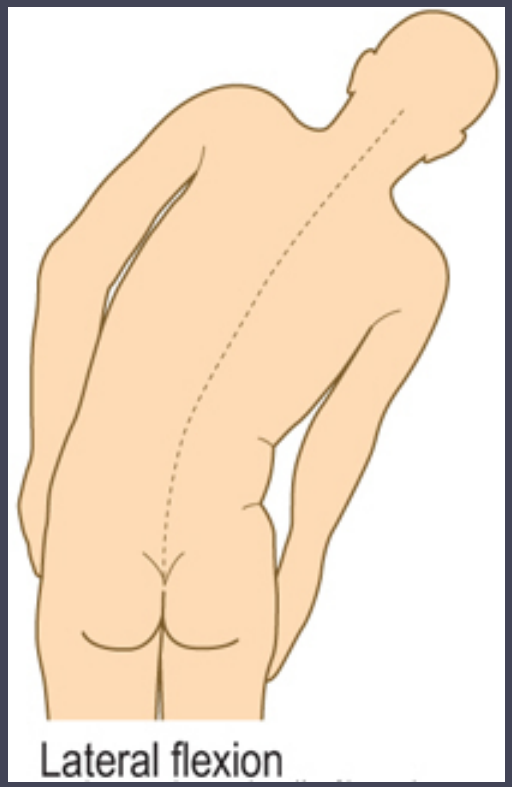
- Spinous processes
- Paraspinal tissues
- Gentle percussion

Examination Sequence

Move





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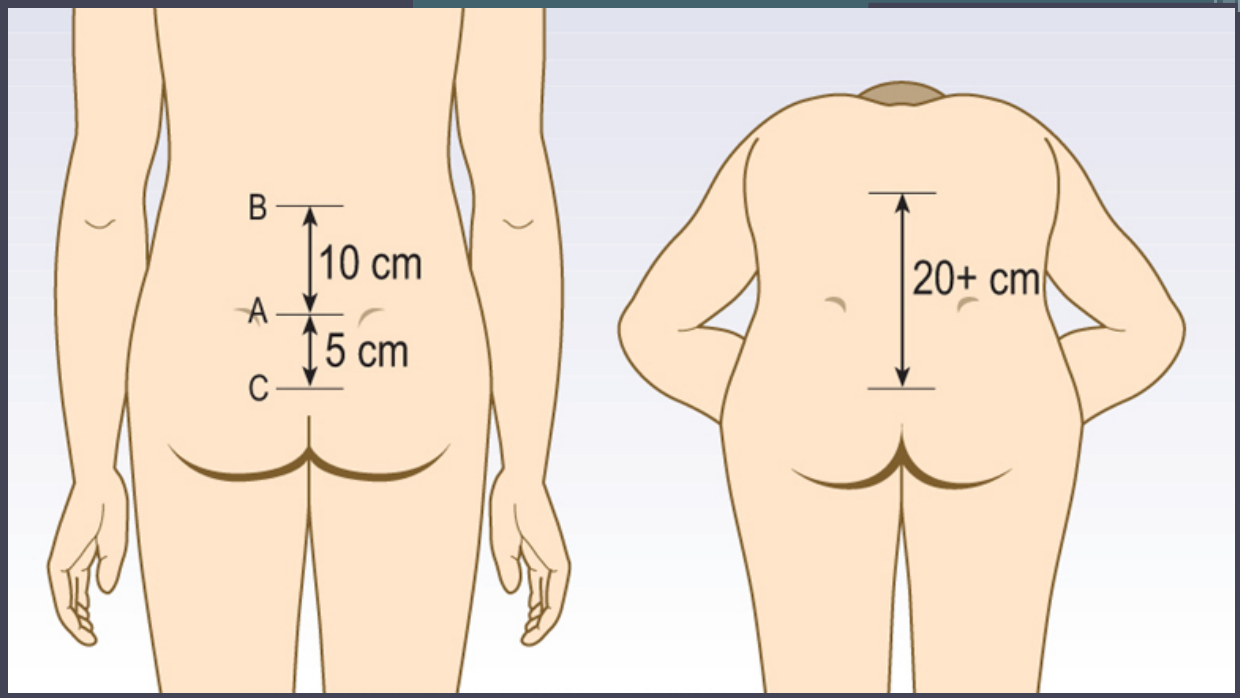
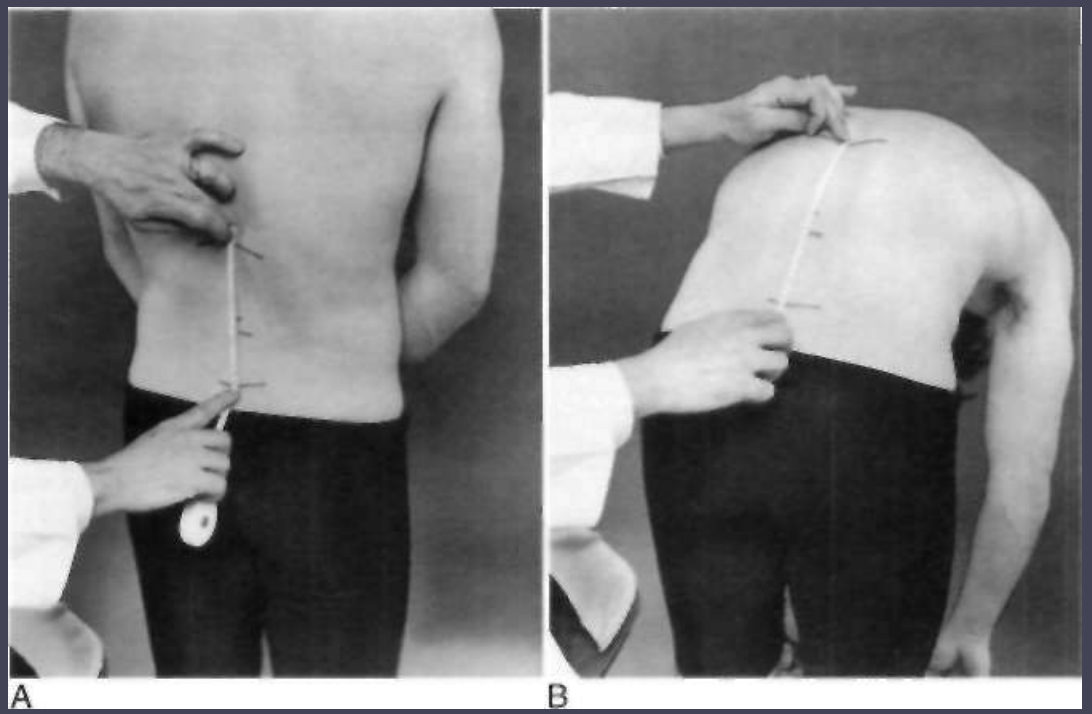
Special tests

Schober's test for forward flexion



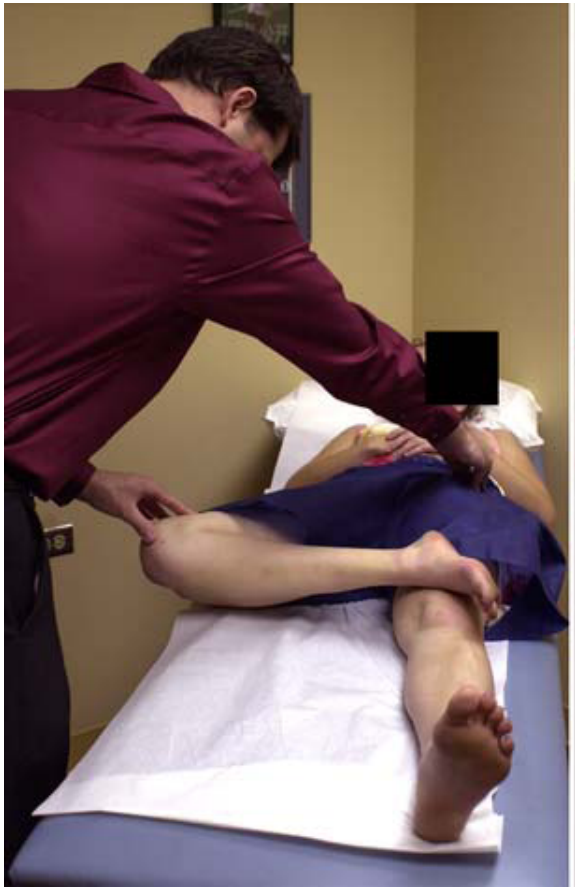


Special tests

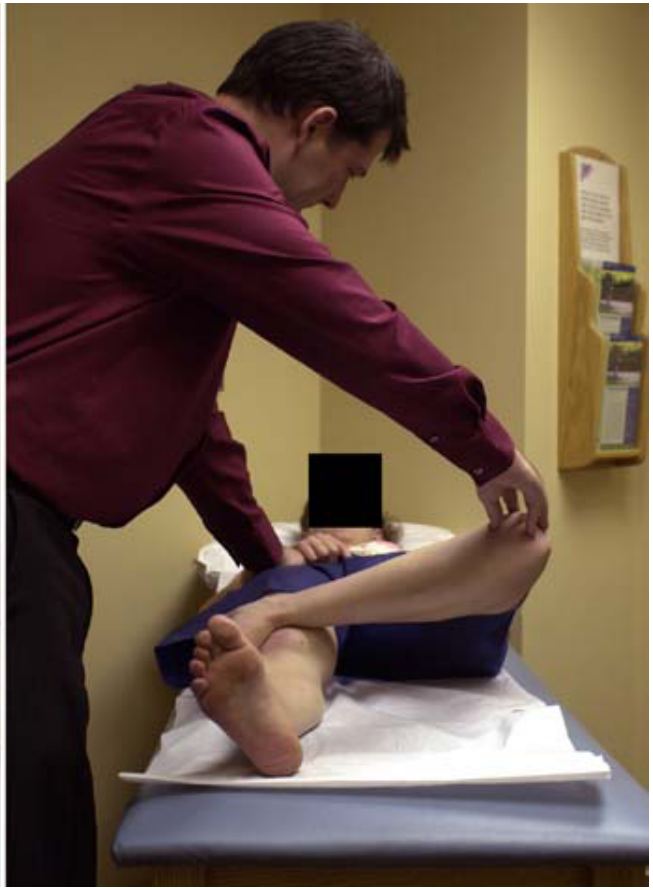
Sacroiliac Joints

Direct pressure in prone position with fist

Patrick's test (FABER)



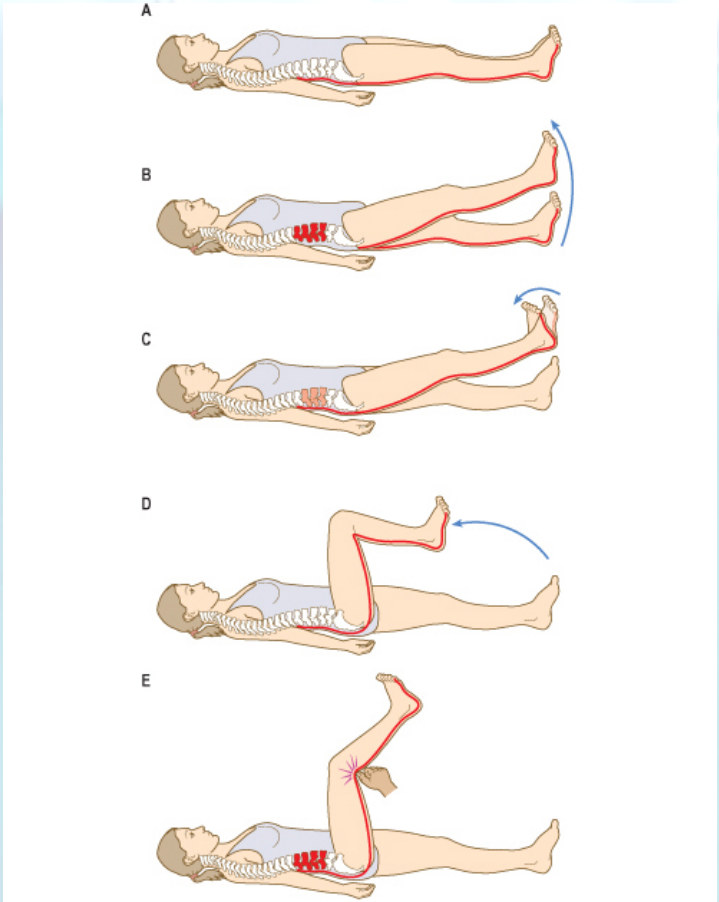
FABER -ve



FABER +ve

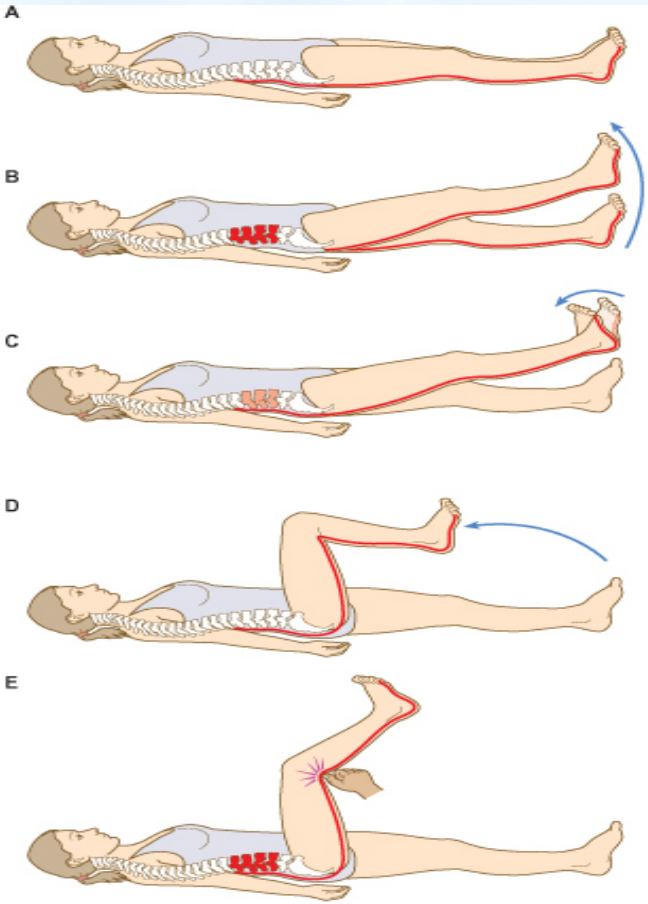
Straight leg raise.

This tests for L4, L5, S1 nerve root tension, e.g. in L3/4, L4/5 and L5/S1 disc prolapse (respectively). With the patient lying supine, lift the foot to flex the hip passively with the knee kept straight. Measure the angle between the couch and the flexed leg to determine any limitation (normal 80-90° hip flexion). If a limit is reached, raise the leg to just less than this level, and test for nerve root tension by dorsiflexing the foot



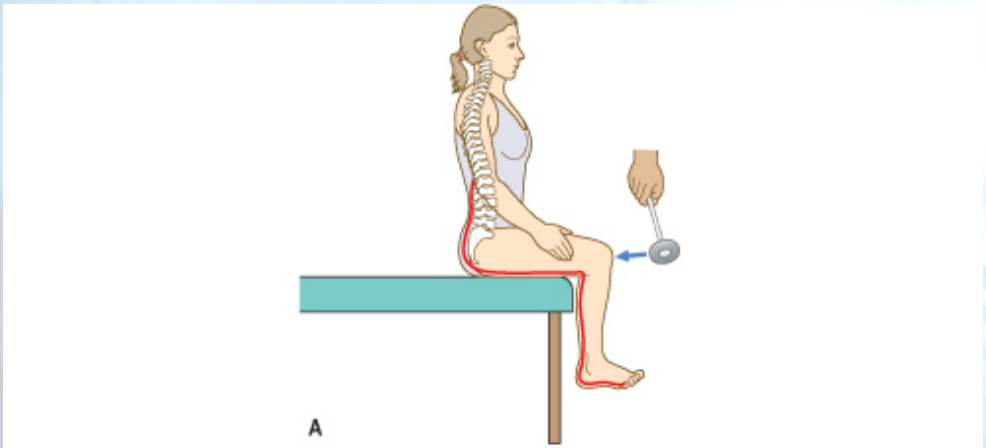
Stretch tests - sciatic nerve roots and tibial nerve

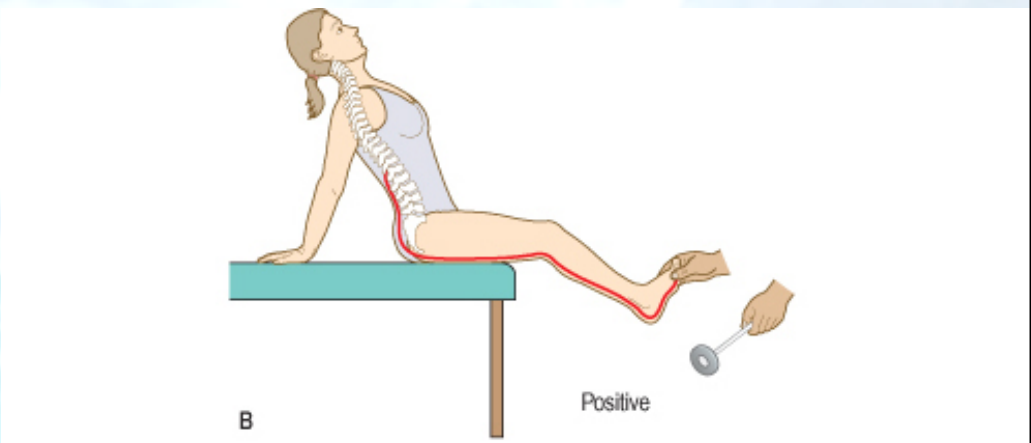
Stretch tests - sciatic nerve roots. (A) Neutral position - nerve roots slack. (B) Straight leg raising limited by tension of root over prolapsed disc. (C) Tension increased by dorsiflexion of foot (Bragard's test). (D) Root tension relieved by flexion at the knee. (E) Pressure over centre of popliteal fossa bears on posterior tibial nerve which is 'bowstringing' across the fossa causing pain locally and radiation into the back.

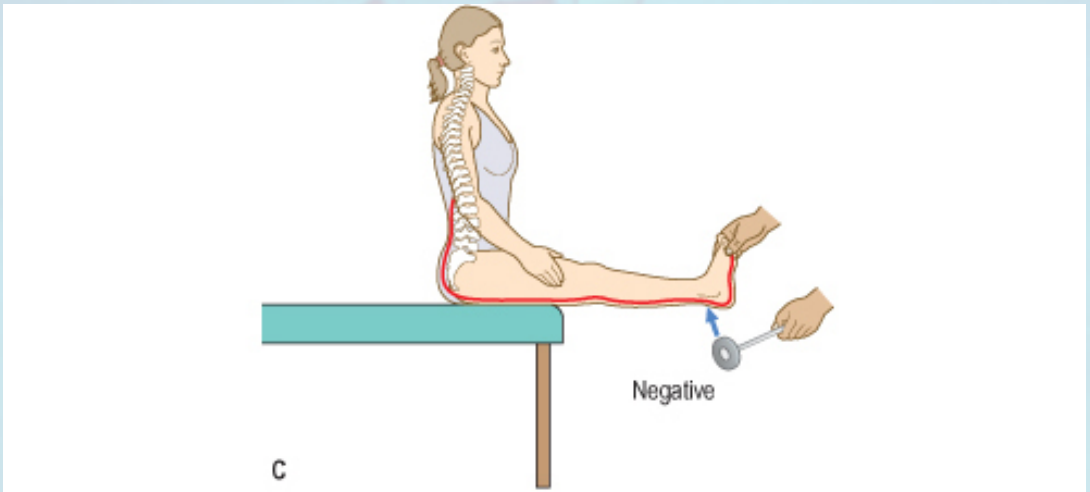


Flip test.

the patient with actual nerve root compression cannot permit full extension of the leg.

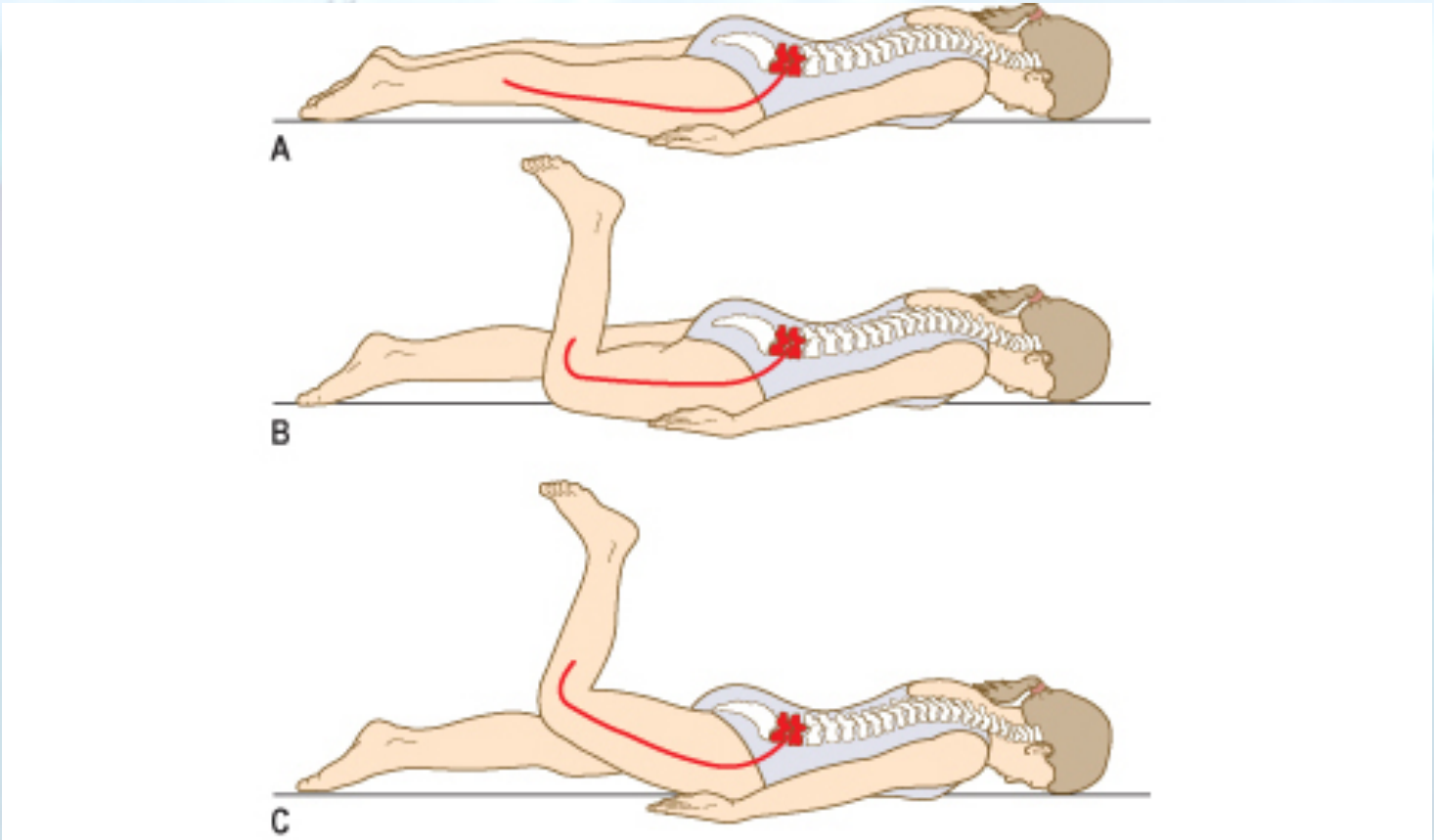






Femoral nerve stretch test.

With the patient lying on the front (prone) flex the knee and then extend the hip This stretches the femoral nerve. A positive result is when pain is felt in the back or the front of the thigh.



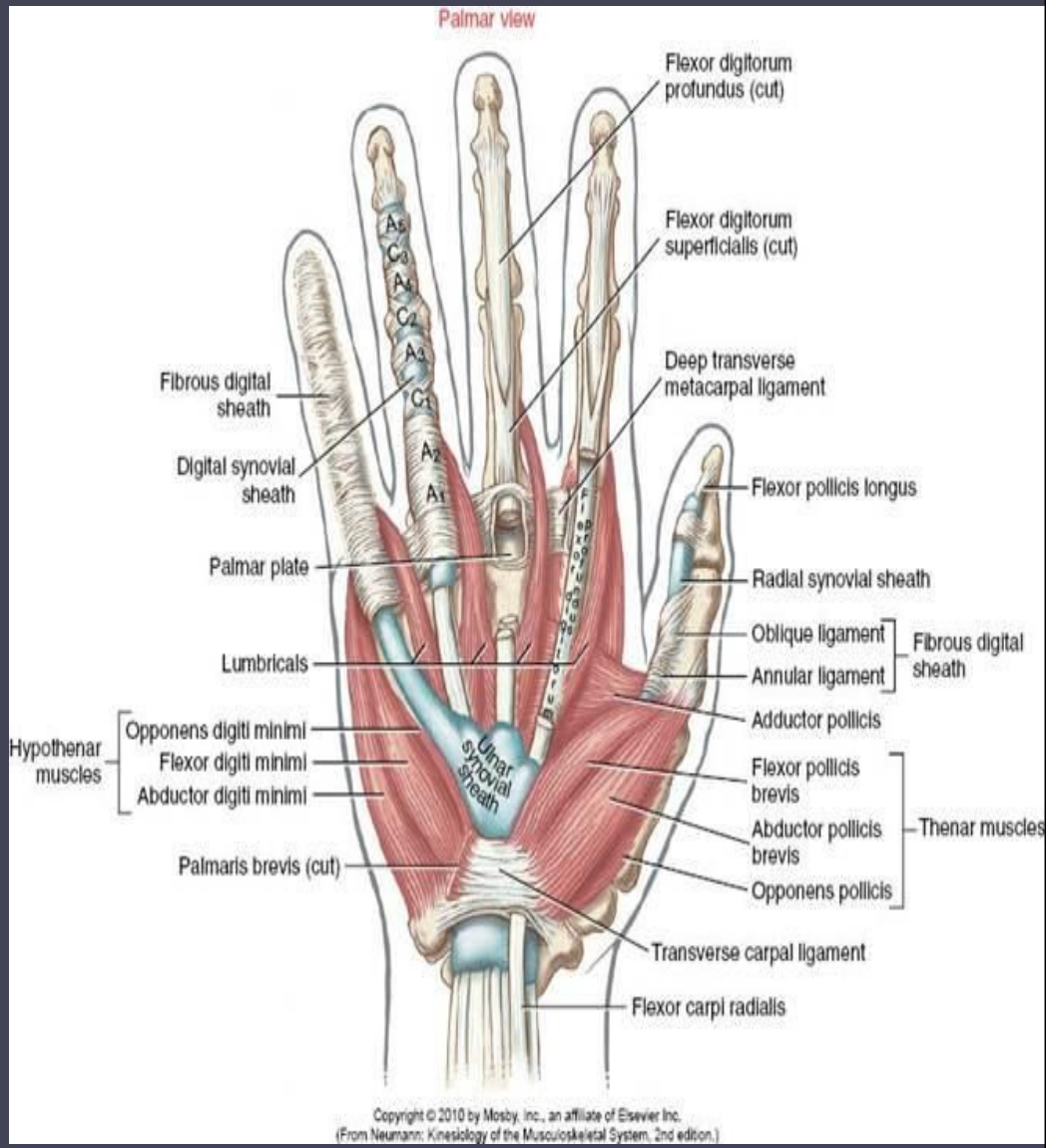
Hand and Wrist

Hand and wrist joint

- Wrist joint: metacarpocarpal,intercarpal,ulnocarpal,radiocarpal

There is a wide range of possible movements, including flexion, extension, adduction (deviation towards the ulnar side), abduction (deviation towards the radial side) and the composite movement of circumduction (the hand moves in a conical fashion on the wrist).

- PIP and DIP hinge joints and allow only flexion and extension
- MCP joint allow adduction and abduction in addition to flexion/ extenson



- The patient will often localize complaints of pain, stiffness, loss of function, contractures, disfigurement and trauma.
- If symptoms are more vague or diffuse, then consider referred pain or a compressive neuropathy (e.g. median nerve in carpal tunnel syndrome).
- Functionality is very important

13.14 American College of Rheumatology/European League Against Rheumatism classification criteria for rheumatoid arthritis, 2010

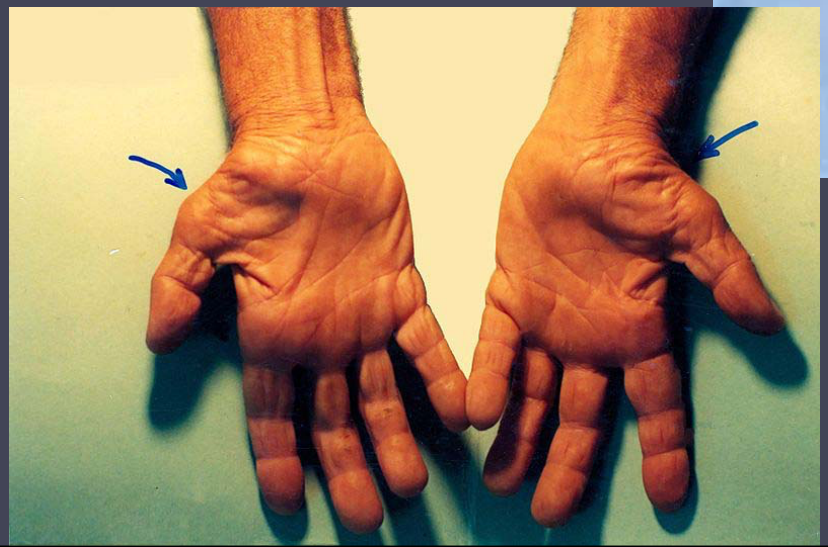
Criteria	Score
Duration of symptoms (as reported by patient)	
<6 weeks	0
>6 weeks	1
Joint distribution (0–5)	
1 large joint[a]	0
2–10 large joints	1
1–3 small joints[b] (large joints not counted)	2
4–10 small joints (large joints not counted)	3
>10 joints (at least 1 small joint)	5
Serology (0–3)	
Negative RF and negative ACPA	0
Low positive RF or low positive ACPA	2
High positive RF or high positive ACPA	3
Acute-phase reactants	
Normal CRP and normal ESR	0
Abnormal CRP or abnormal ESR	1

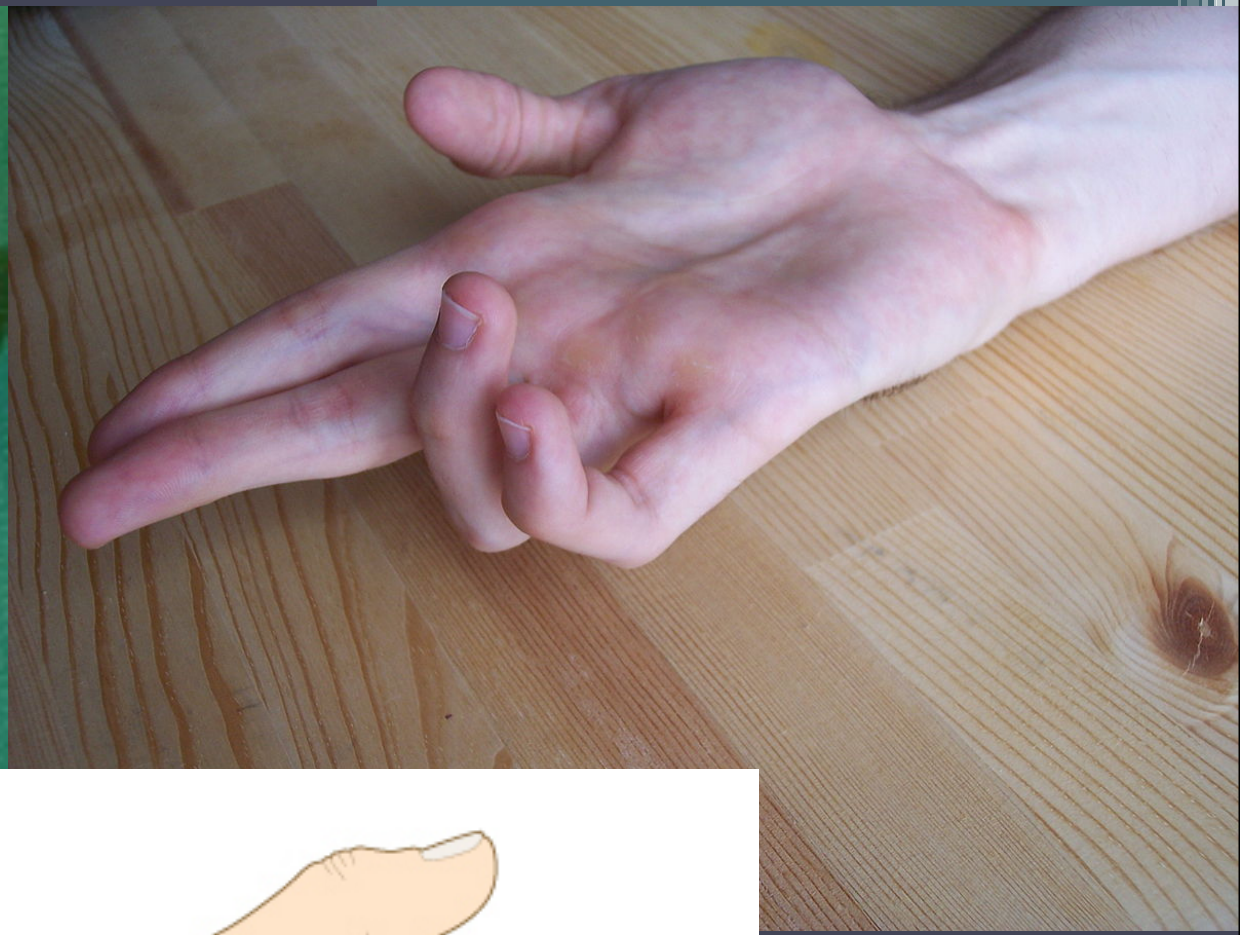
Patients must have at least 1 swollen joint not better explained by another disease.
A score of ≥6 classifies the patient as having definite rheumatoid arthritis. A score of 4–5 is probable rheumatoid arthritis, i.e. a patient may have clinical rheumatoid arthritis but not fulfil all criteria.

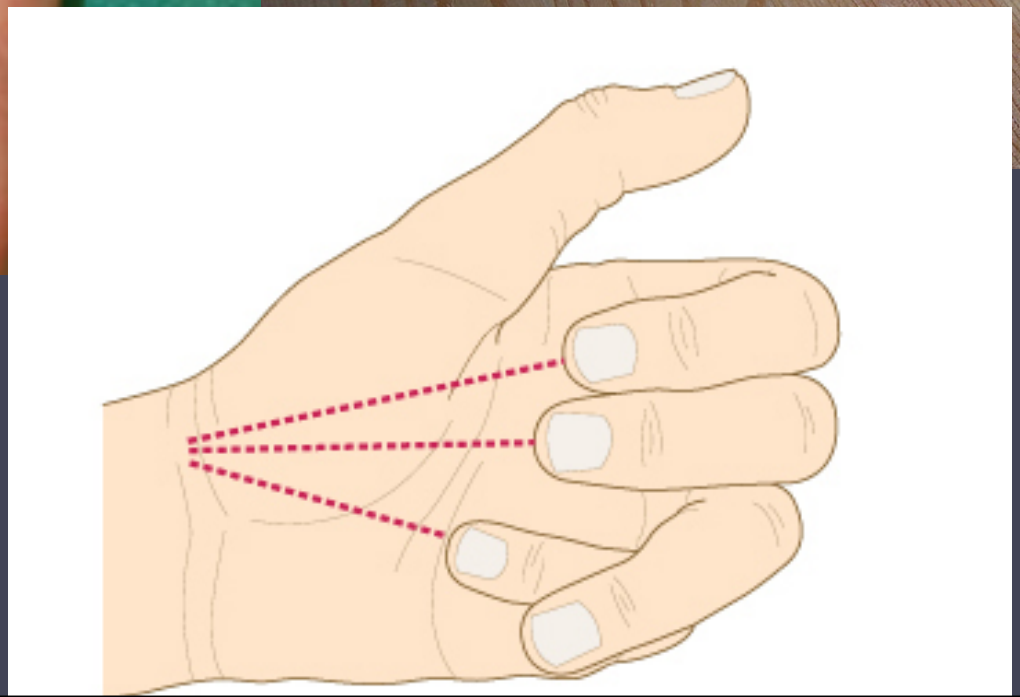
[a]*Large joints: shoulders, elbows, hips, knees and ankles*
[b]*Small joints: all metacarpophalangeal and proximal interphalangeal joints, thumb interphalangeal joint, wrists and 2nd–5th metatarsophalangeal joints.*
ACPA, *anti-cyclic citrullinated peptide antibody;* CRP, *C-reactive protein;* ESR, *erythrocyte sedimentation rate;* RF, *rheumatoid factor.*
Reproduced from Aletaha D, Neogi T, Silman AJ, et al. Rheumatoid arthritis classification criteria: an American College of Rheumatology/European League Against Rheumatism collaborative initiative. Arthritis & Rheumatism 2010; 62(9): 2569–2581, with permission from John Wiley and Sons.

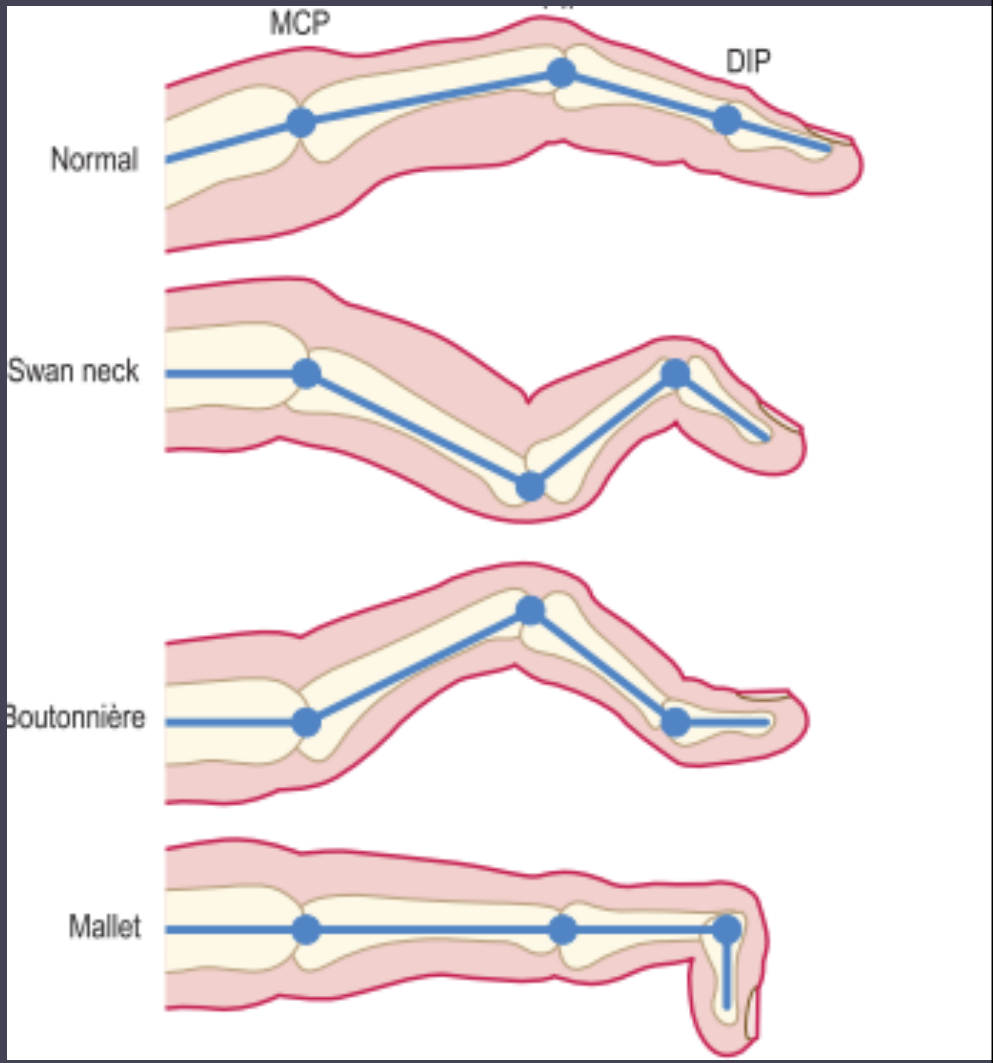
Look:

- *Colour change*
- *Swelling*
- *Deformity*
- *Small muscle wasting*
- *Vasculitis of the fingers*
- *Palmar erythema*
- *Nail changes*
- *Ulnar deviation*








MCP
DIP
Normal
Swan neck
Boutonnière
Mallet

Examination sequence

Seat the patient facing you, with their arms and shoulders exposed. Start by examining the hand and fingers, and move proximally.

Look

- Erythema suggests acute inflammation caused by soft-tissue infection, septic arthritis, tendon sheath infection or crystal arthritis. Palmar erythema is associated with rheumatoid arthritis.
- Swelling of MCP joints due to synovitis produces loss of interknuckle indentation on the dorsum of the hand, especially when the MCP and interphalangeal joints are fully flexed (loss of the normal 'hill–valley–hill' aspect; Fig. 13.19A). 'Spindling' (swelling at the joint, tapering proximally and distally; Fig. 13.19B) is seen when the PIP joints are affected.
- Deformity of phalangeal fractures may produce rotation. Ask the patient to flex the fingers together (Fig. 13.20) and then in turn. Normally, with the MCP and interphalangeal joints flexed, the fingers should not cross, and should point to the scaphoid tubercle in the wrist.
- The fingers are long in Marfan's syndrome (arachnodactyly, see Fig. 3.21B).
- Boutonnière (or buttonhook) deformity is a fixed flexion deformity at the PIP joint with hyperextension at the DIP joint. 'Swan neck' deformity is hyperextension at the PIP joint with flexion at the DIP joint (Fig. 13.21).
- At the DIP joints (Fig. 13.21) a 'mallet' finger is a flexion deformity that is passively correctable. This is usually caused by minor trauma disrupting terminal extensor expansion at the base of the distal phalanx, with or without bony avulsion.
- There may be subluxation and ulnar deviation at the MCP joints in rheumatoid arthritis (Fig. 13.22).
- Bony expansion of DIP, PIP joints of the fingers and CMC joint of the thumb is typical of osteoarthritis (see Fig. 13.8).
- Anterior (or volar) displacement (partial dislocation) of the wrist may be seen in rheumatoid arthritis.

Extra-articular signs

- Dupuytren's contracture affects the palmar fascia, resulting in fixed flexion of the MCP and PIP joints of the little and ring fingers (see Fig. 3.5).
- Wasting of the interossei occurs in inflammatory arthritis and ulnar nerve palsy. Carpal tunnel syndrome causes wasting of the thenar eminence. T1 nerve root lesions (Fig. 13.23) cause wasting of all small hand muscles.
- Look for nail-fold infarcts, telangiectasia, palmar erythema, psoriasis, scars of carpal tunnel decompression, tendon transfer or MCP joint replacement.
- Nail changes, such as pitting and onycholysis (raising of the nail from its bed), occur in psoriatic arthritis (Fig. 3.7A).

Feel

- *Temperature*
- *Hard swellings:* Heberden's and Bouchard's nodes of OA.
- *Soft spongy swellings* suggesting synovitis, palpate joints and flexor tendon sheaths (swelling and tenderness).

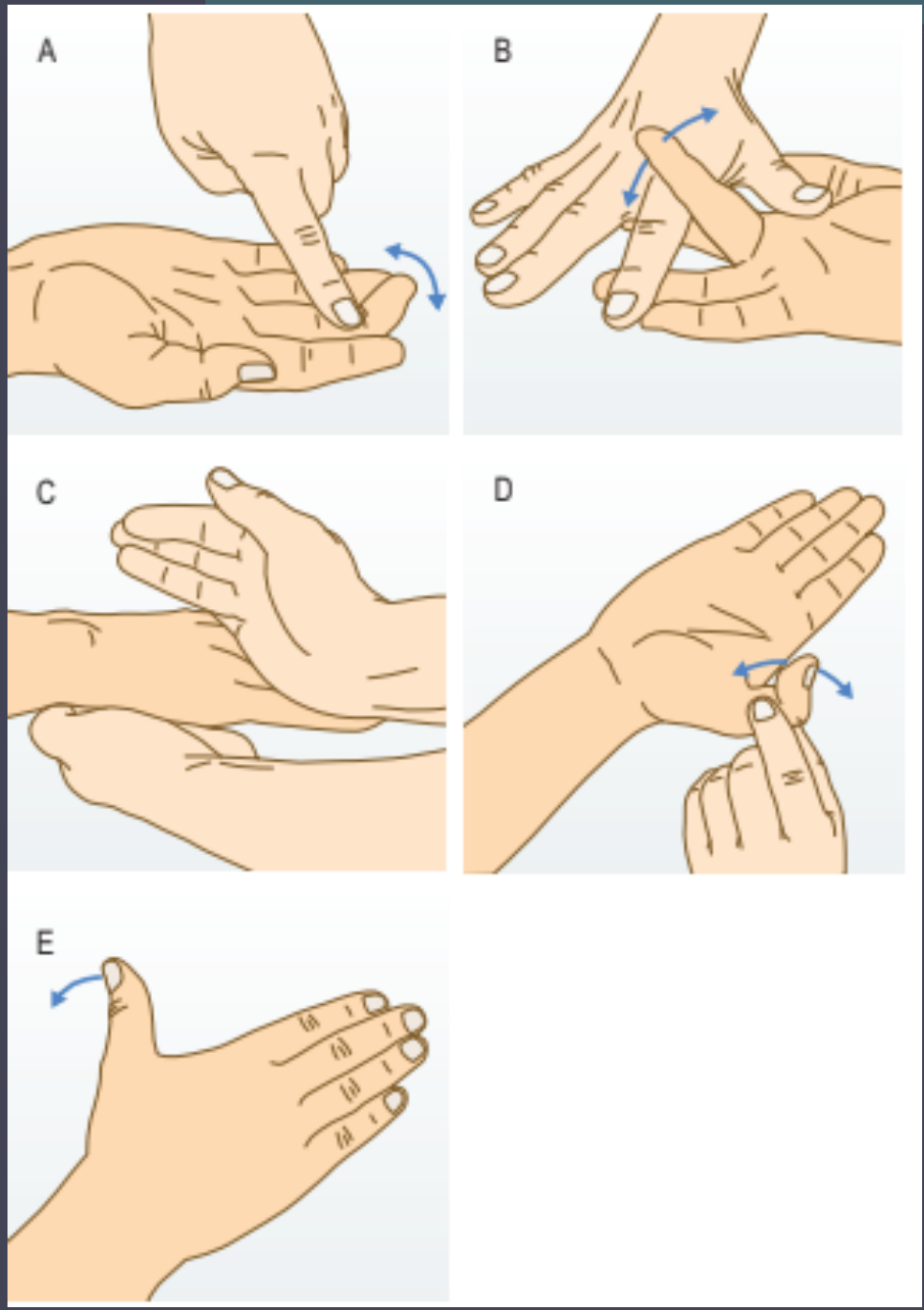
➢ Trigger fingers.

➢ De Quervain's tenosynovitis. >>Finkelestein test.

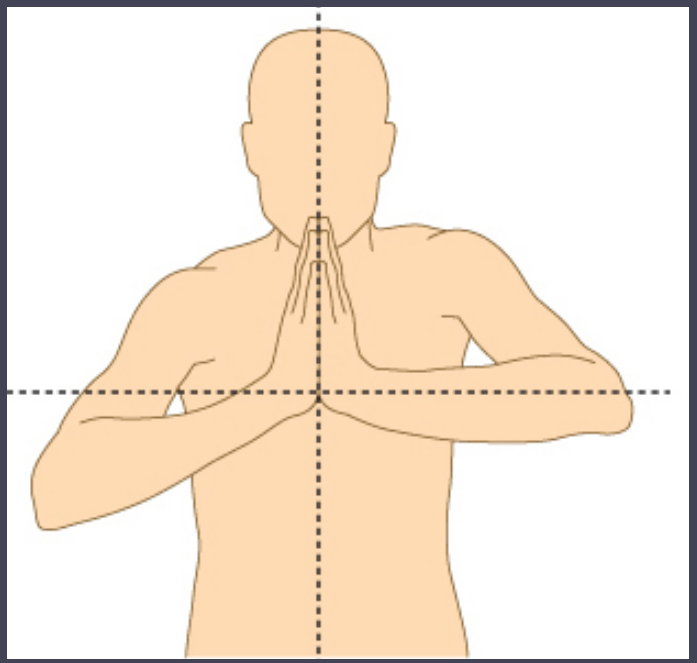
➢ Crepitus in wrist O.A.

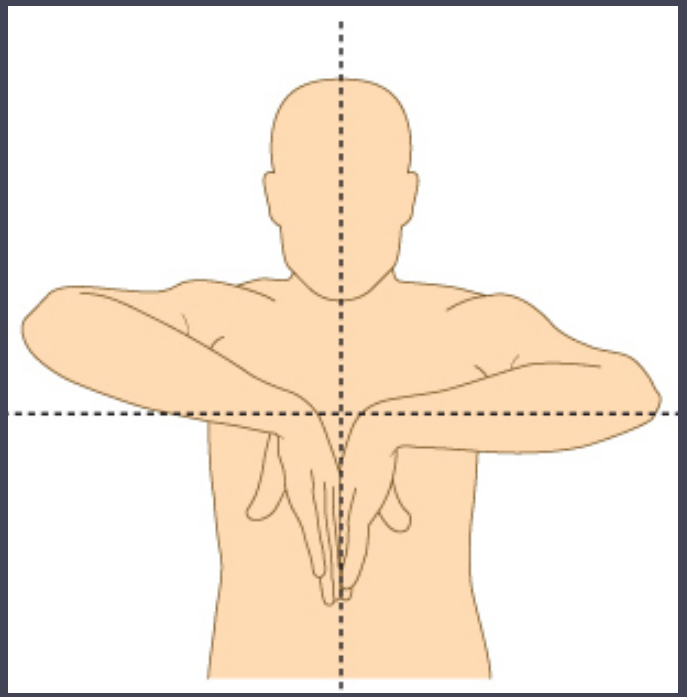
Move

- Wrist and small joints.
- Don’t forget to test grip.
- Assess function of each tendon alone in patients with cut wounds.



Carpal tunnel syndrome

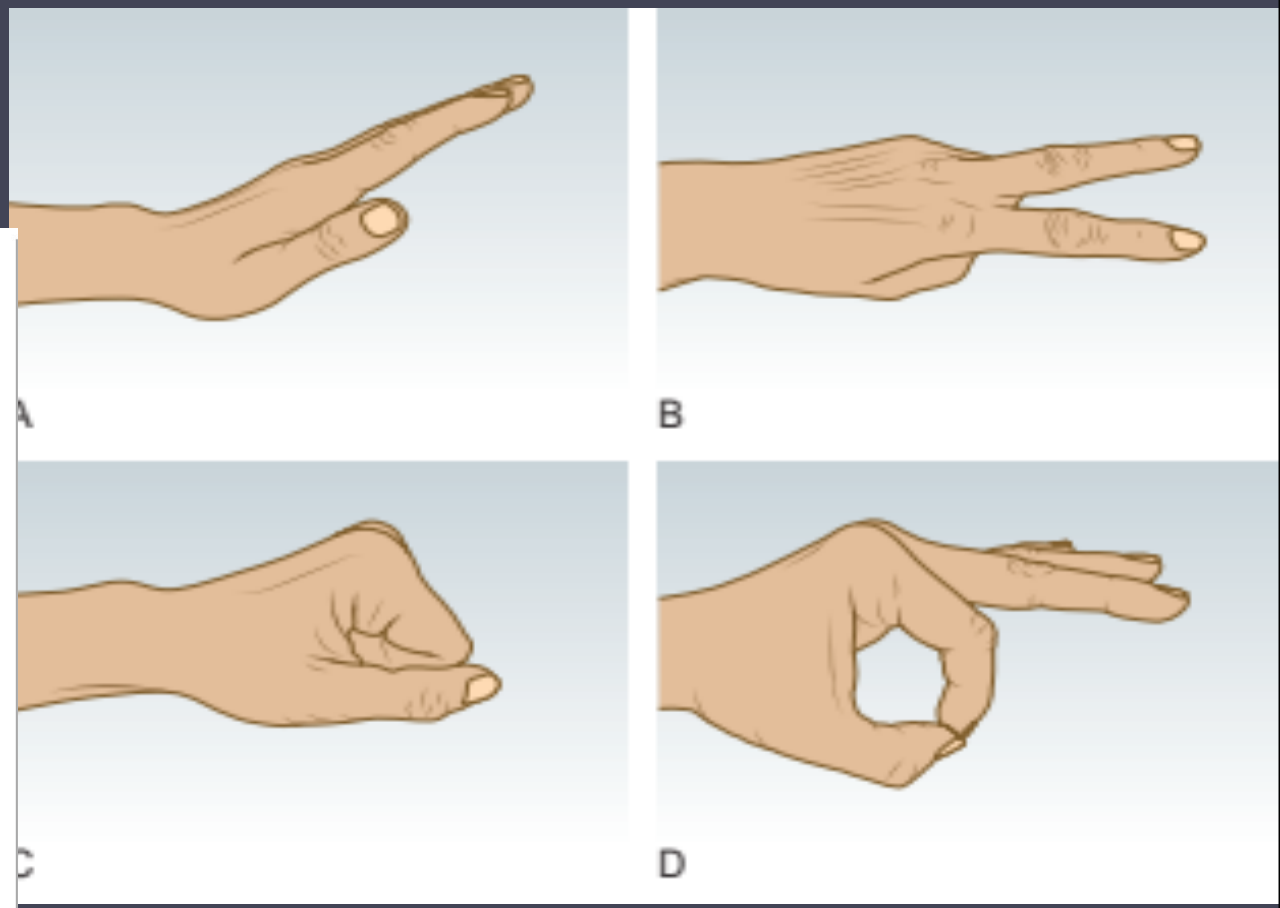




Median, ulnar and radial nerve exam

- Paper-scissors-stone
- OK sign for AIN

- Radial nerve (wrist and finger extensors): ask the patient to extend the wrist and fingers fully ('paper sign').
- Ulnar nerve (hypothenar muscles, interossei, two medial lumbricals, adductor pollicis, flexor carpi ulnaris and the ulnar half of flexor digitorum profundus): ask the patient to make the 'scissors sign'.
- Median nerve (thenar muscles that abduct and oppose the thumb, the lateral two lumbricals, the medial half of flexor digitorum profundus, flexor digitorum superficialis, flexor carpi radialis, palmaris longus and pronator teres): ask the patient to clench the fist fully ('stone sign'). The best test of median nerve motor function is the ability to abduct the thumb away from the palm because of inconstant crossover in the nerve supply to the thenar eminence muscles other than abductor pollicis brevis. However, clenching the fist fully also depends on median function because of its flexor supply.
- Anterior interosseous nerve (flexor pollicis longus, the index finger flexor digitorum profundus and pronator quadratus): ask the patient to make the 'OK' sign. This depends on the function of both flexor pollicis longus and index finger flexor digitorum profundus.



The Knee Joint

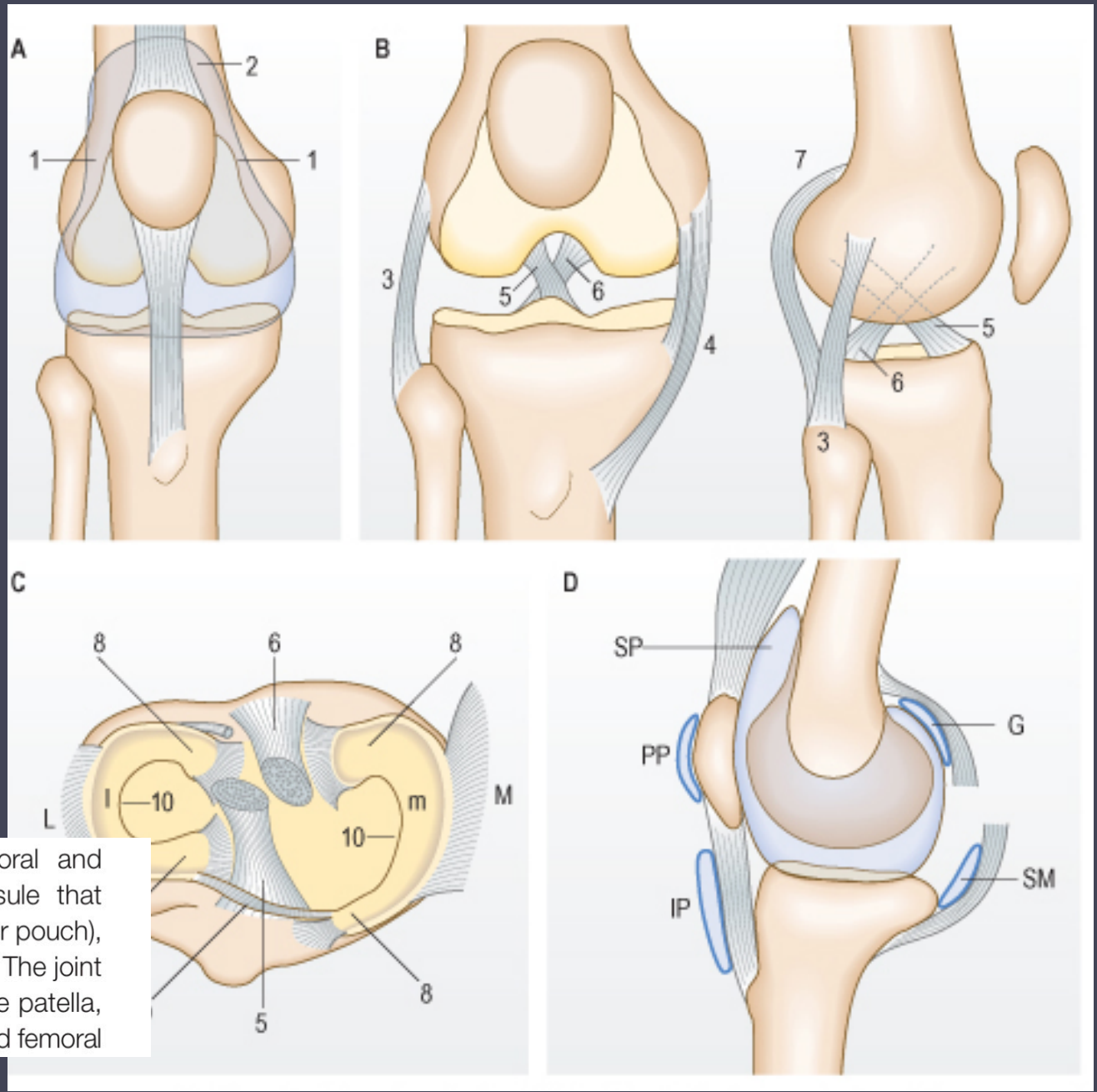
Hinge joint

Extensor apparatus

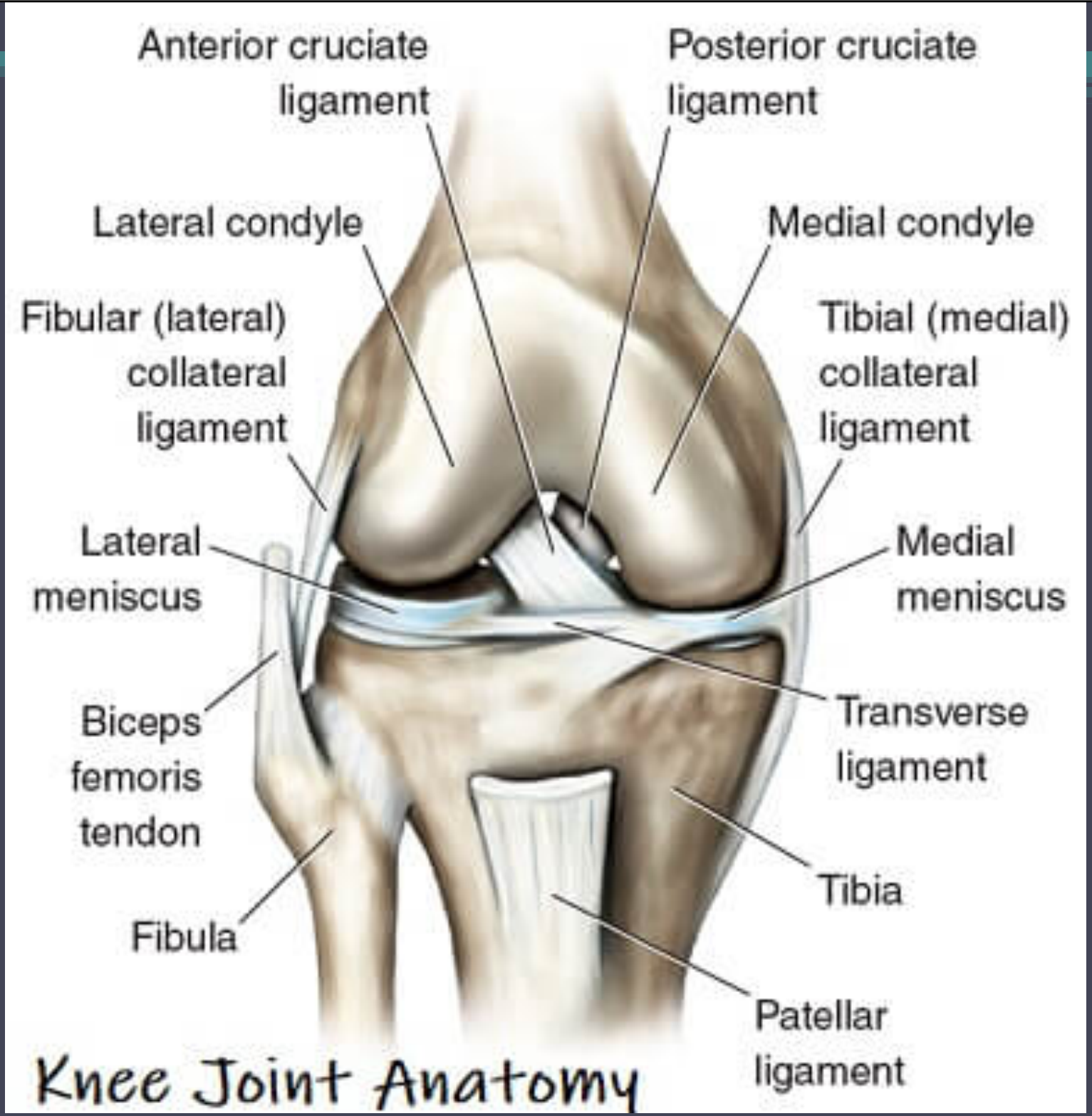
Capsule

Stability

Bursae

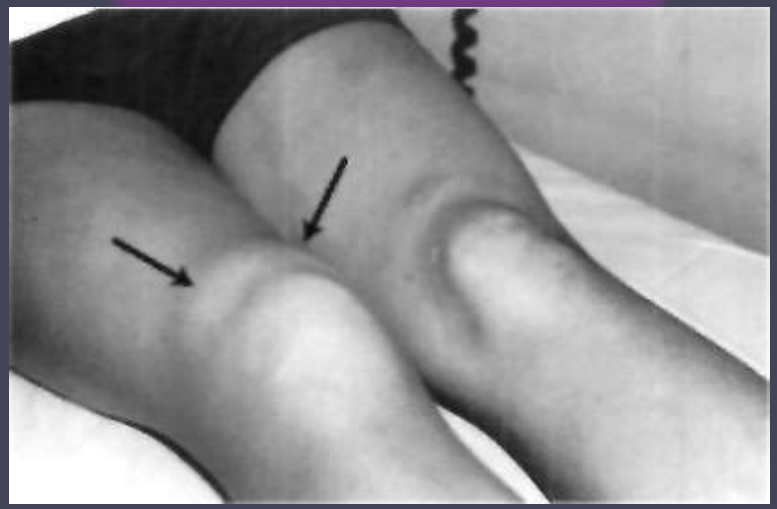


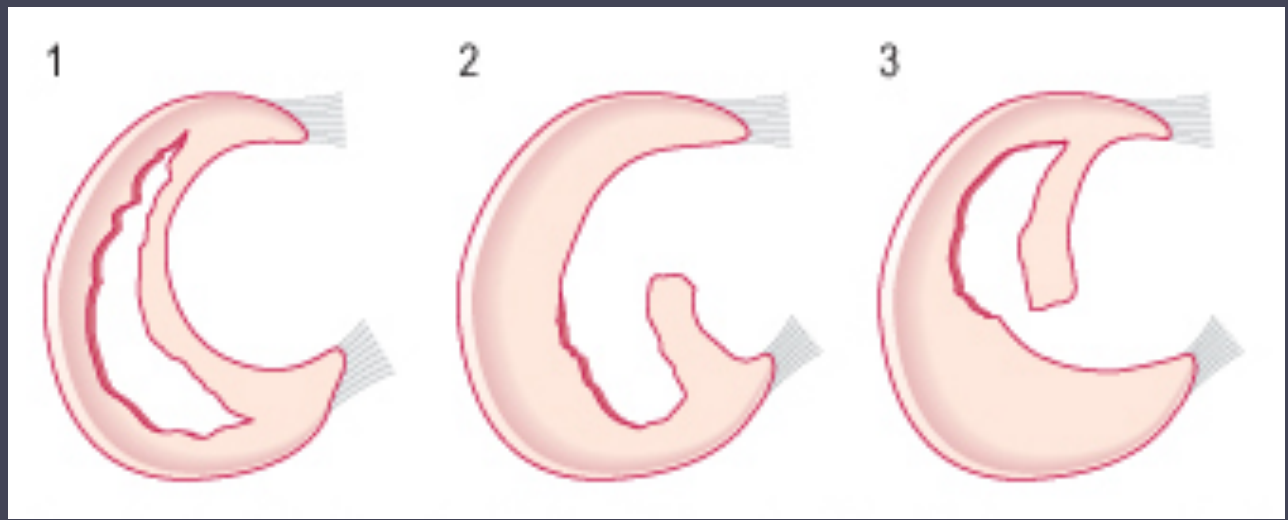
The knee is a complex hinge joint with tibiofemoral and patellofemoral components. It has a synovial capsule that extends under the quadriceps muscle (the suprapatellar pouch), reaching 5 cm above the superior edge of the patella. The joint is largely subcutaneous, allowing easy palpation of the patella, tibial tuberosity, patellar tendon, tibial plateau margin and femoral


Anterior cruciate ligament
Posterior cruciate ligament
Lateral condyle
Medial condyle
Fibular (lateral) collateral ligament
Tibial (medial) collateral ligament
Lateral meniscus
Medial meniscus
Biceps femoris tendon
Transverse ligament
Tibia
Fibula
Patellar ligament
Knee Joint Anatomy

Abnormal Findings

- Pain
- Swelling
- Locking
- Giving way





The hamstring muscles flex the knee. Extension involves the quadriceps muscles, quadriceps tendon, patella, patellar tendon and tibial tuberosity. Any disruption of this 'extensor apparatus' prevents straight-leg raising or produces an extensor lag (a difference between active and passive ranges of extension).

The medial and lateral collateral ligaments resist valgus and varus stress, respectively. The anterior cruciate ligament (ACL) prevents anterior subluxation of the tibia on the femur, and the posterior cruciate ligament resists posterior translation. The medial and lateral menisci are crescentic fibrocartilaginous structures that lie between the tibial plateaux and the femoral condyles. There are several important bursae around the knee:

- anteriorly: the suprapatellar, prepatellar (between the patella and the overlying skin) and infrapatellar bursae (between the skin and the tibial tuberosity/patellar ligament)
- posteriorly: several bursae in the popliteal fossa (Fig. 13.38D).

The history

Pain

Generalised knee pain is likely to be due to pathology in the tibiofemoral joint (Box 13.18). Anterior knee pain, particularly after prolonged sitting or going downstairs, suggests patellofemoral joint pathology. Medial or lateral pain could come from the collateral ligaments or meniscal tears.

Pain in the knee may be referred from the hip.

Take a detailed history of the mechanism of any injury. The direction of impact, load and deformation predict what structures are injured.

Swelling

The normal volume of synovial fluid is 1–2 mL and is clinically undetectable. An effusion indicates intra-articular pathology. Haemarthrosis (bleeding into the knee) is caused by injury to a vascular structure within the joint, such as a torn cruciate ligament or an intra-articular fracture. The menisci are predominantly avascular and do not cause a haemarthrosis, unless torn at their periphery, or in conjunction with some other internal derangement.

Locking

Two common causes in the knee are a loose body, such as from osteochondritis dissecans, osteoarthritis or synovial chondromatosis, and a meniscal tear. Bucket-handle and anterior beak meniscal tears are especially associated with locking. Posterior horn tears commonly cause pain and limit movement in the last few degrees of flexion. Meniscal tears also cause local joint-line tenderness. Congenital discoid meniscus may present with locking and clunking.

Instability ('giving way')

Any of the four main ligaments may rupture from trauma or become incompetent with degenerative disease. The patella is prone to dislocate laterally because the normal knee has a valgus angle.

Examination Sequence

Look:

- Gait
- Scars, sinuses, redness or rashes
- Deformities
- Muscle wasting (measure)
- Leg length discrepancy
- Flexion deformity
- Swelling: effusion, bursae
- Baker's cyst Vs. aneurysm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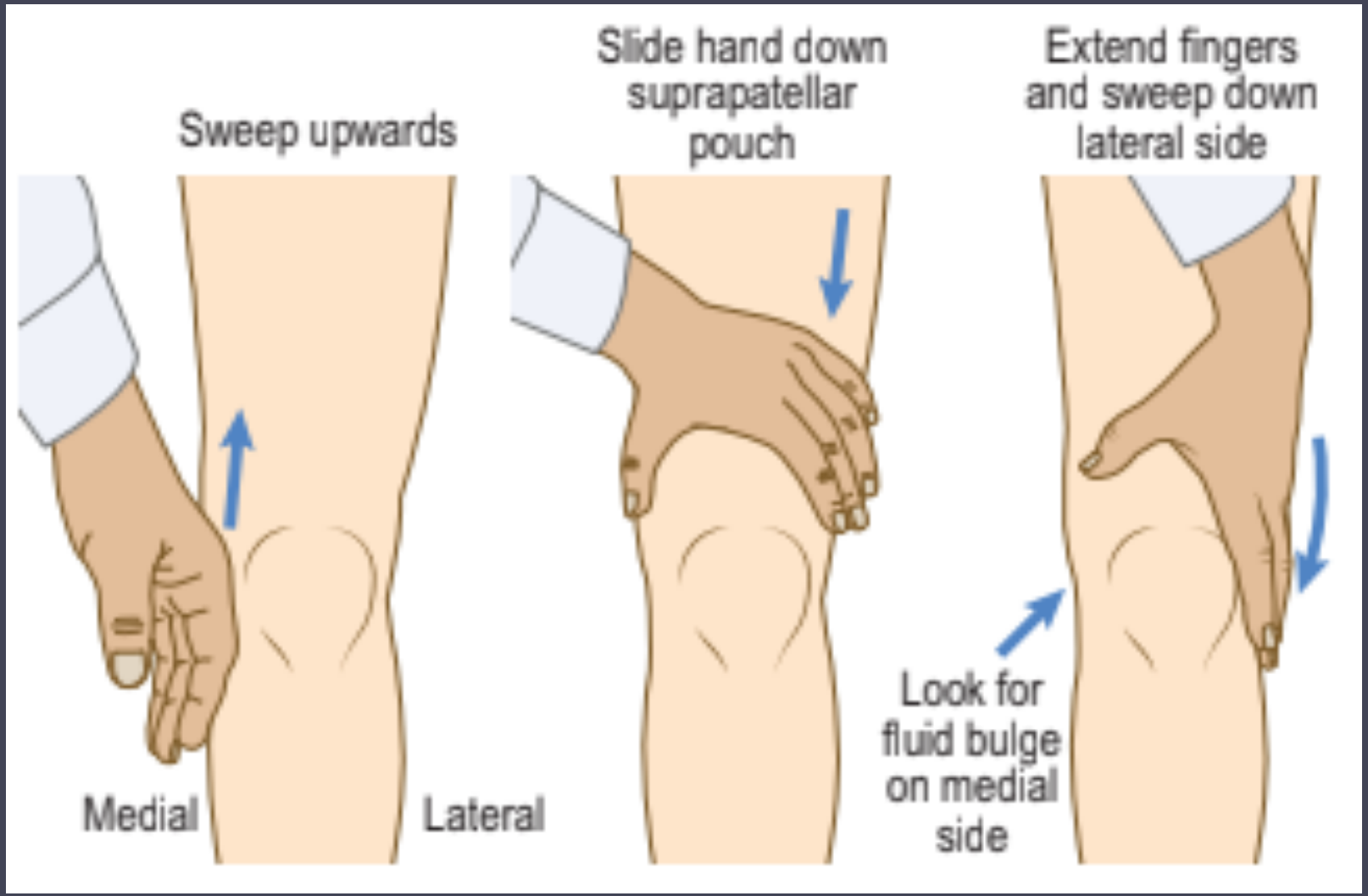
Examination Sequence

Feel:

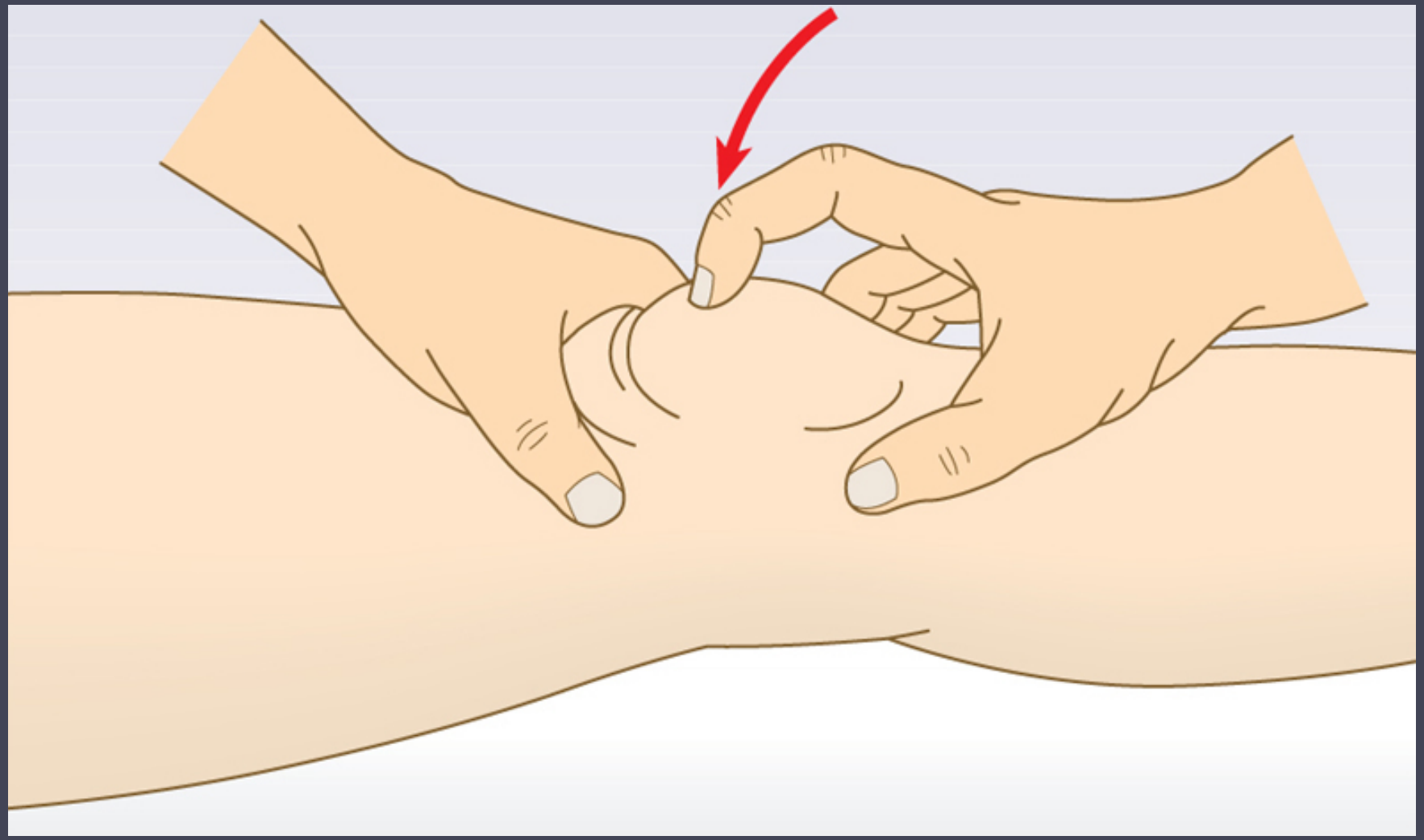
Warmth
Joint lines, patella , tibial tuberosity
Patellar tendon
Effusion
- Parapatellar hollow
- The 'ripple test' (Bulge, Milking)
- The patellar tap
- Fluctuation

Synovitis: sponginess
Joint lines

Ripple Test


Sweep upwards
Slide hand down suprapatellar pouch
Extend fingers and sweep down lateral side
Look for fluid bulge on medial side
Medial
Lateral

Patellar Tap



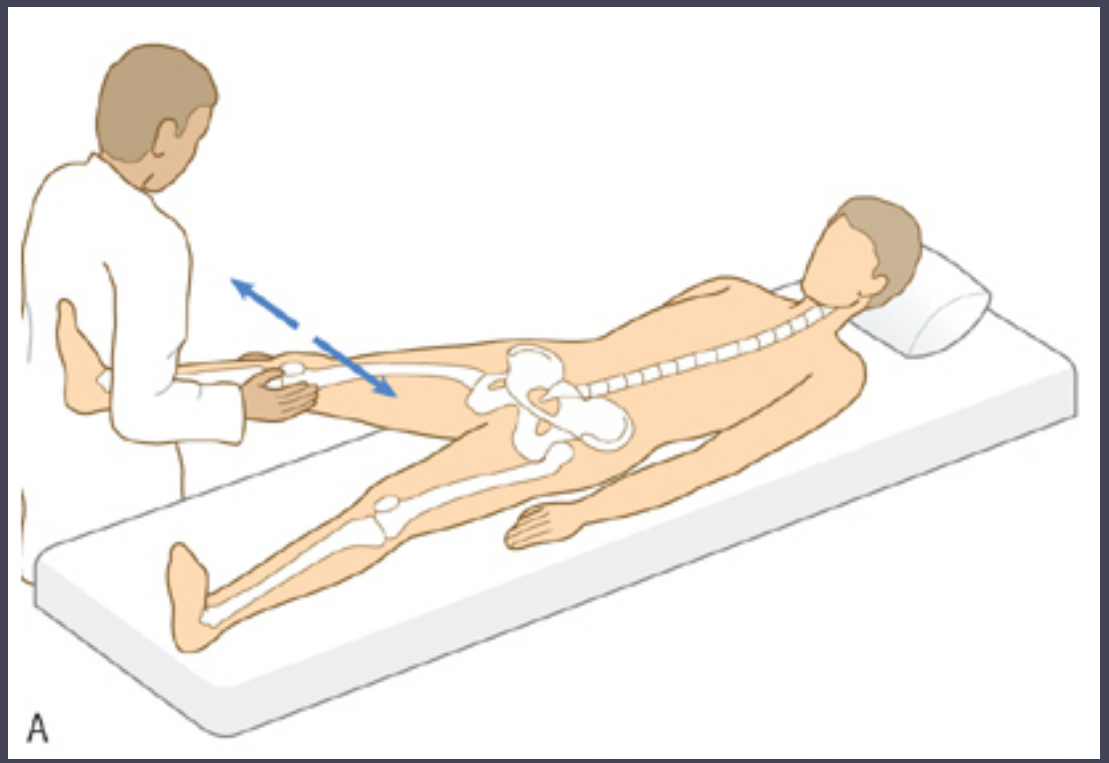
Move . . .

- Active flexion and extension:
  - Supine
  - 0-140
  - Feel for crepitus
- Extensor apparatus (SLR) Vs. Fixed flexion deformity
- Passive flexion and extension:
  - Genu recurvatum-10 is normal

Special Tests:

Collateral Ligaments:

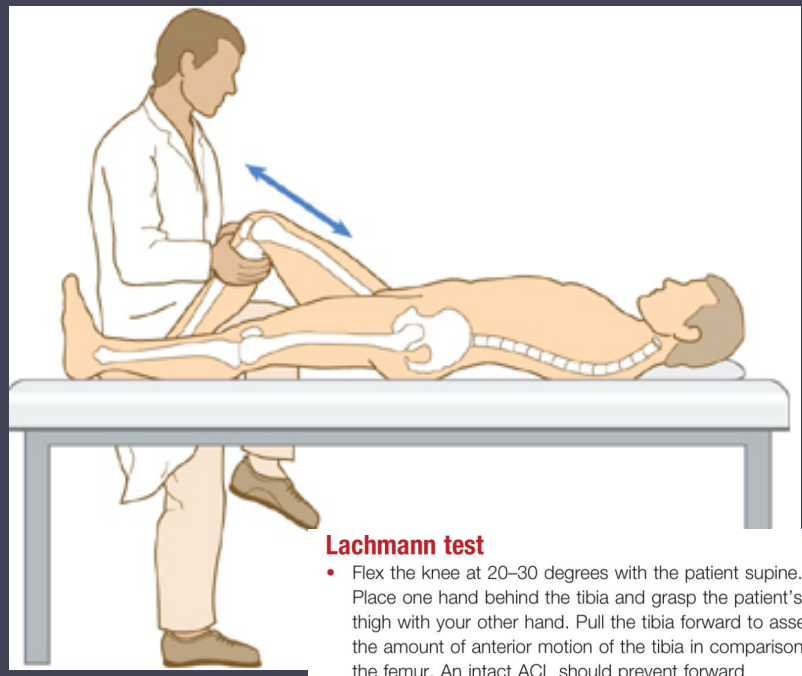
Varus & valgus stress tests



Special Tests:

Cruciate Ligaments:

Anterior drawer (ACL)



Lachmann test

- Flex the knee at 20–30 degrees with the patient supine. Place one hand behind the tibia and grasp the patient's thigh with your other hand. Pull the tibia forward to assess the amount of anterior motion of the tibia in comparison to the femur. An intact ACL should prevent forward translational movement ('firm endpoint'), while a deficient ACL will allow increased forward translation without a decisive 'endpoint'.

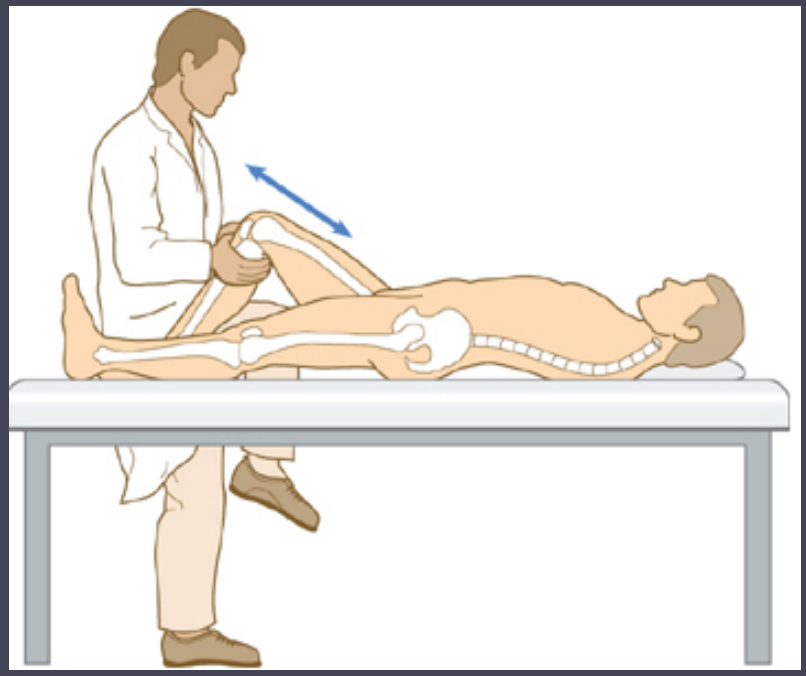
Anterior drawer test

- Flex the patient's knee to 90 degrees and maintain this position using your thigh to immobilise the patient's foot.
- Check that the hamstring muscles are relaxed and look for posterior sag (posterior subluxation of the tibia on the femur). This causes a false-positive anterior drawer sign that should not be interpreted as ACL laxity.
- With your hands behind the upper tibia and both thumbs over the tibial tuberosity, pull the tibia anteriorly (Fig. 13.41B). Significant movement (compared with the opposite knee) indicates that the ACL is lax. Movement of >1.5 cm suggests ACL rupture. There is often an associated medial ligament injury.

Special Tests:

Cruciate Ligaments:

Posterior drawer (PCL)

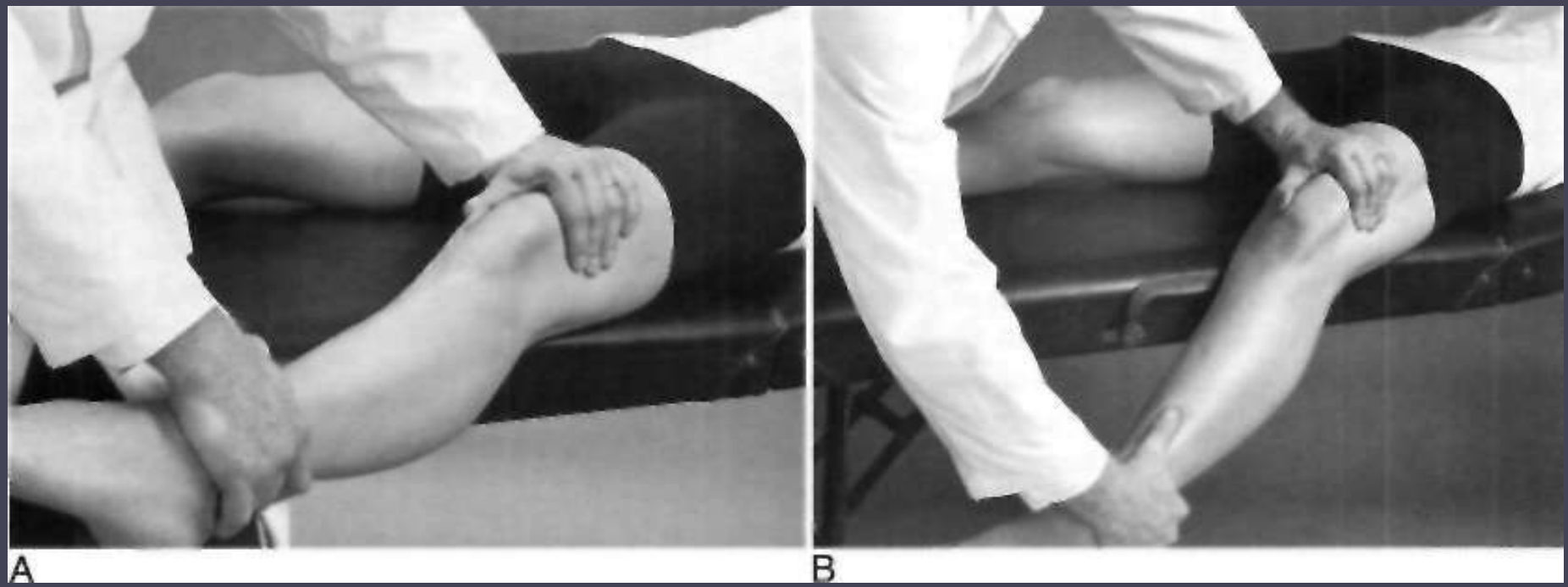


Posterior drawer test

- Push backwards on the tibia. Posterior movement of the tibia suggests posterior cruciate ligament laxity.

Special Tests:

Patellar apprehension test



Special Tests:

Medial Meniscal tears:

Medial McMurray test

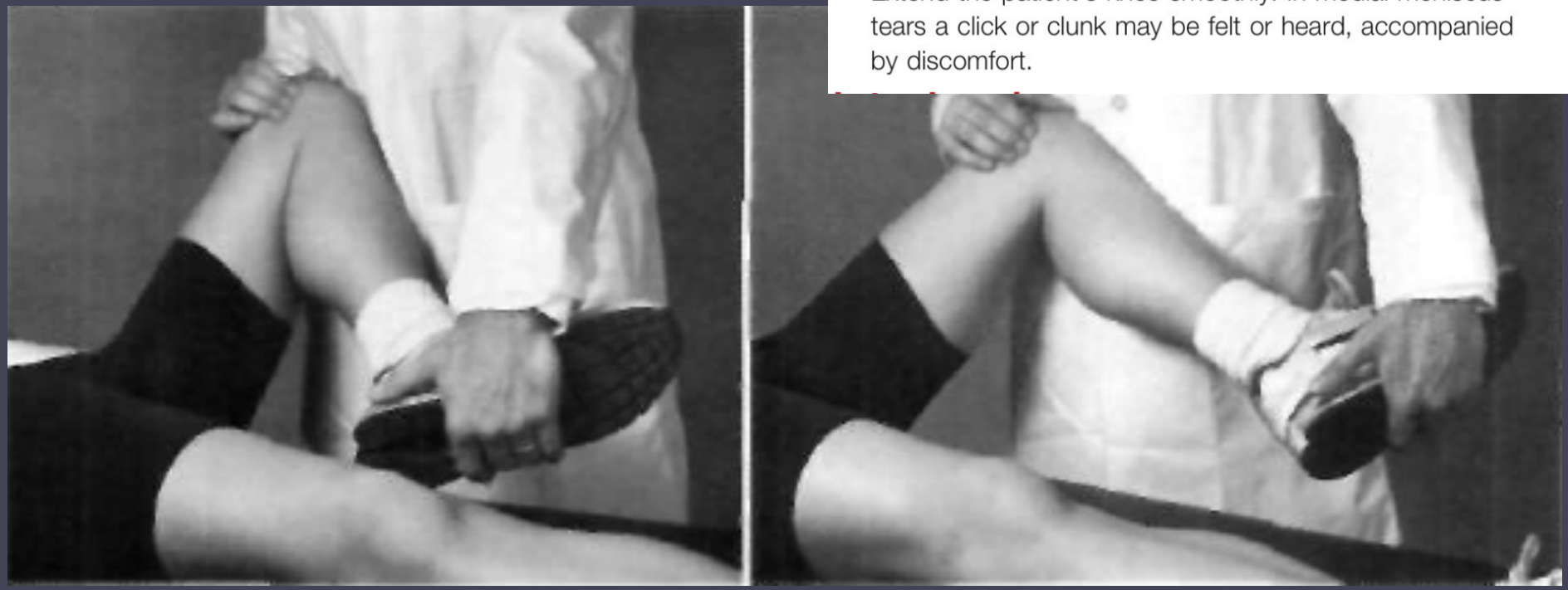
Tests for meniscal tears

Meniscal tears in younger, sporty patients usually result from a twisting injury to the weight-bearing leg. In middle-aged patients, degenerative, horizontal cleavage of the menisci is common, with no history of trauma. Meniscal injuries commonly cause effusions, especially on weight bearing or after exercise. Associated joint-line tenderness is common.

A simple test for a meniscal tear is to extend the patient's knee rapidly from 30 degrees flexion to full extension. If the patient experiences medial or lateral pain, this suggests a tear, and formal testing should take place.

Medial meniscus

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



Special Tests:

Lateral Meniscal tears:

Lateral McMurray test

Lateral meniscus

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

13.6 Clinical vignette: joint pain and rash

A 32-year-old lady is seen in the outpatient clinic with fatigue and intermittent pain and swelling in her hands, which she has had for the last year. She noticed a rash across her cheeks and on her arms while she was on holiday in Spain recently and this seems to have sparked off painful mouth ulcers and worsening joint pain. She has no other relevant history. Examination shows a 'butterfly' rash across the cheeks and nose, several mouth ulcers and two swollen metacarpophalangeal joints. Blood tests reveal anaemia, lymphopenia, positive antinuclear antibody and raised anti-double-stranded DNA antibodies.

A diagnosis of systemic lupus erythematosus is made.

13.13 Clinical vignette: back pain

A 34-year-old man attends his general practitioner's surgery with back pain. He first developed pain in his late teens but it improved for a few years. He has had persistent pain in his lower back and sometimes his buttocks for 5 years now. It wakes him from sleep and he can be very stiff in the mornings, although this eases as the morning progresses. There is no radiation to the leg. He is stiff after sitting or driving. He has always put it down to his occupation. He has used ibuprofen to good effect but has had diarrhoea and abdominal pain recently, which he attributes to this drug. Examination in the outpatient clinic shows a thin man with reduced lumbar mobility (modified Schober's index, reduced at 2 cm; see Fig. 13.15), pain on sacroiliac joint compression, and tenderness at his Achilles insertion. Investigations show him to have a raised C-reactive protein, an anaemia of chronic disease, a positive human leucocyte antigen B27 and a raised faecal calprotectin, suggesting inflammatory bowel disease. Magnetic resonance imaging confirms bilateral sacroiliitis and inflammatory changes in the lumbar spine.

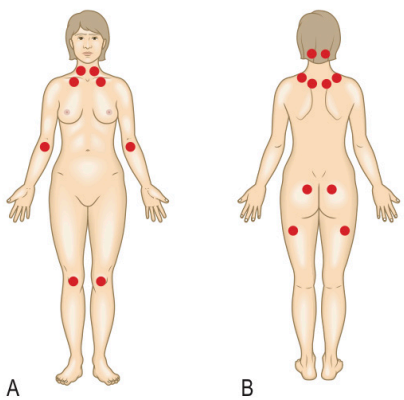
A diagnosis of axial spondyloarthritis is made.

Ankylosing spondylitis. The patient trying to touch his toes.

13.4 Clinical vignette: arthralgia and fatigue

A 34-year-old mother-of-two presents to her GP with a 1-year history of gradually worsening pain and persistent fatigue. The pain moves around and involves the back, neck, shoulders, elbows, hands and knees. All joints are described as swollen, particularly her hands, which swell 'all over'. Further history reveals poor sleep with the patient wakening every 2 hours and feeling unrefreshed in the morning. She has a difficult social background and a past history of depression and irritable bowel syndrome. Examination shows no skin or joint abnormality but there is widespread tenderness, particularly across her shoulders, in her neck and down her back (see figure). Blood tests are all normal.

She is diagnosed with fibromyalgia.



Typical tender points in fibromyalgia. A Anterior view. B Posterio view.