

ORTHOPAEDICS

SPINE EXAM

Today I examined **Mr Smith**, a **32-year-old male**. On general inspection, the patient appeared comfortable at rest, with no stigmata of musculoskeletal disease. There were no objects or medical equipment around the bed of relevance. "Assessment of the **spine** revealed **normal alignment**, with no tenderness on **palpation**. The **range of movement** of the **cervical, thoracic** and **lumbar** spine was **normal**." In summary, these findings are consistent with a **normal examination of the spine**." For completeness, I would like to perform the following **further neurovascular exams** and **review available images**."

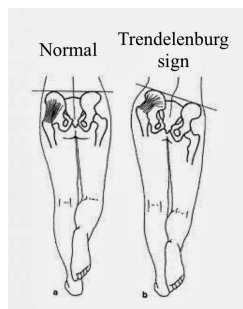
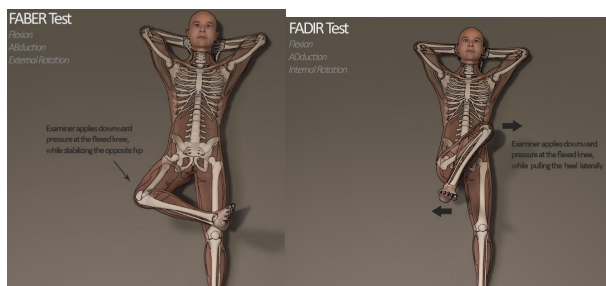
General inspection	<ul style="list-style-type: none">Responsive Vital signs Mobility aidsExposure upper body (maintain privacy) → weight (body habitus) → risk factor for osteoarthritis		
Assess gait	<ul style="list-style-type: none">Observe gait [walk normal – tip-toes (S1) – heel (L5)] → ASSESS symmetry, smoothness, discomfort, ability to turn quickly?<ul style="list-style-type: none">foot drop – neurological [common fibular nerve entrapment]stiff and slow – rheumatological [inflammation slows down motion] PARKINSONS'antalgic gait → Sciatica pain		
Inspection [SWEAT]	Anterior	Lateral (begin here)	Posterior:
	<ul style="list-style-type: none">Scars (joint replacement) & BruisingCachexiaErythema skin (active arthritis or infection)Asymmetry of shoulder girdle (e.g. dislocation)Rash (psoriasis)Abnormalities in feet/hands (e.g. clawing, high/low arch profile, presence of hallux valgus, dactylitis)	Deformity <ul style="list-style-type: none">Cervical lordosisThoracic kyphosisLumbar lordosisfoot arches	<ul style="list-style-type: none">SWEATPopliteal swelling (baker's cyst – fluid filled sac behind the knee)Spinal & iliac crest alignmentScoliosis (Equal level of iliac crests) → leaning forward emphasizes thisAbnormal tuft of hair (lumbar) – spina bifida
Cervical spine <i>[patient prone supported by pillow]</i>	Movement (active)	<ul style="list-style-type: none">Flexion (chin tuck – C1 → ≈80°)Extension (looking up → ≈50°)Lateral flexion (Tilt head to side (Ear to shoulder)→ ≈45°)Rotation (look left and right → ≈80°) → check eyelashes (more eyelashes seen = reduced ROM)	
	Special tests <i>[Spurling's test]</i>	<ul style="list-style-type: none">Spurling test: PATIENT rotates head and extends towards affected side worsens symptoms → apply force downwards to reproduce nerve root symptoms	
	Feel	<ul style="list-style-type: none">skin warmth → cool joint (not inflammatory), warm joint (active synovitis, infection, gout)tenderness and uneven spacing between C1-C7 spinous processes<ul style="list-style-type: none">when patient sitting downwhen patient is prone with chest supported by pillow)	
Thoraco-lumbar spine <i>(standing → lying)</i>	Movement (Active) & Special tests	<ul style="list-style-type: none">Flexion (Bend down to touch toes)Extension (lean backwards) → 10-20°Lateral flexion (lumbar) → (right hand reach down right leg)	
	Special tests <i>[Schober's test]</i>	<ul style="list-style-type: none">Identify PSIS on either SIDEMark 5cm below and 10cm above PSISLumbar flexion → distance > 20cm (ank spondylitis)	
	Special tests <i>[Quadrant test]</i>	<ul style="list-style-type: none">Rotate spine + lean backwardsApply pressure down on shoulders	
	Movement (active #2)	<ul style="list-style-type: none">Sit down on bed → cross arms → Rotation (thoracic) → 10-20°	
	Feel (prone)	<ul style="list-style-type: none">skin warmth → cool joint (not inflammatory), warm joint (active synovitis, infection, gout)Apply pressure on:<ul style="list-style-type: none">tenderness → fibromyalgiaPosterior spinous processes OR renal angle tenderness (pyelonephritis)paravertebral muscles [Use thumb]	
	Feel (supine)	<ul style="list-style-type: none">Straight leg raise → lift leg to 80-90° [Pain in posterior thigh or buttock = sciatica pain]Sacroiliac test: Faber's test → stabilize pelvis + knee acts as lever<ul style="list-style-type: none">Back pain = lumbar back painAnterior pain = Hip issue	
	Other	<ul style="list-style-type: none">Power tests [bring thigh up → and down → bend your knee → extend knee]Knee reflexes [patella tap]NEUROVASCULAR STATUS	
Requests/ Tests	<ul style="list-style-type: none">Rheumatological suspicion (ESR/CRP, ANA – anti-nuclear antibody) →<ul style="list-style-type: none">proceed for anti-CCP, HLA-B27 (for sero-negative spondyloarthropathies)FBC/ALT (nephropathy → e.g. methotrexate induces liver enzyme activity)MRI (identify possible joint inflammation especially for AS)DXA scan → check for osteoporosis to reduce fracture risk → high risk of mortality, immobility		
Herniation level:	Nerve root	Dermatome (sensation loss)	Movement lost
• L3/4 = 5%	L4	Medial shin	Knee extension, ankle DF
• L4/5 = 50%	L5	Top of foot	Toe DF, Foot eversion
• L5/S1 = 45%	S1	Back of foot	Knee flexion, ankle PF, Toe inversion
• Deep peroneal	L4-S1	Lateral ½ big toe & medial ½ 2 nd toe	Anterior leg muscles – DF (EHL, EDL), Inversion (Ant. Tib)
• Superficial peroneal	L5-S2	Dorsal foot	Lateral leg muscles (FB, FL) = Eversion
• Tibial	L4-S3	Plantar foot	Posterior leg muscles – Ankle PF [tip-toe on one foot – GC, soleus]

Root Reflex Weakness	C5 Biceps Biceps/deltoid	C6 Biceps supinator Biceps supinator	C7 Triceps All extensors of arm	C8 Finger flexors	T1 All intrinsic hand muscles Horner's syndrome	Root Reflex Weakness	L3 Knee Knee extension Hip adduction	L4 Knee Knee extension Ankle dorsiflexion	L5 Toe dorsiflexion Eversion	S1 Ankle Ankle plantarflexion Inversion of toes Knee flexion

Hip Examination

Watching you walk, looking at your hip joints, feeling your hip joint and then checking the movements of hip joints

Key Hx Points	<ul style="list-style-type: none">• True hip pain = anterior groin pain radiating to knee• Trochanteric bursitis/gluteus medius tendinitis or tear = pain over greater trochanter [sprinter athletes]• Psoas bursitis or tendon slipping of gluteus maximus = clicking or snapping from hip region• Functional impairment = pain and difficult walking and climbing stairs, and sitting down and standing up• Fever, weight loss = septic arthritis (staph, gonococcal), or malignancy• Signs of hypermobility , arachnodactyly			
Exam	GAIT	<ul style="list-style-type: none">• Limping = antalgic gait (painful on one side)• Samba dance = weak muscles• Mobility aids (walking stick)		
	Special tests [Trendelenburg]	<ol style="list-style-type: none">1. Place hand on iliac crest on either side + patient stands on one leg for 30 seconds and flex other leg2. Notice which hand moves up or down3. In older patients, do from anterior and hold out your hand (if they require a lot of support = +ve test)4. <u>Normally</u> → iliac crest on side of foot off the ground will rise up (may rise up more if strong abductors) <p>Positive Trendelenburg sign = non-weight bearing hip sags & does not rise when standing on one leg</p> <ul style="list-style-type: none">○ proximal myopathy of standing leg causing weak hip abduction (i.e. gluteus medius/minimus) on contralateral hip → may indicate significant hip arthritis○ R hip pathology = stand on R hip, L hip lowers/drops due to pain and weak abductors and shortened femoral neck		
	LOOK @ HIP [SWEAT]	<ul style="list-style-type: none">• Patient supine• Front: Scars, Quadriceps wasting (posterior), erythema, asymmetry• One leg shorter → femur fracture?		
	FEEL HIP [anterior, lateral] "Don't forget the bump!"	<ul style="list-style-type: none">• Temperature (hot = inflammation/infection?, cold = peripheral vascular disease)• Locate ASIS + pubic symphysis<ul style="list-style-type: none">○ Feel for Joint tenderness (at midpoint of inguinal ligament)• Roll over → Locate PSIS [depression in back]• Palpate greater trochanter → Tenderness = trochanteric bursitis (DON'T FORGET THE BUMP)		
	Move HIP (active → passive) ALWAYS LOOK AT THEIR FACE	General	<ul style="list-style-type: none">• Abduction (50°) & Adduction (45°) → patient spread legs out and in [You help]• Flexion (120°) → active then passive• Internal (away from body) and external (towards patient) rotation (both knee and hip must be flexed at 90°)• [DO LAST] PATIENT PRONE: Extension → hand on sacroiliac joint (30°) <p>Restricted internal rotation, abduction and extension = OA</p>	
		FABER [Figure 4]	<ul style="list-style-type: none">• Flexion of hip → abduction of hip (spread open legs) → external rotation of hip• Push on knee and hip<ul style="list-style-type: none">○ Limited ROM = Hip or iliopsoas disease○ Pain on hip = SI joint disease○ Pain on knee = hip issue	
		FADIR	<ul style="list-style-type: none">• Flexion of hip → adduction of hip → internal rotation of hip• Apply inward pressure on acetabulum → pain in acetabulum?	
	Measure HIP [Leg length]	<ul style="list-style-type: none">• True leg length: ASIS → medial malleolus → abnormal = hip disease on shorter side [possible neck of femur fracture since quadriceps pulls leg upwards]• Apparent length: Umbilicus → Medial malleolus → difference in length = pelvic tilting		
Special tests [Thomas' test]	<p>NEUROVASCULAR STATUS</p> <p>Thomas' test → measure the flexibility of hip flexors (i.e. iliopsoas muscle group, rectus femoris, pectineus, gracillis, tensor fascia latae and sartorius)</p> <ul style="list-style-type: none">• Place hand under patient's spine → flatten any lumbar lordosis• Actively flex leg as far as possible (use hands to pull)→ contralateral leg should be flat on bed• Positive test = unflexed thigh lifts off the bed → loss of hip extension = FIXED hip flexion contracture (muscle spasm)			




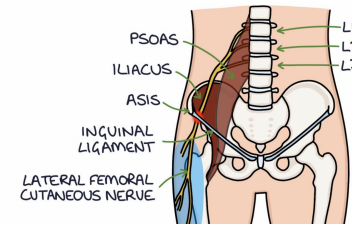
Pathology in L) hip abductors

Movements of the hip.



(a) Flexion; (b) extension; (c) flexion, knee bent; (d) internal rotation; (e) external rotation; (f) abduction

Common conditions affecting the spine and hip

	Pathophysiology	RF	Sx	Exam / Ix	Treatment				
Compartment syndrome	Pressure in fascial compartment abnormally elevated restricting blood supply 2 types: ➤ Acute – assoc. with acute injury ➤ Chronic – aka chronic exertional compartmental syndrome – assoc. with exertion ONLY (no pain when at rest)	• Bone fracture • Crush injury • Recent tight backslabs / plaster of paris	• Pain disproportionate • Paraesthesia • Pale • Pressure high • Paralysis (late sign) Nb: pulseless is not a feature unlike acute limb iscaemia	• Needle manometry – measure compartment pressure (measure before and after exertion – especially for chronic compartment syndrome)	Orthopaedic emergency ➤ Remove external dressing /casts ➤ Elevating leg to heart level ➤ Avoid HypoTN ➤ Fasciotomy +/- debride tissue necrosis (wound left open and covered with dressing)				
Osteomyelitis	Inflammation of bone and bone marrow (due to bacterial infection) ➤ Haematogeneous osteomyelitis – pathogen carried through blood and seeded in bone (most common method of infection)	• Open # • Prosthetic joints (1%) • DM • PAD • IVDU • Immunosupp.	• Fever • Pain • Tenderness • Erythema • Swelling	x-ray (may not show any osteopenia or bone damage) ➤ MRI (best) ➤ FBC, EUC, ESR ➤ 2x blood culture ➤ Bone cultures	Orthopaedic + ID referral ➤ Surgical debridement ➤ ABx – 6x week flucloxac +/- rifampicin for first 2 weeks <i>Vancomycin (MRSA)</i> <i>Clindamycin (if penicillin allergy)</i> <i>Chronic osteomyelitis (3/12 ABx)</i>				
Sarcoma (rare)	Bone sarcoma ➤ Osteosarcoma (most common) ➤ Chondrosarcoma ➤ Ewing sarcoma (children, teens) Soft tissue sarcoma ➤ Rhabdomyosarcoma ➤ Leiomyosarcoma ➤ Liposarcoma ➤ Synovial sarcoma ➤ Angiosarcoma ➤ Kaposi's sarcoma (HHV8 – HIV)	FHx: ➤ <i>Li fraumelli</i>	• Soft tissue lump • Persistent bone pain (nocturnal waking) • UWL, fevers, NS	• XR • USS • CT/MR – check for mets spread • Biopsy (TNM staging)	Sarcoma MDT ➤ Surgery (preferred Rx) ➤ Radiotherapy ➤ Chemotherapy ➤ Palliative care				
Back pain and sciatica	Causes of sciatica (L4-S3) ➤ Herniated disc (LEADING CAUSE) ➤ Spondylolisthesis (anterior displacement of vertebra) ➤ Spinal stenosis ➤ Nb: bilateral sciatica = cauda equina	DDx of acute back pain: • Most back pain 90% =non-specific • Spinal fracture (e.g., major trauma) • Cauda equina (LMN lesion) (e.g., saddle anaesthesia, urinary retention, incontinence or bilateral FND, reduced anal tone and reflexes) • Spinal stenosis (e.g., intermittent neurogenic claudication) • Ankylosing spondylitis (e.g., age under 40, gradual onset, morning stiffness or night-time pain) • Spinal infection (e.g., fever or a history of IV drug use)	MOST do not imaging or tests • FBC, CRP (inflammatory?) • ABPI and CT angio to exclude peripheral arterial disease (if intermittent claudication Sx present) • Imaging only if specific cause or serious cause (e.g. cauda equina, epidural abscess) • XR and MRI (bamboo spine and bone oedema for AS or >6 wk sciatica) Nb: Patients w/ radicular pain may NOT need imaging as does not change Mx	• Self-Mx, education, • keeping active and losing wt • Physiotherapy, group exercise (tai-chi), CBT • NSAID, codeine, and benzos • Amitriptyline • Duloxetine Specialist management for chronic sciatica: ➤ epidural steroid injections ➤ RF ablation ➤ Surgical discectomy (faster recovery but same healing as time as conservative Mx)					
Cauda equina syndrome	Main causes of cauda equina: ➤ secondary mets common from [PORTABLE]= Prostate, Renal, Thyroid, Breast, Lung ➤ Herniated disc ➤ Abscess (infection) ➤ Spondylolisthesis	Causes of stenosis: ➤ Congenital ➤ Degenerative changes (facet joint changes, bone spurs, disc disease) ➤ Herniated discs ➤ Thickened PLL, or ligamentum flava ➤ Spinal # ➤ Spondylolisthesis ➤ Tumours		Neurosurgical referral ➤ Emergency MRI scan ➤ Lumbar decompression surgery ➤ If metastatic spinal cord compression → High-dose steroids of- reduce swelling and compression					
Spinal stenosis	Narrowing of spinal canal – 3 main types ➤ Central stenosis → pseudoclaudication (buttock pain and leg weakness) BUT normal peripheral pulses unlike PAD ➤ Lateral stenosis → sciatica ➤ Foraminal stenosis → sciatica			Refer to neurosurgeon • General = PA, wt loss, analgesia, PT and decompression surgery • Laminectomy (remove part of lamina to widen stenosis)					
	Pathophysiology	RF	Sx	Exam / Ix	Treatment				
Hip Fracture 	➤ 30 day mortality rate (5-10%) ➤ Aim surgery within 48hrs <table><tr><td>Intra-capsular</td><td>➤ Undisplaced < 60 → cannulated screws (internal fixation) ➤ Displaced > 60 (grade 3 and 4) → THR, hemiarthroplasty (since BV compromise)</td></tr><tr><td>Extra-capsular</td><td>➤ Intertrochanteric → dynamic or sliding hip screw ➤ Subtrochanteric → IM nail into proximal femur shaft</td></tr></table>	Intra-capsular	➤ Undisplaced < 60 → cannulated screws (internal fixation) ➤ Displaced > 60 (grade 3 and 4) → THR, hemiarthroplasty (since BV compromise)	Extra-capsular	➤ Intertrochanteric → dynamic or sliding hip screw ➤ Subtrochanteric → IM nail into proximal femur shaft	• OP • Advanced age Falls risk • Anaemia • Electrolyte • HF, arrhythmia • MI, Stroke • Parkinson's • URTI, UTI	• Groin/ hip pain radiating to knee • Cannot wt bear • Shortened abducted and ER leg Avascular necrosis (medial and lateral circumflex arteries)	• XR (AP and lateral) :shenton's line disrupted on AP "usu. continuous line from medial border of femoral neck to inferior border of superior pubic ramus" • MRI/CT (if negative XR but suspected #)	• Treat reversible cause for falls • Analgesia • VTE prophylaxis - clexane • Pre-op assessment (bloods, ECG) • Orthogeriatrics input • ERAS – early wt bearing post-op (assistance w/ PT)
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Extra-capsular	➤ Intertrochanteric → dynamic or sliding hip screw ➤ Subtrochanteric → IM nail into proximal femur shaft								
Meralgia Paresthetica	Compression of lateral cutaneous femoral nerve – ➤ L1-3 nerve roots (mononeuropathy) 	• Tight belts or seatbelts (truck driver) • Obesity • Immobility prolonged	• Only sensory sx - paraesthesia, hair loss, cold sensation • Worse on movement (esp. hip extension) • Better at rest • NO motor sx	None:	Conservative • Rest + looser clothing (no tight belts) • Weight loss • Physiotherapy Medical ➤ Analgesia (Panadol, NSAIDs) ➤ Neuropathic analgesia (amitriptyline, gabapentin, duloxetine) ➤ Local steroid injections Surgical ➤ Decompression ➤ Transection (cut) ➤ Resection (remove)				
Trochanteric bursitis	Inflammation of bursa over greater trochanter on outer hip "greater trochanteric pain syndrome"	• Friction from repetitive movements • Trauma • RA • Infection	• Localised warm painful hot joint • Swelling (inflamed bursa) • Worse on lying on side	Any pain with following tests = bursitis • +ve trendelenberg • Resisted adduction • Resisted IR • Resisted ER	• RICE • Analgesia (NSAIDs) • Physiotherapy • Steroid injections • Abx (if fever present) Explain that it may take at least 6 months to recover				

Knee Examination (COMPLEX HINGE JOINT)

Hx	<ul style="list-style-type: none"> Pain: localised (mechanical trauma), diffuse (inflammatory disease) → Stiffness: gradual (OA) Locking: cannot reach full extension (mechanical issue = torn meniscus or loose body) → ALSO affects flexion Swelling: sudden after injury (heamarthroses) but also arthritis and synovitis Deformity: arthritis Unstable: ruptured ligaments
General	<ul style="list-style-type: none"> Adequate exposure (remove socks and shoes) Difficulty undressing?
Gait	Inspect foot wear and walking aids
LOOK Anterior posterior	<ul style="list-style-type: none"> General (sweat): Scars, Quadriceps Wasting (Esp. Vastus Medius → OA?), Erythema, Asymmetry Lateral: Knee Flexion, Foot Arches, Toe Deformity Posterior: Iliac Crest Alignment, Gluteal Muscle Bulk, Popliteal Swelling & Hindfoot Abnormalities Varus Thrust = Bowing Of Knee During Gait "Where Is My Horse?" (OA) Valgus Thrust = Knocked Knees = arthritis Patella Height (sit on end of bed)
FEEL	<p>Tell me if there is any pain?</p> <ol style="list-style-type: none"> Joint Temp Palpate (flex at 30°): tibial tuberosity → patella tendon → around patella → medial/lateral joint lines (meniscal cyst) → popliteal fossa (Baker's cyst, DVT, popliteal entrapment syndrome) Effusion check: <ol style="list-style-type: none"> Swipe sign . bulge = small effusion Patellar tap = compress suprapatellar pouch → confirm large effusions [PUSH HARD] Quadriceps circumference (20cm above tibial tuberosity)
MOVE (active then passive)	<ul style="list-style-type: none"> Flexion (135°) + Extension (5°) <ul style="list-style-type: none"> rest hand on joint lines of knee cap Passive movement → [hear for crepitus = normal] <ul style="list-style-type: none"> Passive knee flexion Passive knee hyperextension (>10° = abnormal) NEUROVASCULAR STATUS
Special test "Extra tests"	<ol style="list-style-type: none"> Medial and lateral collateral ligaments <ol style="list-style-type: none"> Flex leg at 15° → hold behind knee and move leg laterally/medially Anterior (towards you - PCL)/Posterior (away from you - ACL) drawer test <ol style="list-style-type: none"> Place fingers on medial and lateral tibia Lachman's test → check for ACL injury or tear <ol style="list-style-type: none"> Flex leg to 30° Hold lower leg with one hand & thigh on the other Hand on thigh → Pull tibia forward on femur while other hand stabilises femur McMurray's test: (test for lateral meniscal tear): <ol style="list-style-type: none"> Patient flexes → hold joint lines + hold bottom of patient's ankle and: <ol style="list-style-type: none"> IR tibia (turn foot inwards) → apply varus pressure to knee = lateral meniscus ER tibia (turn foot outwards) → apply valgus pressure to knee = medial meniscus +ve sign = popping sensation followed by inability to extend knee CHECK FOR ANY CREPITUS (?OA, patella maltracking) Apley's grinding test (test for meniscal damage) <ol style="list-style-type: none"> Patient prone → flex knee to 90° → hold knee while twisting and pushing down via tibia (i.e. IR + ER of tibia w/ downward pressure) Apprehension test → lift knee up and repeat (put more pressure on meniscus)

Testing for patellar effusion.

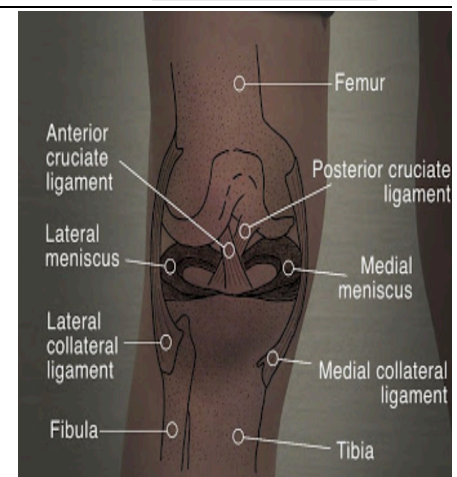


(a) The patellar tap; (b) the bulge sign; compressing the suprapatellar pouch

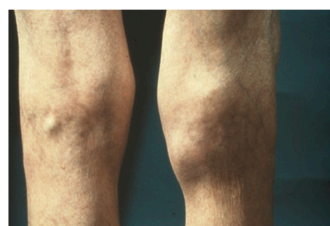
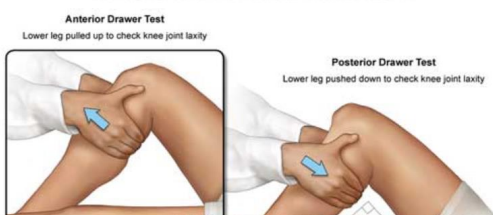
Knee examination.



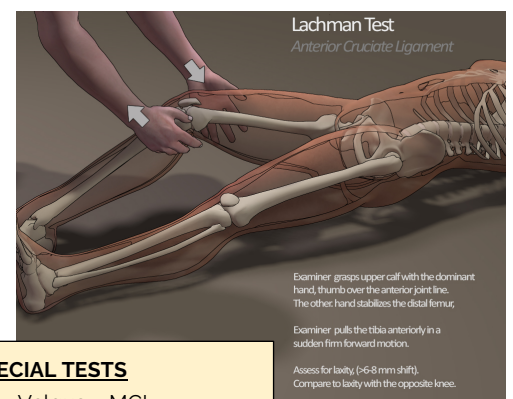
(a) Testing knee flexion—"Let me bend your knee"; (b) testing the collateral ligaments; (c) testing the cruciate ligaments



Anterior and Posterior Drawer Tests

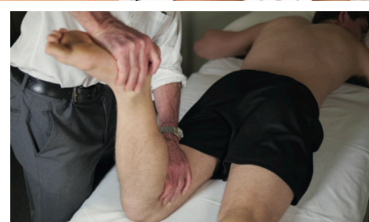


Baker's cyst of the right knee, viewed from behind

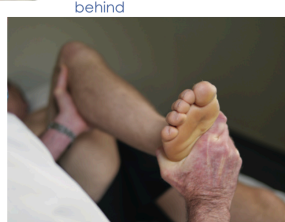


SPECIAL TESTS

- Valgus – MCL
- Varus = LCL



Apley's grinding test (push hard)



McMurray's test of the knee

ANKLE AND FEET Examination

Today I examined **Mr Smith**, a **32-year-old male**. On general inspection, the patient appeared comfortable at rest, with no peripheral stigmata of musculoskeletal disease. There were no objects or medical equipment around the bed. Assessment of the **lower limbs** revealed an unremarkable **gait** and **hip/ankle joint appearance**. The **range of movement** of both hip/ankle/foot joints was also normal with no evidence of **pelvic tilt** or **fixed flexion deformity of the hip/foot deformity**. In summary, these findings are consistent with a **normal hip (ankle and foot) joint examination**. For completeness, I would like to perform the following **Neurovascular exam** (no need for X-ray/MRI)

Hx	<ul style="list-style-type: none">Pain: only when wearing shoes OR specific area<ul style="list-style-type: none">Ask: sports that require twisting of foot (e.g. netball, football), Hx of RA,Severe pain = gout or after vigorous exercise (likely stress fracture)Excess Alcohol or seafood intake = goutSwelling: bilateral (inflammation), over medial aspect of 1st metatarsal head at bunion (aging or RA)Paraesthesia: cold feet (not diabetes) BUT if cyanosis or ulceration (diabetes)																
Exam	Gait	<ul style="list-style-type: none">Adequate exposure [socks & shoes off] walking aids (INSPECT FOOTWEAR)<ul style="list-style-type: none">Ask to walk on tippy toes → Inability = possible posterior leg muscle, achilles tendon or tibial nerve entrapment (S1)Walk on heel → possible weakness of anterior leg compartment (L5)Antalgic gait = gait in response to painStiff knee gait = when flexed knee or weak quadricepsFlexed Knee Gait - short stride without heel strike & toe offVarus thrust = Bowing of knee during gaitValgus thrust = sudden onset of valgus as limb accepts weight															
	LOOK [all sides]	<ul style="list-style-type: none">General: SWEAT, toe deformities (e.g. hallux vagus, clawing, toe crowding in RA), ulcers, Raynauds, rash, callus, BunionsNail changes (PSA) = psoriasis, ingrown nail, pitting?Anterior: symmetry, # of toes, sausage digits (dactylitis -PSA)On side: Transverse Foot arches – If flattened (RA)Posterior: Achilles tendon, symmetry, scars, swelling, RA nodules	<p>Rheumatoid nodule of the Achilles tendon</p>														
	FEEL	<p><u>Let me know of any pain before checking joints</u></p> <ol style="list-style-type: none">Temperature & Pulse (Dorsalis pedis & posterior tibial)MTP → IP → MT<ul style="list-style-type: none">Inspect for tinea in between toes!Tarsal → ankle → medial/lateral malleoli → subtalar → calcaneus → distal fibulaPlantar fascia insertion (metatarsal heads → base of 5th metatarsal → calcaneum)Metatarsal squeeze across whole foot (Morton's neuroma) <p><i>*capillary refill time [for diabetes and neuro]</i></p> <table><tr><th>Location</th><th>Pathology</th></tr><tr><td>Tender posterior medial malleolus</td><td>suspected ankle fracture</td></tr><tr><td>Tenderness/Pain Between 3rd and 4th metatarsals</td><td>Morton's neuroma = nerve entrapment and swelling of digital nerve between toes = pain and numbness</td></tr><tr><td>Tender Inferior aspect of heel</td><td>Plantar fasciitis → seronegative spondyloarthropathies</td></tr><tr><td>Tender/stiff interphalangeal joint</td><td>seronegative spondyloarthropathies</td></tr><tr><td>Tender MTP joint</td><td>Early RA NB: Extremely Tender 1st MTP joint = possible acute gout!</td></tr><tr><td>Tender Achilles tendon + RA nodules</td><td>Achilles tendinitis</td></tr></table> <div></div>	Location	Pathology	Tender posterior medial malleolus	suspected ankle fracture	Tenderness/Pain Between 3 rd and 4 th metatarsals	Morton's neuroma = nerve entrapment and swelling of digital nerve between toes = pain and numbness	Tender Inferior aspect of heel	Plantar fasciitis → seronegative spondyloarthropathies	Tender/stiff interphalangeal joint	seronegative spondyloarthropathies	Tender MTP joint	Early RA NB: Extremely Tender 1 st MTP joint = possible acute gout!	Tender Achilles tendon + RA nodules	Achilles tendinitis	
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Tender Inferior aspect of heel	Plantar fasciitis → seronegative spondyloarthropathies																
Tender/stiff interphalangeal joint	seronegative spondyloarthropathies																
Tender MTP joint	Early RA NB: Extremely Tender 1 st MTP joint = possible acute gout!																
Tender Achilles tendon + RA nodules	Achilles tendinitis																
Move (mostly active)	<ul style="list-style-type: none">Dorsiflexion (20°) and plantarflexion (50°) – “bring feet up as if pointing towards your head” “push your feet down like pressing down on pedal”Inversion (35°) /eversion (15°) of subtalar and mid-tarsal [pain and limited ROM]<ol style="list-style-type: none">“Try to touch the soles of your feet together.”“Try to angle the soles of your feet outwards as far as you are able to.”Flexion/Extension of Hallux and toes<ol style="list-style-type: none">“curl up your toes as tight as you can” “Extend toes back towards your head”																
Special tests	<ul style="list-style-type: none">Simmond's test (is Achilles tendon intact?) = squeeze calf [no movement of foot = Achilles tendon rupture]<ul style="list-style-type: none">Knee on bed and stand up straightInspect also: soles of feet, dry/cracked heels, tinea (i.e. scaly skin +/- red)Palpate for calcaneum & Achilles Tendon insertionTalar tilt / anterior drawer test – lateral ankle ligaments (anterior talofibular and calcaneofibular ligaments)NEUROVASCULAR STATUS																

Common conditions affecting the knee and ankle

	Pathophysiology	Risk factors	Common Symptoms	Exam / Ix	Treatment
Meniscal tear	<p>Meniscal damage - Trauma due to forceful twisting or hyper-flexing of the knee joint</p> <ul style="list-style-type: none"> Unhappy Triad = ACL, MCL + medial meniscus 	<ul style="list-style-type: none"> netballer's injury* athletes standing from seated 	<ul style="list-style-type: none"> A "pop" RAPID onset swelling Instability (cannot weight bear)- knee giving way Locking/clicking sound esp. ascending stairs 	<ul style="list-style-type: none"> Tender swollen joint line + reduced ROM McMurray test Apley grind test MRI (confirm Dx) Arthroscopy (gold standard to dx tear) 	<ul style="list-style-type: none"> 1st line = RICE + NSAID Physio (before and after surgery) Arthroscopic surgery <ul style="list-style-type: none"> Repair meniscus Resect affected meniscus portion
ACL / PCL tear rupture	<ul style="list-style-type: none"> ACL – normally stops tibia moving in front of femur (lateral intercondylar notch → anterior intercondylar area of tibia) PCL – normally stops tibia moving posterior to femur (medial intercondylar notch → to posterior intercondylar area of tibia) 	<ul style="list-style-type: none"> Trauma due to high friction surfaces + high intensity movements netballer's injury* 	<ul style="list-style-type: none"> A "pop" RAPID onset swelling Instability (cannot weight bear) 	<ul style="list-style-type: none"> Positive Lachman test (knee flexed at 20°) Positive Ant. drawer test MRI (confirm Dx) Arthroscopy (gold standard to dx tear) 	<ul style="list-style-type: none"> 1st line = NSAID Crutches and knee braces Physio (before and after surgery) Arthroscopic surgery (ligament reconstruction – for young active adults) – new ligament created from graft of tendon: <ul style="list-style-type: none"> Hamstring tendon Quadriceps tendon Bone-patellar tendon bone
Baker's cyst and rupture	<ul style="list-style-type: none"> Degenerative knee jt changes Rupture produces fluid leaking down into your calf DDx: DVT, abscess, ganglion cyst, lipoma, popliteal artery aneurysm, varicose veins, tumours 	<ul style="list-style-type: none"> Meniscal tears (main cause) OA Knee injury RA 	<ul style="list-style-type: none"> Pressure sensation or fullness Palpable lump, swelling Oedema = if cyst compress veins <p>If ruptured</p> <ul style="list-style-type: none"> Pain, swelling, redness 	<ul style="list-style-type: none"> Foucher's sign = lump gets smaller when knee flexed from full extension USS = confirm Dx and rule out DVT MRI = for surgery plan 	<p>Asymptomatic = no Rx</p> <p>Symptomatic</p> <ul style="list-style-type: none"> Activity mod. (PT) Analgesia (NSAID) USS-guided aspiration Steroid injections Surgery – arthroscopy to treat underlying issue (e.g. meniscal tear) – difficult to excise cyst
Osteoarthritis	<ul style="list-style-type: none"> Degenerative change Wear and tear Previous injury/trauma 	<ul style="list-style-type: none"> FHx Repetitive injury or trauma 	<ul style="list-style-type: none"> Asymmetrical Knee pain (worse on exercise) Stiffness (< 30 mins) → worse after immobile Elderly (>60) Hx of injury 	<ul style="list-style-type: none"> Effusion Higher BMI Quadriceps wasting (esp. vastus medius) Crepitus Heberden and Bouchard's nodes 	<ul style="list-style-type: none"> Weight loss (5% makes big difference) NSAIDs DO NOT REST FOR OA or tendinopathy → Hydrotherapy Denosumab?
Patellofemoral syndrome "Housemaid's"	<ul style="list-style-type: none"> cartilage under the MEDIAL kneecap is damaged due to injury or overuse. Involves patella, iliotibial tract, ligament laxity 	<ul style="list-style-type: none"> injury or overuse. DDx: Patellar maltracking 	<ul style="list-style-type: none"> Assymetricla Pain Muscle weakness Stiffness Antalgic gait 	<p>Frontal knee pain → exacerbated upon kneeling</p>	<ul style="list-style-type: none"> Brace Rest Ice packs
Osgood–Schlatter's disease	<p>Inflamed tibial tuberosity where patellar ligament inserts (secondary to multiple minor avulsion fractures)</p> <ul style="list-style-type: none"> Once resolved – hard non-tender bony lump over tibial tuberosity 	<ul style="list-style-type: none"> 10-15yo males 	<ul style="list-style-type: none"> Unilateral knee pain Visible hard tender lump Worse on activity 	<p>None</p>	<ul style="list-style-type: none"> RICE – reduce PA PT = strength joint and function Analgesia (NSAID) Surgery ONLY if complete avulsion fracture
Achilles tendinopathy	<p>2 types:</p> <ul style="list-style-type: none"> Insertion tendinopathy (within 2cm of insertion) Mid-portion tendinopathy (2-6cm above insertion) 	<ul style="list-style-type: none"> Sports (basketball, track athletes) Quinolone Abx (within 48hrs) DM HC INFLAMMATION 	<ul style="list-style-type: none"> Pain or ache in achilles tendon Stiff Tender Swelling Nodularity on palpation 	<p>None</p> <ul style="list-style-type: none"> Positive Simmond's test 	<ul style="list-style-type: none"> RICE – minimise rest Analgesia (NSAID) PT and orthotics (insloes) Extracorporeal shock wave therapy Surgery – remove nodules and alter tendon <p>NO steroid injection = ↑ rupture risk</p>
Achilles tendon rupture	<p>Sudden onset rupture of Achilles tendon (lost connection between gastrocnemius/soleus with calcaneus/heel)</p>	<ul style="list-style-type: none"> Sports (basketball, track athletes) Quinolone Abx (within 48hrs) Systemic steroids Advanced age FHx Existing tendinopathy 	<ul style="list-style-type: none"> Sudden onset Achilles pain Snapping sound and sensation 	<ul style="list-style-type: none"> Tender and DF position Weakness on PF of ankle Cannot stand on tiptoes Positive Simmond's test Confirm on USS 	<ul style="list-style-type: none"> Urgent ortho referral (same-day) RICE Analgesia (NSAID) Non-surgical = specialist boot to immobilise ankle with full plantarflexion in 1st boot then moving towards neutral (6-12 wk with high risk of recurrence) Surgical = surgically reattaches Achilles followed by specialist boot (long rehab process)
Plantar fasciitis	<p>Inflamed plantar fascia (attached to calcaneous)</p> <ul style="list-style-type: none"> Can lead to ruptured plantar fascia or fat pad atrophy 	<ul style="list-style-type: none"> Worse w/ pressure (prolonged walk/stand) 	<ul style="list-style-type: none"> Gradual onset pain on heel plantar aspect 	<ul style="list-style-type: none"> Tenderness on palpation 	<ul style="list-style-type: none"> RICE Analgesia (NSAID) PT Steroid injections
Fat pad atrophy	<p>Atrophy of fat pad over heel of foot</p>	<ul style="list-style-type: none"> age, inflammation or repetitive activity 	<ul style="list-style-type: none"> Similar to plantar fasciitis 	<p>USS – reduced fat pad thickness</p>	<ul style="list-style-type: none"> Analgesia Weight loss Comfort shoes (custom insoles)
Morton's neuroma	<p>Nerve dysfn in intermetatarsal space usu. 3rd and 4th metatarsal</p>	<ul style="list-style-type: none"> High heels Narrow shoes 	<ul style="list-style-type: none"> Pain at front of foot Lump sensation in shoes Paraesthesia in distal toes 	<ul style="list-style-type: none"> Analgesia (NSAID) PT Mulder's sign = painful click when rubbing either side of foot w/ 2 hands USS/MRI to confirm 	<ul style="list-style-type: none"> Activity mod (no high heels) Analgesia (NSAID) PT, insoles Wt loss RF ablation or excision of neuroma
Bunions (Hallux Valgus)	<p>Bony lump due to deformed MTP at base of big toe – inflamed and enlarged</p>	<ul style="list-style-type: none"> OA 	<ul style="list-style-type: none"> Painful while walking (esp. tight shoes) 	<p>Wt bearing XR</p>	<ul style="list-style-type: none"> Wide comfortable shoes Analgesia Surgery (definitive Rx)
Gout	<p>Crystal arthropathy where elevated uric acid levels</p>	<ul style="list-style-type: none"> Gout RF 	<ul style="list-style-type: none"> Common cause of pain and swelling in MTP 	<p>Joint fluid aspiration + polarised microscopy</p> <ul style="list-style-type: none"> Aim to exclude septic 	<ul style="list-style-type: none"> Restrict purine rich food, EtOH 1st LINE = NSAID 2nd line = colchicine 3rd line = Steroid injections *start allopurinol ONLY after acute attack settled

LIGAMENT INJURIES

Avoid US, MRI, X-ray [false Dx – freaks patient out to seek surgical Rx]

KNEE LIGAMENT INJURIES					ANKLE LIGAMENT INJURIES				
Ottawa rules (X-ray indication)	Knee x-ray indications: Ottawa knee rules (acute) <ul style="list-style-type: none">Age ≥55 yearsIsolated patella tendernessTenderness at head of fibulaInability to flex knee 90°Inability to bear weight (4 steps) immediately after injury and in emergency department <ul style="list-style-type: none">Traumatic knee injury (e.g. twisting, ACL, MCL, meniscus, LCL injuries)Swelling makes it difficult to exam (may need to wait 1 wk)				<div><div><div><div>Lateral view</div><div>Medial view</div></div><div><div><div>A Posterior edge or tip of lateral malleolus → 6 cm</div><div>B Posterior edge or tip of medial malleolus → 6 cm</div><div>C Base of 5th metatarsal</div><div>D Navicular</div></div></div><div><div>An ankle x ray series is required only if there is any pain in malleolar zone and any of these findings:<ul style="list-style-type: none">Bone tenderness at ABone tenderness at BInability to bear weight both immediately and in emergency department</div><div><div>A foot x ray series is required only if there is any pain in midfoot zone and any of these findings:<ul style="list-style-type: none">Bone tenderness at CBone tenderness at DInability to bear weight both immediately and in emergency department</div></div></div></div></div>				
	Exam	Damaged	MOA	Sx	<p>Palpate:</p> <ul style="list-style-type: none">Deltoid ligament (medial)Calcaneofibular, anterior talofibular, posterior talofibular (lateral)Fibular (?fracture) <p>Special test (more useful 3-5 days after acute injury)</p> <ul style="list-style-type: none">Squeeze test @ mid-lower leg: ?Intact syndesmosis?Anterior drawer test (?talofibular ligament)Tilt test (?lateral ligament issue → calcaneofibular) <p>FOOT EXAM:</p> <ul style="list-style-type: none">Lisfranc fracture = fracture/dislocation of jts in midfoot5th metatarsal base = # risk after XS ankle inversion due to ligament pulling				
General Mx	Crutches + analgesia + education <ul style="list-style-type: none">NSAID PO tds for 7 daysRICE – early mobilise, ice (20min 4x day), compress bandage, elevate for 24 hrsGradual weight bearing (2mins 2x/day for a mth) – while brushing teeth?Physio esp. if not improving in 1-2 wks								
Specific Mx	Grade	Sx	Rx	Healing Time	Grade	Sx	Rx	Healing Time	
	(1) Ligament stretch w/ microscopic tearing	➤ Stable knee on exam	Elastic wool and crepe bandage	2-4 wks	(1) Ligament stretch w/ microscopic tearing	➤ Local tender ➤ Mild swelling	Elastic compression bandage 2 wks	2-4 wks	
	(2) Ligament stretch w/ partial tear	➤ Laxity but definite endpoint	Knee brace	4-12 wks	(2) Ligament stretch w/ partial tear	➤ Local tender ➤ Oedema ➤ Bruising / ecchymoses ➤ Reduced ROM	Stirrup splint	4-12 wks	
	(3) Complete ligament rupture	➤ Jt opens > 1cm	MCL/LCL = knee brace ACL/PCL = cast + surgical reconstruction	6-12 wks		(3) Complete ligament rupture	➤ XS swelling ➤ XS pain ➤ XS instability	Aircast boot +/- surgery	3-6 mths
	Meniscus	➤ Knee gives way + click and locks	Arthroscopic repair if locked knee						
	<div><div>Healthy knee joint</div><div><div>Quadriceps tendon</div><div>Patella</div><div>Medial collateral ligament</div><div>Posterior cruciate ligament</div><div>Anterior cruciate ligament</div><div>Patellar tendon (ligament)</div></div><div><div>Femur</div><div>Articular cartilage</div><div>Meniscus</div><div>Lateral collateral ligament</div><div>Fibula</div><div>Tibia</div></div></div>				<p>DDx for ligament injury:</p> <ul style="list-style-type: none">###Septic arthritisInflammatory arthritis – RA, SpA (reactive)Juvenile arthritis (still's disease) <p>Mx considerations:</p> <ul style="list-style-type: none">Use paracetamol + Avoid NSAIDs if:<ul style="list-style-type: none">PUD, gastric ulcer HXAsthma (flare up via leukotriene pathway)PregnancyCaution w/<ul style="list-style-type: none">CCF/HTN/ILDCKDAspirin + anti-coagulant usageTriple whammy (ACEi + NSAID + Diuretics)				

SHOULDER Examination (**synovial ball-socket = very mobile & unstable**)

"Today I examined **Mrs Smith**, a **32-year-old female**. On general inspection, the patient appeared comfortable at rest, with no stigmata of musculoskeletal disease. There were no objects or medical equipment around the bed of relevance.

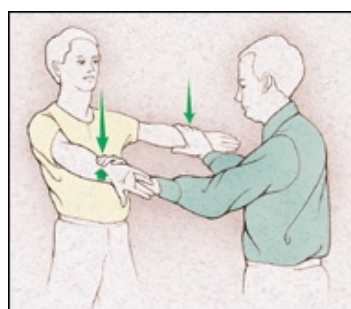
"Assessment of the **upper limbs** revealed a **normal shoulder joint appearance**, with no tenderness on **palpation**. He had a full range of **passive and active movements** in both shoulder joints was normal. "In summary, these findings are consistent with a **normal shoulder joint examination**. To complete the examination, I would also examine the **elbow** and the **cervical spine** as well as a neurovascular status of both upper limbs."

General:

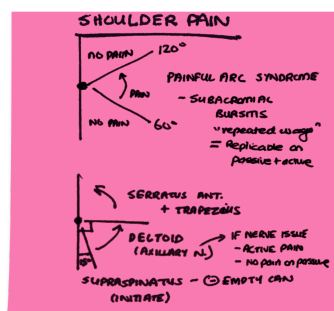
- Limited ROM + >70 years old + with abnormal X-ray (e.g. osteophytes) → **osteoarthritis**
- Limited ROM + young + normal X-ray → **adhesive capsulitis**
- UNSTABLE movements** → **rotator cuff muscles**: supraspinatus, infraspinatus, teres minor and subscapularis
- Young patients** = tendinitis and impingement
- Rare** = fracture dislocation

Hx	<ul style="list-style-type: none"> Pain → most common → felt over front and lateral part of joint radiating to insertion of deltoid <ul style="list-style-type: none"> If pain over top shoulder → acromioclavicular joint or base of neck Instability = dislocation "shoulder jumping out of socket" Loss of function or reduced ROM → cannot reach back! 	
Exam	General	<ul style="list-style-type: none"> Consent: looking at shoulder, feeling shoulder joint and assess movement of shoulder joint Do you have any pain at the moment? Adequate exposure No T-shirt
	LOOK Anterior Lateral posterior	<ul style="list-style-type: none"> General (anterior): scars./ swelling/bruising, wasting, erythema, asymmetry <ul style="list-style-type: none"> Popeye deformity: Static anterosuperior migration of humeral head (massive RC tear) Muscle wasting: deltoid (shoulder issue) General (lateral): scars?, supraspinous and infraspinous fossa General (posterior): scoliosis, Muscle wasting: trapezius (c-spine issue), deltoid (shoulder issue), supraspinatus, infraspinatus, <ul style="list-style-type: none"> Press both hands against wall → Deformity (winged scapula) → long-thoracic nerve injury (serratus anterior (C5-C7))
	FEEL	<p><i>Tell me of any pain when I feel the shoulder joint?</i></p> <ul style="list-style-type: none"> Temp Palpate (back): c-spine + border/spine of scapula Palpate (both sides): sternoclavicular joint → clavicle → GHJ (2cm below acromium + push hard!) → acromioclavicular joint → coracoid process → biceps groove → head of humerus → greater tuberosity of humerus Extra: acromioclavicular joint: <ul style="list-style-type: none"> cross chest adduction <div data-bbox="395 1149 719 1312"> <p>MOST COMMON SHOULDER DISLOCATION IS ANTERIOR (DUE TO TRAUMA)</p> </div> <div data-bbox="735 1088 1546 1382"> </div>
	MOVE (active then passive)	<p>Bring arms out above head and back down as far as possible behind you → c</p> <ul style="list-style-type: none"> Flexion (≈180°) → ANTERIOR DELTOID, PEC MAJOR, CORACOBRACHIALIS Extension (≈65°) → Latissimus Dorsi Scapula Rhythm smooth? → Checks deltoid, supraspinatus and rotator cuff muscles NB: for hitching or use of other muscle <p>Bring arms out to side and up to top and bring them down and across your body → SUBACROMIAL BURSITIS</p> <ul style="list-style-type: none"> Abduction tests (≈90°) Adduction (≈50°) painful arc test = Supraspinatus = shoulder impingement syndrome Asymmetry in movement and note pain at which angle <div data-bbox="400 1789 924 1989"> </div> <p>(a) to (c) Apley scratch test to assess shoulder movement</p> <p>Tuck elbows in → move forearm away from you and across body</p> <ul style="list-style-type: none"> External rotation (≈65°) → infraspinatus Internal rotation (≈90°) → subscapularis <p>With both hands reach up back as far up as you can</p> <ul style="list-style-type: none"> Internal rotation (≈90°) <p>Both hand behind head and push elbows back (like an arrest)</p> <ul style="list-style-type: none"> External rotation (≈65°) Abduction tests (≈90°) <p>Spurling's test → tilt head back + look to affected side</p> <ul style="list-style-type: none"> If pain = c-spine pathology → MRI spine <div data-bbox="932 1794 1482 2007"> </div>
Neurovascular exam	<ul style="list-style-type: none"> Spinal Accessory Nerve (Trapezius), Suprascapular Nerve (Supra & Infraspinatus) Axillary Nerve (Deltoid) 	
	<ul style="list-style-type: none"> Long Thoracic Nerve (Serratus Anterior -C5-7) → cannot retract scapula Dorsal Scapular Nerve (Rhomboids) Injury → asymmetry (one side will be close to scapula than other) 	

Special test (rotator cuff exam)	1. (Gerber's lift off test - IR against resistance)	<ul style="list-style-type: none"> Subscapularis rupture or tendonitis Subscapular nerve lesion 	<ul style="list-style-type: none"> back of hand on lower back (lift-off actively and against resistance) Belly test (actively push inwards against resistance) Bear hug (pull my hand towards your shoulder) XS ER power
	2. Empty can test "Jobe test"	<ul style="list-style-type: none"> Supraspinatus rupture or tendonitis 	<ul style="list-style-type: none"> 90 deg shoulder flexion + 30 deg abduction + IR with thumb to ground Resistance against pushing arm down
	3. Hawkin's test	<ul style="list-style-type: none"> Subacromial bursitis RC tear / tendinitis 	<ul style="list-style-type: none"> Flex shoulder and elbow at 90 deg then internally rotate Pain = + sign
	4. Neer's sign	<ul style="list-style-type: none"> Subacromial bursitis / impingement 	<ul style="list-style-type: none"> Passive shoulder flexion with arm internally rotated (thumb to floor)
	5. ER against resistance at 0 deg abduction	<ul style="list-style-type: none"> Infraspinatus tear Teres minor tear 	<ul style="list-style-type: none"> Elbow flexed at 90 deg → slight abduction Passive ER of arm to maximum → push against my hand Hornblower → arms drop down = massive rotator cuff tear (irreversible) teres minor
	6. Supination against resistance	<ul style="list-style-type: none"> Biceps tendon 	<ul style="list-style-type: none"> Supination against resistance
	7. Apley scratch test or scarf test	<ul style="list-style-type: none"> Adhesive capsulitis AC joint arthritis 	<ul style="list-style-type: none"> Reach begin shoulder to medial scapula on other side Ask to reach across chest to opposite shoulder
	8. Apprehension test	<ul style="list-style-type: none"> Shoulder instability (previous anterior dislocation or sublux) 	<ul style="list-style-type: none"> Supine patient → shoulder abducted to 90 degrees and elbow flexed at 90 degrees Shoulder slowly ER → patient feels scared it will dislocated (NO pain)



Empty can test
"supraspinatus"



Painful arc syndrome
"subacromial bursitis"



Gerber's lift off test
"subscapularis"



External Rotation
"infraspinatus"

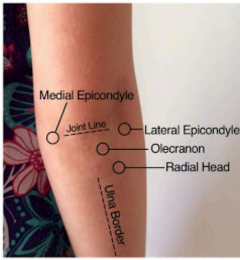
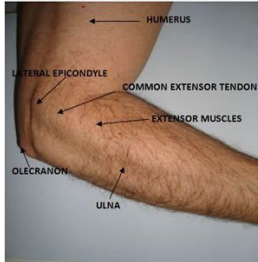
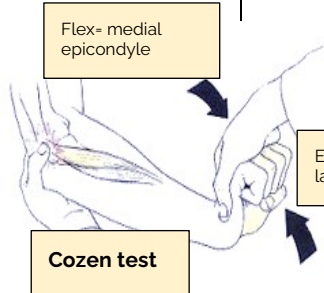
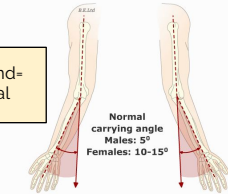
	Adhesive capsulitis = "Frozen Shoulder"	Rotator cuff tears	Shoulder dislocations						
PP	Inflammation and fibrosis in joint capsule leads to adhesions (scar tissue) → bind to capsule and tighten around joint to reduce ROM	Injury to rotator cuff tendons (partial or fully)	Head of humerus (ball) comes out of glenoid cavity (socket)						
Cause	2 types: <ul style="list-style-type: none">➤ Primary (idiopathic)➤ Secondary (trauma, surgery, immobilisation)	2 types <ul style="list-style-type: none">➤ RC tear (FOOSH, avulsion injury)➤ RC arthropathy due to Degenerative changes with age (>70yo)	<ul style="list-style-type: none">➤ Subluxation = partial dislocation (naturally pops back in)➤ 90% are anterior dislocations (FOOSH)➤ Post. dislocations = electric shocks /seizures						
RF	<ul style="list-style-type: none">➤ Middle age➤ Diabetes	<ul style="list-style-type: none">➤ Overhead activities (e.g. construction work , playing tennis)							
DDx	If no preceding trauma, consider: <ul style="list-style-type: none">➤ Supraspinatus tendinopathy➤ Acromioclavicular joint arthritis➤ Glenohumeral joint arthritis If preceding trauma, consider <ul style="list-style-type: none">➤ Shoulder dislocation➤ Fractures (proximal humerus, clavicle)➤ Rotator cuff tear	<table><tr><th>RC tear</th><th>RC arthropathy</th></tr><tr><td>Acute injury</td><td>Degenerative</td></tr><tr><td><ul style="list-style-type: none">• Wider CSA > 38• Lateral acromion• Upward tilting glenoid</td><td><ul style="list-style-type: none">• Narrower CSA < 31• Shorter acromion• Downward tilting glenoid</td></tr></table> *DDx: Supraspinatus tendinitis , Shoulder impingement syndrome (SIS)	RC tear	RC arthropathy	Acute injury	Degenerative	<ul style="list-style-type: none">• Wider CSA > 38• Lateral acromion• Upward tilting glenoid	<ul style="list-style-type: none">• Narrower CSA < 31• Shorter acromion• Downward tilting glenoid	Complications: <ul style="list-style-type: none">➤ Bankart lesion = tears to anterior labrum (repeated subluxation/dislocations)➤ Hill-sachs lesions = compression fracture on posterolateral part of humerus head➤ Erb's palsy (axially nerve damage – C5, C6) → deltoid and teres minor weakness and major patch sensation loss➤ Fractures – humeral head, greater tuberosity, acromion, clavicle
RC tear	RC arthropathy								
Acute injury	Degenerative								
<ul style="list-style-type: none">• Wider CSA > 38• Lateral acromion• Upward tilting glenoid	<ul style="list-style-type: none">• Narrower CSA < 31• Shorter acromion• Downward tilting glenoid								
Sx	3 main phases (lasting 6/12 each) <ol style="list-style-type: none">Painful phase = shoulder pain worse at nightStiff phase = stiffness in both active and passive movement (ER most affected)Thawing phase = gradual improvement	<ul style="list-style-type: none">➤ Shoulder pain➤ Weakness and pain specific to RC tendon (SITS)➤ Difficulty sleep – pain lying on affect side➤ "Painful arc syndrome"	<ul style="list-style-type: none">➤ Hold affected arm against side of body➤ Flattened deltoid + bulging head of humerus➤ Assess: neurovascular status (pulses, CRT, – Erb's palsy w/ major patch sensation loss)➤ Apprehension test =						
Ix	XR = normal (but helps to exclude OA) USS, CT or MRI = thickened jt capsule	XR = normal (but helps to exclude OA) USS or MRI = for diagnosis	XR (confirm dislocation and exclude fractures) MRI +/- arthroscopy = assess shoulder damage e.g. Bankart and Hill-sachs lesions						
Rx	Self-resolves over 1-3 years <ul style="list-style-type: none">➤ Rest,➤ NSAIDs,➤ PT + Activity mod – continue arm use without pain➤ IA steroid injections If resistant to above <ul style="list-style-type: none">➤ Manipulation under anaesthesia (stretch capsule to improve ROM)➤ Arthroscopy (remove adhesions)	Conservative Mx (for degenerative RC tears) <ul style="list-style-type: none">➤ Rest, NSAIDs,➤ PT + Activity mod –arm use without pain If acute or full thickness tears or when PT fails <ul style="list-style-type: none">➤ Arthroscopic RC repair (tendon reattached to bone in keyhole surgery)➤ Reverse TSR (for massive RCT w/ arthritis but intact deltoid) Nb: irreparable tear if: <ul style="list-style-type: none">➤ fat infiltration into muscle➤ ER lag sign, Hornblower sign	Conservative Mx (for degenerative RC tears) <ul style="list-style-type: none">➤ Analgesia (NSAID)➤ Broad arm sling (support arm)➤ Closed reduction of shoulder (after # excluded)➤ Post-reduction XR➤ Immobilisation after shoulder relocation To reduce risk of recurrent (20% risk) <ul style="list-style-type: none">➤ PT = improve function of shoulder➤ Shoulder stabilisation surgeries - remove <i>Bankart and Hill-sachs lesions</i> OR <i>tighten shoulder capsule</i>➤ Beware prolonged recovery period (≥3/12)						

ELBOW Examination

Assessment of Elbow (synovial hinge)

"Today I examined Mrs Smith, a 32-year-old female. On general inspection, the patient appeared comfortable at rest, with no stigmata of musculoskeletal disease. There were no objects or medical equipment around the bed of relevance.


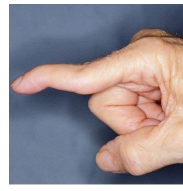




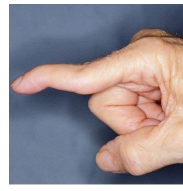




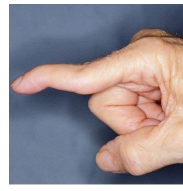



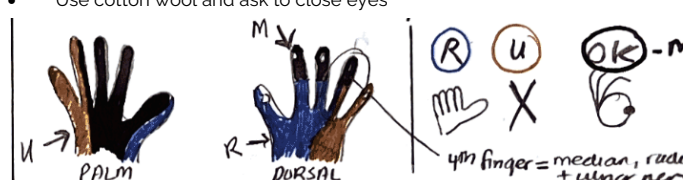
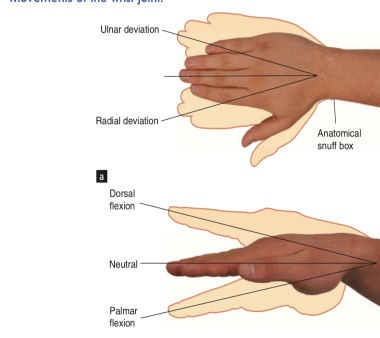
"Assessment of the **upper limbs** revealed a normal **elbow joint appearance**, with no tenderness on **palpation**. The **passive and active movements** in both elbow joints was normal. "In summary, these findings are consistent with a **normal elbow joint examination**. To complete the examination, I would also examine the shoulder and wrist joint as well as a neurovascular exam."

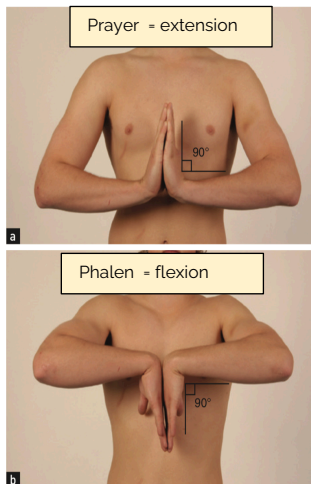
General	<ul style="list-style-type: none">Adequate exposure - - expose shoulder and wristDifficulty undressing?			
LOOK [MUST be in anatomical position]	<ul style="list-style-type: none">General (anterior): scars, swelling, erythema, bruising	Anterior	Lateral	Posterior
	<ul style="list-style-type: none">Carrying angle (F > M ≈ 7-12°) → cubitus valgus/ varus deformity *NB: make sure both arms in line despite fixed flexion deformityOlecranon swelling (bursitis) → if bilateral olecranon swelling (joint effusion)		<ul style="list-style-type: none">fixed flexion deformityswelling	skin changes: <ul style="list-style-type: none">rheumatoid nodules/psoriatic plaques (behind elbow)gouty tophi,
FEEL	<p><u>Tell me if there is any pain?</u></p> <ul style="list-style-type: none">Temp (olecranon fossa) + Radial PulsePalpate (lateral): lateral epicondyle + common extensor origin → Radial headPalpate (posterior): olecranon → triceps insertionPalpate (medial): medial epicondyle + common flexor origin → medial collateral ligament (45°) → cubital tunnel (subluxing ulnar nerve + tinnels)Palpate (anterior): biceps tendon while elbow flexed (hook) <div></div>		<p>Palpate swellings</p> <ul style="list-style-type: none">HARD = rheumatoid nodulesFIRM + yellow = Gouty tophiSoft and tender = fluid inn olecranon bursa <div><p>Cubitus valgus and cubitus varus</p></div> <p>Cozen test</p>	
MOVE /POWER (active then passive)	<ul style="list-style-type: none">Elbow flexion (145°)/extension (0°) → boxer armsSupination (90°)/pronation (85°) → have elbow flexed and thumbs pointing up BEFORE testing → shake hands (push against)Assess passively to determine any crepitus			
Impingement	<ul style="list-style-type: none">Anterior Impingement → coronoid osteophytePosterior Impingement → olecranon osteophyte			
Special test "instability"	Static Valgus Stress Test (MCL)	<ul style="list-style-type: none">Shoulder Abduction with Full ER & Supinated Forearm + elbow at 25°		
	Moving Valgus Stress (MCL)	<ul style="list-style-type: none">Shoulder Abduction with Full ER & Supinated Forearm → Full Flexion & Extension + Valgus forceLook for Apprehension/Pain in Mid-Arc - Diff Dx includes RC OA and Lateral OCD		
	Static Varus Stress Test (LCL)	<ul style="list-style-type: none">IR Shoulder and Pronate Forearm + elbow at 25°		
Special test "extra tests for joint problems"	<p>Cozen's test → *active wrist extension against extension* to check for tennis elbow or lateral epicondylitis</p> <ul style="list-style-type: none">Flexion → make a fist:wrist flexion against resistance → positive test = pain on medial epicondyle → common flexorwrist extension against resistance → positive test = pain on lateral epicondyle → common extensor			
Neurovascular Exam	<ul style="list-style-type: none">Median nerve → tinel's test (i.e. pressure over carpal tunnel of behind olecranon) → cubital tunnelUlnar Nerve → Spread Fingers Apart And In Together (trauma = → paraesthesias, numbness or limited strength) → RING AND PINKYAnterior Interosseus Nerve (Median) → Make Circle Between Thumb And Index Finger (i.e. thumb opposition)Posterior Interosseus Nerve (Radial) → Spiderman's Web			

Common conditions affecting the elbow

	PP	Sx	Exam / Ix	Rx
Elbow epicondylitis (medial)	<ul style="list-style-type: none"> golfer's or painter's elbow Overuse/degenerative 	<ul style="list-style-type: none"> Pain Weak grip (cannot shake hands) 	<ul style="list-style-type: none"> Pain at common flexor origin of medial epicondyle Wrist Flexion against resistance → exacerbates pain of medial epicondylitis 	<ul style="list-style-type: none"> RICE, + activity mod Analgesia (NSAID) Physiotherapy. Orthotics (elbow braces or straps) Steroid injections
Elbow epicondylitis (lateral)	<ul style="list-style-type: none"> 'tennis elbow' Overuse/degenerative 		<ul style="list-style-type: none"> Pain at common extensor origin of lateral epicondyle Wrist Extension against resistance (Mill's and Cozen's test) → exacerbates pain of lateral epicondylitis 	
Olecranon Bursitis "students' elbow"	Bursa Inflammation due to: <ul style="list-style-type: none"> mechanical strain / friction (Studying too hard) Trauma Inflammation (RA,gout) Infection (septic bursitis) 	<ul style="list-style-type: none"> Swollen, warm, tender fluid filled joint Septic = fever, very painful, signs of sepsis 	<ul style="list-style-type: none"> Tenderness at the tip of the elbow exposed to mechanical stress Joint aspiration (if infection suspected) before ABx <ul style="list-style-type: none"> M/C/S and crystal inspection Pus = infection, (if straw coloured = less likely) blood = trauma, infection, inflammation milky = gout, pseudogout 	Signs of septic arthritis <ul style="list-style-type: none"> Fluid aspiration ABx – flucloxacillin (clarithro = 2nd line) Admit to hospital (VBG, culture, IV ABx, IVF)
Pulled elbow (paediatrics)	<ul style="list-style-type: none"> Age: 1 -4 years old Proximal radioulnar joint Radius pulled out of annular ligament 	<ul style="list-style-type: none"> Pain on elbow use 	<ul style="list-style-type: none"> extended elbow with pronated forearm NO bending of affected elbow no swelling, deformity or bruising of elbow or wrist 	Controversial <ul style="list-style-type: none"> PRP injections Extracorporeal shockwave therapy

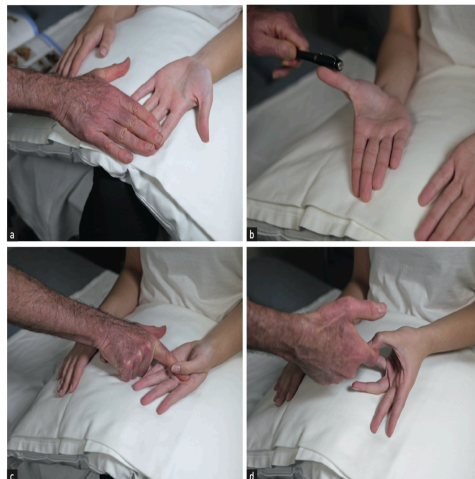
HAND/WRIST Examination

General	<ul style="list-style-type: none">Adequate exposure (roll up to shoulder) Difficulty undressing?What is your dominant hand?											
LOOK Dorsal Palmar	<table><tr><th>Palmar Hand [SWEAT]</th><th>Dorsal Hand [SWEAT]</th></tr><tr><td><ul style="list-style-type: none">ScarsWasting (thenar, hypothenar, intrinsic muscles),Erythema/Palmar crease pallorAsymmetryPsoriasis – check behind the elbowDupuytren's contracture [palmar thickening]</td><td><ul style="list-style-type: none">Rheumatoid Nodules, Gouty tophiOA = Bouchard's nodes (PIP), Heberden's nodes (DIP)RA = Z-deformity of thumb: hyperextension of IP joint and fixed flexion and subluxation of MCPRA = swan neck: hyperextension of PIP + fixed flexion at DIP (tendon shortening)RA = boutonniere "Buttonhole" deformity: fixed flexion of PIP and extension of DIPRA = ulna deviationPsA = Dactylitis - Sausage shaped phalangesPsA = Nail pitting/ onycholysis (spoon-shaped)</td></tr></table>	Palmar Hand [SWEAT]	Dorsal Hand [SWEAT]	<ul style="list-style-type: none">ScarsWasting (thenar, hypothenar, intrinsic muscles),Erythema/Palmar crease pallorAsymmetryPsoriasis – check behind the elbowDupuytren's contracture [palmar thickening]	<ul style="list-style-type: none">Rheumatoid Nodules, Gouty tophiOA = Bouchard's nodes (PIP), Heberden's nodes (DIP)RA = Z-deformity of thumb: hyperextension of IP joint and fixed flexion and subluxation of MCPRA = swan neck: hyperextension of PIP + fixed flexion at DIP (tendon shortening)RA = boutonniere "Buttonhole" deformity: fixed flexion of PIP and extension of DIPRA = ulna deviationPsA = Dactylitis - Sausage shaped phalangesPsA = Nail pitting/ onycholysis (spoon-shaped)	<table><tr><td> Ulnar deviation + Z deformity</td><td> Swan Neck deformity (DIP)</td><td> Boutonniere deformity of PIP & DIP</td><td> Bouchard's nodes (PIP) Heberden's nodes (DIP)</td><td> Dactylitis</td></tr></table>		 Ulnar deviation + Z deformity	 Swan Neck deformity (DIP)	 Boutonniere deformity of PIP & DIP	 Bouchard's nodes (PIP) Heberden's nodes (DIP)	 Dactylitis
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FEEL [grab a pillow!]	<ol style="list-style-type: none">Warmth? (septic or inflammatory arthritis)radial and ulna pulsesMuscle atrophy (LMN lesions = median/ulnar nerve → scalloping in thenar (median)/hypothenar eminence)Thickened palm (Dupuytren's contracture)Joints (Wrist, CMC, MCP, PIP, DIP),ulna styloid, radial styloid,anatomical snuffbox = tenderness (scaphoid fracture)		<p>Sensation) + R U OK? [radial, ulna AND median nerve distribution]</p> <ul style="list-style-type: none">Use cotton wool and ask to close eyes 									
MOVE (active then passive)	<table><tr><td>Wrist</td><td><ul style="list-style-type: none">F/E (dive, prayer) → MCP + IP (make fist and open and close)ulna deviation/radial deviation.</td></tr><tr><td>Finger</td><td><ul style="list-style-type: none">F/E → check FDS (PIP) and FDP (DIP) OR grasp fingers testAbd (ant. Interosseus - median) → splay fingers and don't let me push them togetherAd (post. Interosseus - ulnar) → tissue paper</td></tr><tr><td>Thumb</td><td><ul style="list-style-type: none">F/E [make a 4 – say hi!]Abd (APB → Median → Supinate palm + Point thumbs to ceiling and don't let me push them down)opposition</td></tr><tr><td>Function</td><td><ul style="list-style-type: none">power grip [opening jar]pincer grip [pick up small item]do up a button</td></tr></table>	Wrist	<ul style="list-style-type: none">F/E (dive, prayer) → MCP + IP (make fist and open and close)ulna deviation/radial deviation.	Finger	<ul style="list-style-type: none">F/E → check FDS (PIP) and FDP (DIP) OR grasp fingers testAbd (ant. Interosseus - median) → splay fingers and don't let me push them togetherAd (post. Interosseus - ulnar) → tissue paper	Thumb	<ul style="list-style-type: none">F/E [make a 4 – say hi!]Abd (APB → Median → Supinate palm + Point thumbs to ceiling and don't let me push them down)opposition	Function	<ul style="list-style-type: none">power grip [opening jar]pincer grip [pick up small item]do up a button	<p>Movements of the wrist joint.</p>  <p>(a) Ulnar and radial deviation; (b) dorsal and palmar flexion</p>		
	Wrist	<ul style="list-style-type: none">F/E (dive, prayer) → MCP + IP (make fist and open and close)ulna deviation/radial deviation.										
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Function	<ul style="list-style-type: none">power grip [opening jar]pincer grip [pick up small item]do up a button											
Special test "Extra tests"	<ul style="list-style-type: none">Tinel's sign "tapping a tin" [median nerve]: gentle percussion over carpal tunnel with extendedPhalen's test [carpal tunnel syndrome] = Prolonged (60 s) passive wrist flexion<ul style="list-style-type: none">Positive Phalen's sign = tingling sensation in median nerve + numbness and weaknessFinkelstein's test [De Quervain's tendonitis] = patient's thumb tucked into their first → turn wrist into full ulnar deviation<ul style="list-style-type: none">Positive Finkelstein's sign = Sharp pain in tendon sheathAsk to check feet<ul style="list-style-type: none">Gouty tophi, toe crowding (RA)Eyes (uveitis) and CV + RESP Exam											



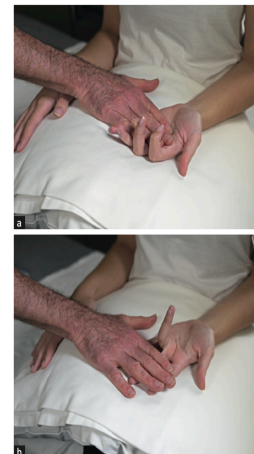
(a) Active wrist extension; (b) active wrist flexion

Thumb movements.



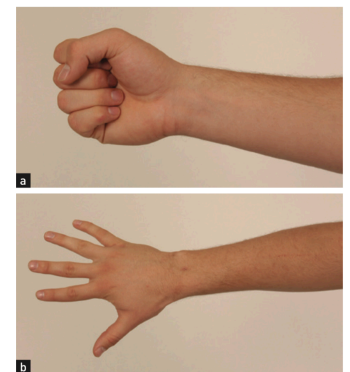
(a) Extension; (b) abduction; (c) adduction; (d) opposition

Testing the superficial and profundus flexor tendons.



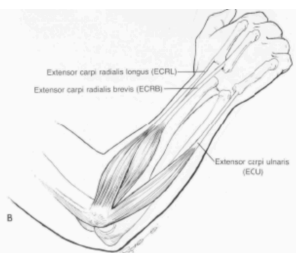

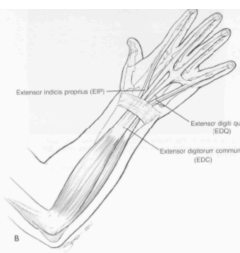
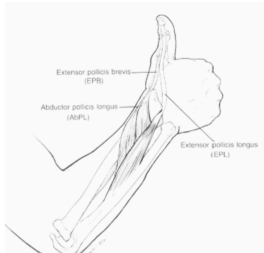

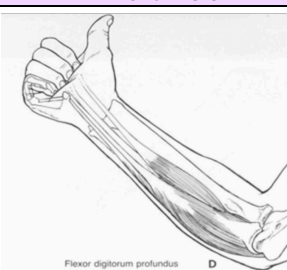
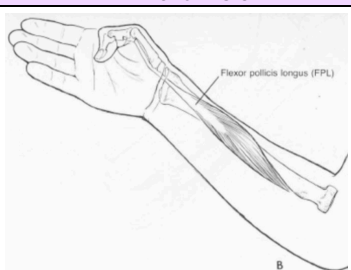
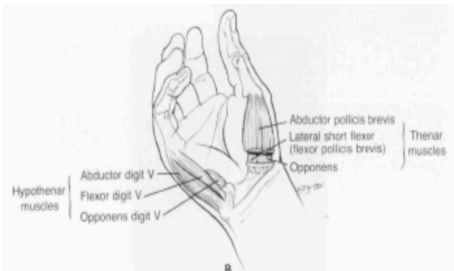
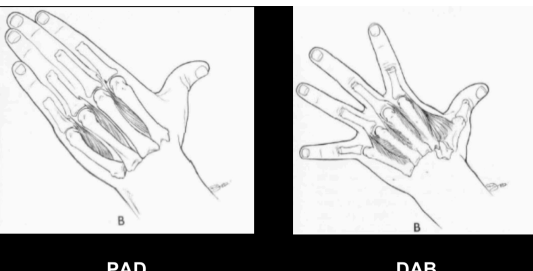
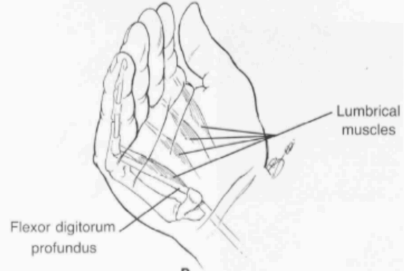
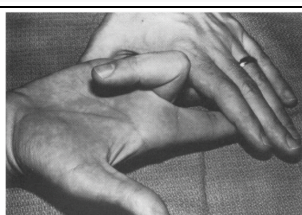



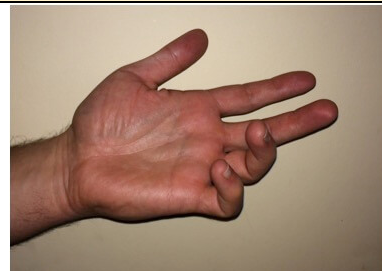

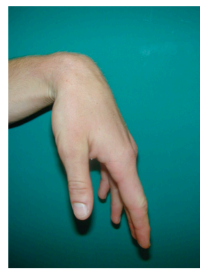

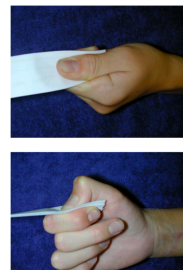
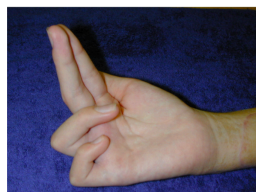
(a) Flexor profundus; (b) flexor superficialis

Screening metacarpophalangeal and interphalangeal movements.

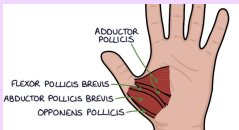


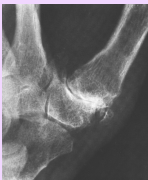


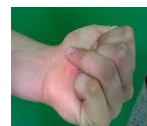


(a) Flexion—'Make a fist'; (b) extension—'Now open your hand up'

NERVE PATHOLOGIES

Wrist extensors	Wrist flexors	Finger extensors	Thumb extensors
			
FDS - extrinsic	FDP - extrinsic	FPL - extrinsic	
			
Intrinsic	Palmar/ dorsal Interossei muscles	Lumbricals	
			
			
PIP test - FDS tendon [median]	DIP test - FDP tendon [median - AIN]	FDS + FDP	
			
FDP [flexible joint?]	Ulnar Nerve [denervates lumbricals with no MCP extension]	Volkmann's ischaemic contracture [causes compartment syndrome]	
 Wrist drop	 Loss thumb opposition	 Froment's sign	 Ulnar claw
RADIAL nerve (C5-T1)	MEDIAN nerve (C6-T1) ➤ Anterior interosseus nerve	ULNAR nerve (C8, T1) ➤ Loss of thumb adductor (flex IP joint via FPL to compensate)	

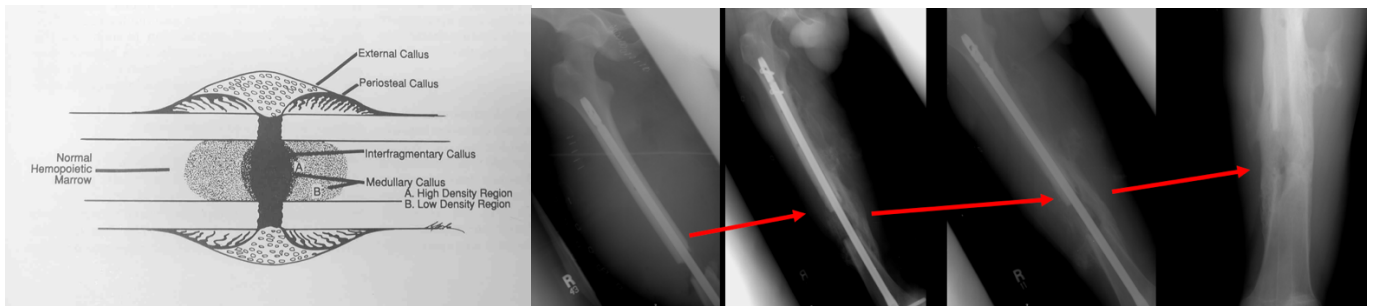
COMMON conditions affecting the Hand and Wrist

	PP/ Assoc.	Risk Factors	SX	Ix	MANAGEMENT	
Repetitive strain injury	Umbrella term for soft tissue irritation, microtrauma or strain due to repetitive activity	<ul style="list-style-type: none">Poor postureAssembly line workerScrolling smartphone, power tool vibration	<ul style="list-style-type: none">Replicable Pain, ache, cramp, numbness of joint	<ul style="list-style-type: none">XR – check for OAUSS – RA?, RC tear?Bloods- CRP, RF	<ul style="list-style-type: none">RICEAnalgesiaPTSteroid injections	
Carpal tunnel syndrome 	Compression of median nerve <ul style="list-style-type: none">➤ Unilateral (trauma)➤ Bilateral (systemic)	<ul style="list-style-type: none">Repetitive strainRADiabetesAcromegalyHypothyroidPregnancyObesity	<ul style="list-style-type: none">Pain/ numb / parasthesia in median dermatome (thumb, index and lateral half of ring finger) "pinky unaffected"Weakness to APB, OP, FPB (thenar muscles)Wake up at nightNo fine finger movement	<ul style="list-style-type: none">Tinel's sign:Phalen's testNerve conduction studies (confirm Dx)	<ul style="list-style-type: none">Rest + activity mod (shake hands to warm up)Wrist splintsSteroid injectionsSurgery (open vs endoscopic) – release flexor retinaculum pressure	
Dupuytren's contracture 	Thickened palmar fascia causing fixed flexion contractures and reduced ROM > unknown MoA	<ul style="list-style-type: none">AgeFHx (aut. dom.)MaleSmoking + EtOHEpilepsyT1DMManual labour (jackhammers)	<ul style="list-style-type: none">Asymptomatic Hard nodules on palmRing finger most affected (index least likely)	<ul style="list-style-type: none">Table top test – cannot flatten hand on table	Conservative (watch and wait) If symptomatic → surgery: <ol style="list-style-type: none">Needle fasciotomy – divide and loosen cord causing contractureDermofasciotomy – removing abnormal fascia and skin (may need skin graft)	
De Quervain's tenosynovitis "mummy's thumb"	Swelling and inflamed tendon sheaths (APL and EPB)	Repetitive strain injury 	<ul style="list-style-type: none">APL – abduct thumb, wrist (insert 1st MCP of thumb)EPB – abduct thumb, wrist (insert proximal phalanx)Pain and parasthesia	<ul style="list-style-type: none">Finkelstein's test (Eichhoff's test)	<ul style="list-style-type: none">RestActivity mod (PT)AnalgesiaSplints (restrict movement)steroid injectionsurgery (last line = release pressure from extensor retinaculum)	
Trigger finger	<ul style="list-style-type: none">Tender palpable nodule along 1st annular pulley at MCP jointNodules gets stuck at pulley when extended from flexed position	<ul style="list-style-type: none">40-50sWomenT1DM > T2DM	<ul style="list-style-type: none">Painful tender around MCP palmar surfaceStiff movementCrepitusFixed flexionImproved during day	Clinical diagnosis	<ul style="list-style-type: none">Rest + activity mod (shake hands to warm up)Wrist splintsSteroid injectionsSurgery (release A1 pulley)	
Ganglion cyst	Sacs of synovial fluid from tendon sheath or joints (usu. in wrist or fingers)	None	<ul style="list-style-type: none">Ranges in size (0.5-5cm)TransilluminatesWell-circumscribed	<ul style="list-style-type: none">XR – normal bonesUSS – exc. crystal arthropathies	Conservative (watch and wait) If symptomatic → surgery: <ul style="list-style-type: none">Needle aspiration (high rate of recurrence)Surgical excision (low recurrence rate but infection and scarring risk)	
Osteoarthritis (inc. CMC jt) 	<ul style="list-style-type: none">AthletesHousehold cleanersBuilders/manual workers	Progressive degeneration of articular cartilage in synovial CMC joints of through wear and tear	<ul style="list-style-type: none">Painful acheThickened jointLoss of spaceTenderness	<ul style="list-style-type: none">Positive grind test – pain on loadingCannot pinch or gripOsteophytesJoint space narrowing	<ul style="list-style-type: none">WEIGHT LOSSWeight bearing exerciseNSAID w/ PPIIA steroid injectionsJoint replacement – if severe impacts on ADLs	
Other	Mallet finger 	Fixed DIP joint flexion while extensor tendon contracted (cannot fully extend)	Skier's thumb 	<ul style="list-style-type: none">Forced <i>lateral</i> stress to thumb MCP jointCannot grasp objects	FDP rupture "jersey finger" 	<ul style="list-style-type: none">Closed rupture of FDP Tendon – FDP maximally contractedFull passive DIP flexion

Fractures Description



Steps	Description	
Description	Who (correct pt), what (correct limb), when (time), why and where	
Type	Complete (all the way through bone)	Incomplete (whole cortex not broken)
	<ul style="list-style-type: none"> <u>Transverse</u> = straight across bone <u>Oblique</u> = oblique line across bone <u>Spiral</u> = corkscrew <u>Comminuted</u> → 2 fracture parts <u>Salter harris</u> = fracture of growth plate 	<ul style="list-style-type: none"> Bowing = long bone bent Buckle = fracture of concave surface Greenstick = fracture of convex surface Usu. (paeds?)
Location	Diaphysis VS metaphysis VS epiphysis + bone involved	
Displacement	Angulation (dorsal/volar) VS translation VS rotation VS distraction / impaction (w/ reference to proximal)	
Other	Jt involvement	Is jt surface involved or fracture extends into joint
	Another fracture?	Check other sites – X-ray ABOVE and BELOW fracture
	Bone lesion	Pathological fracture e.g. MM, mets
Example	<ul style="list-style-type: none"> Transverse fracture of mid-to-distal third of right tibia. No significant angulation BUT translation Spiral fracture of distal 1/3rd of left tibia. Mild varus angulation, lateral translation and angulation. Fracture does not extend to jt surface. Buckle fracture of left distal radius w/ no significant displacement 	

Fracture Healing



Aim = promote healing	1. Adequate BV supply	Blood flow substantially increases at fracture site (peaks after 2 wks) <ul style="list-style-type: none">early stability promotes revascularisationloading promotes greater callus formation in 1st mth	
	2. Adequate mech. Stability		
Mechanism	Inflammation	1. Haematoma induced coagulation cascade creates platelet rich injury site → cytokines released 2. Vasodilatation + recruitment of WCC → increased blood flow	
	Repair	3. VEGF → Neoangiogenesis (+++ osseous blood supply) 4. Primary soft callus forms within 6 weeks → fibrocartilage matrix	
	Remodelling (longest time)	5. woven bone → mineralisation of matrix → lamellar bone → Wolff's law (stress + strain) 6. Full fracture healing within 12 weeks 7. Adults and lower limb bones 2x longer to heal	
Primary vs Secondary Healing		PRIMARY (direct) BONE HEALING	SECONDARY (indirect – callus)
	Indication	Little Strain is < 2% [i.e. need strong stability]	Some strain 2%-10% [i.e. relative stability] Fractures that are not rigidly fixed
	Repair time	Months to year	• Fairly rapid - weeks
	Process	Creeping Substitution = cutting cones OR haversian system <u>Healing fracture by forming numerous 2° osteons either through:</u> <ul style="list-style-type: none">Contact healing (direct contact)Gap healing (partially fill w/ woven bone thant remodelled into lamellar)	Endochondral ossification <ul style="list-style-type: none">Larger gaps = filled with fibrous tissue before undergoing secondary ossification
	Rx	• Dynamic Compression Plating <ul style="list-style-type: none">+++ stability, minimal strain = 1°healing	• Bracing & Cast Immobilisation <ul style="list-style-type: none">External Fixation & bridge plating - ORIFIntramedullary (IM) Nailing

FRACTURE TYPES (RESUS → REDUCE → RETAIN → REHAB)

FOREARM			DISTAL RADIUS		NOF		TIBIA		ANKLE/FOOT						
Cause	Falls (mainly)		Most common fracture of upper extremity (fall from height, MVA or sports injury, OLD LADY)		<ul style="list-style-type: none">OP, bisphosphonate, denosumab usagePoste-meno, smoking,		<ul style="list-style-type: none">Falls (mainly), direct blow, sports related		<ul style="list-style-type: none">Axial vs rotational loadingRF: high BMI, fragile women						
Types	<ul style="list-style-type: none">Monetggia (ulna #)Galeazzi (radius #)Gru__some Murder		<ul style="list-style-type: none">Colles - FOOSH = distal radius # w/ dorsal angulationSmith's = distal radius # w/ volar angulationBarton's = intra-articular distal radius #		Shortened, ER and abducted leg <ul style="list-style-type: none">Intra-capsularExtra-capsular		<ul style="list-style-type: none">RF: Diabetes, HIV, smokingGUSTILLO Classification		Isolated malleolar – 60% Bimalleolar – 25%, trimalleolar – 5-10% Open # - 2%						
Non-Op	1. Reduction + casting 2. Functional brace 3. Early mobilisation		<ul style="list-style-type: none">All displaced fracture = closed reductionCast immobilisation – if minimally displaced		40% return to own home ➢ Vit D, Ca, bisphosphonates, denosumab										
Rx Goals	1. Stop pain 2. Restore anatomy (e.g. length/curvature/rotation of bone) and integrity of interosseus space +++ Stabilise + ROM. 3. Maintain normal neurovascular function 4. Prevent infection														
Reduce	Oblique/ spiral	Lag screw	External fixation w/ plates + pins ➢ ORIF – dorsal or volar plating, fragment specific plating			Intra-capsular	➢ Undisplaced < 60 → cannulated screws ➢ Displaced > 60 (grade 3 and 4) → THR		Femur/tibial shaft	IM nail	Weber B & C (disrupted syndesmosis)	<ul style="list-style-type: none">LM = Lag screw + neutral plateMM = cancellous screwFIBULA = Syndesmotic stabilisation			
	Transverse	Compression plate					Extra-capsular	➢ Intertrochanteric → dynamic hip screw ➢ Subtrochanteric → IM nail		Open/closed #			External fixation	Compartment syndrome	External fixation
	Comminuted	Interfragmentary screws				 SHENTON'S LINE									
	Monetggia	Compression plate													
	Galeazzi	K wires													
Retain (non-op)	Clavicle	Broad arm sling	Colles #	Closed manipulation under haematoma block (aspirate + give 10mL xylocaine) ➢ backslab		 SHENTON'S LINE			Lateral malleolus (weber A)	Below knee cast or aircast boot or stirrup brace					
	Proximal + mid humerus	Collar and cuff sling													
	Distal humerus	Collar and cuff + elbow backslab													
Rehab	Physio	Non-weight bearing		→	Toe-touch weight bearing		→	Partial weight bearing		→	Weight bear		→	Full weight bearing	
		➢ Legs do not touch floor ➢ ≈ 6wks for unstable # and after plate fixation			Toes touch floor to balance BUT not supported by any weight			< 50% of body weight			As tolerated			After intramedullary nails, external fixations, jt replacements	
Comp.		General		Specific				Specific ED							
	Immediate	Haemorrhage, arterial damage,		tendon/ligament or neurovascular damage,				Fat embolus							
	Early (few wks)	➢ Wound infection – skin edge necrosis ➢ chest infection, ➢ VTE,		➢ prosthesis infection ➢ anatomical loss of position/fixation,				Compartment Syndrome (urgent fasciotomy) → compartment pressure within 30mmHg of DBP ➢ 6 P's → pain, palpable swelling, parasthesia (early), paralysis and absent peripheral pulse (late) ➢ Irreversible muscle and nerve damage → AKI (PCT necrosis) + poikilothermia							
	Late (mths-years)	Neuropathic pain		➢ Malunion (incorrect union) ➢ Non-Union (cannot heal) – failure to unite after 6/12 with no signs of callus/healing for 3 consecutive mths ○ E.g. hypertrophic, oligotrophic, atrophic ➢ Delayed Union – failure to unite within 6/12 but may unite soon ➢ OA,				Avascular Necrosis (retrograde blood supply) 1) scaphoid, → radial artery 2) head of femur → medial and lateral circumflex artery (more common in intracapsular NOF #) 3) neck of talus							

General work up:

- FBC, EUC, LFT
- COAGS, Group + save
- ECG
- CXR + X-ray Imaging – AP/PA/Lateral of jt

General plan:

- ABCDE – 02, BP, IVF /hydration
- **3-point contact necessary to maintain close reduction**







Analgesia (before repair)

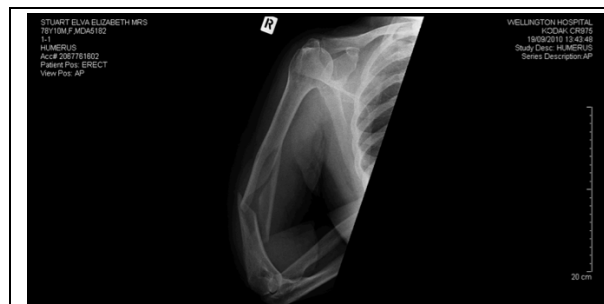
- **Haematoma block** (aspirate haematoma + inject 10mL xylocaine)
- **Bier's block** = double tourniquet proximal + Venous system filled with local anaesthetic

Simple fracture work up:

No fracture	RICE
Fracture ONLY	Cast immobilise
Fracture + Dislocated	Reduce + Splint
Compound #	ED surgery
ACUTE #	splint or backslab (allow for swelling)
1wk post-injury	full circumferential cast (better immobilization)

External fixation	<ul style="list-style-type: none"> Contaminated open wounds or #, soft tissue injury 	Post-op considerations	Rx # cause
Internal fixation	Comminuted/displaced #, intra-articular # <ul style="list-style-type: none"> IM Nail – long bone # IM K-wire – temp. fixation for 4 wks (small bones) Extramedullary (plates screws) bridge <i>comminute</i> #, compress <i>simple/transverse/oblique/spiral</i> #, support areas of thin cortex or tension side of # 		
Conservative Immobilise	1. Splints/backslabs (non-circumferential) – plaster/fibreglass Allows for swelling and protect bony prominence 2. Casts (circumferential) – plaster/fibreglass 3. Brace (support but allow ROM) 4. Sustained traction e.g. collar & cuff, buddy strap, traction splint		
		1. Swelling → RICE → early mobilisation 2. Smoking cessation → faster wound healing 3. Analgesia → avoid NSAIDs 4. VTE prophylaxis 5. ABx prophylaxis → open #	1. OP, fall, cancer 2. delirium (hypoxia, infection, drugs, 3. Hypoxia – stroke, STEMI, DVT/PE 4. Dehydration, AKI

	Case 1	Case 2	Case 3	Case 4
Case	<ul style="list-style-type: none"> IA 25 yo male Fit/Healthy Non-smoker Unemployed Direct Blow to Left Lower Limb whilst Playing Rugby 	<ul style="list-style-type: none"> JA 67 yo female Out on the town drinking Getting out of a taxi and felt like she rolled her ankle. Pain and unable to weight bear on the left ankle. BG – Under investigation for palpitations 	<ul style="list-style-type: none"> IS 45 yo female Slipped on tiled kitchen floor whilst wearing stockings 	<ul style="list-style-type: none"> TM, 19 yo male in High speed MVA Head Injury → SDH, SAH, DAI GCS 3, intubated and sedated Multiple stable spinal injuries Bilateral pulmonary contusions Splenic laceration (minor) – treated non-operatively
O/E	<ul style="list-style-type: none"> Immediate pain/Swelling/ Mild deformity NV Intact Comfortable Obvious Contusion - No Skin break – □ Swollen – Tender No marked Deformity 	<ul style="list-style-type: none"> Painful swollen left leg above the ankle - tender to palpate distal tibia. Tender around the proximal fibula. Neurovascular intact. Nil other points of bony tenderness. 	<ul style="list-style-type: none"> Lower leg deformed Approx. 1.5cm wound over anteromedial aspect of lower le Spike of bone exposed, wound clean Calf compartments soft, non tender Distal neurovascular status normal Wound washed out with 1L of normal saline, betadine 	<ul style="list-style-type: none"> Left leg – large open wound antero-medially Bone protruding through skin 3cm Elliptical wound 3cm x 9cm No obvious contamination Neurovascular intact
X-Ray				
	<p>Treated with an IM nail</p> <p>□ Discharged 3/7 following injury without immediate complication and awaiting follow-up</p>		 <p>Leg deformity corrected and AK backslab applied</p> <ul style="list-style-type: none"> IM nail + primary closure Wound check 3/7 later in theatre Edges debrided, thoroughly irrigated and closed Discharged day 12 post injury + Review 6/52 Progress to weightbearing, awaiting 12/52 follow-up 	



Mrs Stuart R humerus erect X-ray taken 13:43 showing a spiral fracture in mid to distal 1/3rd humerus diaphysis with butterfly fragment and displacement and posterior angulation concerned with radial nerve damage.

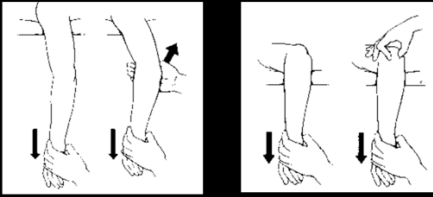


Salter harris type 2 (left) and salter harris type 3 (right) → triplane fracture (overall salter harris type 4 as both epiphysis and metaphysis involved)

CLASSIFICATION SYSTEMS + MX

Common Closed Reductions

- Elbow Dislocation** - traction, flexion, and direct manual push



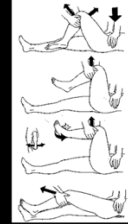
Common Closed Reductions

- Shoulder Dislocation** - relaxation, traction, gentle rotation if necessary



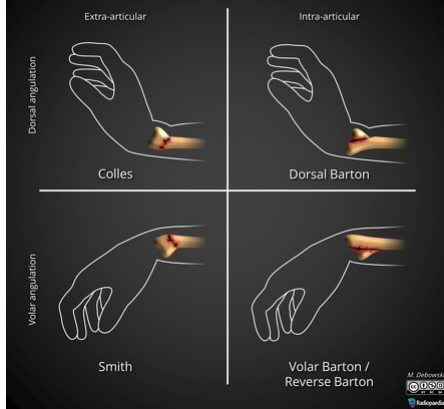
Common Closed Reductions

- Hip Dislocation**
- Relaxation, flexion, traction, and rotation
- Gentle and atraumatic



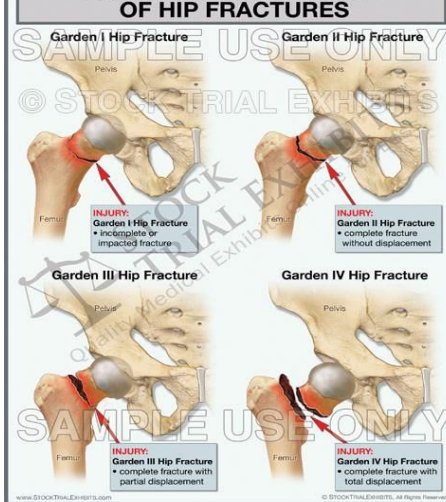
Relocation should be palpable and permit significantly improved ROM. This often requires very deep sedation.

Common distal radius fractures



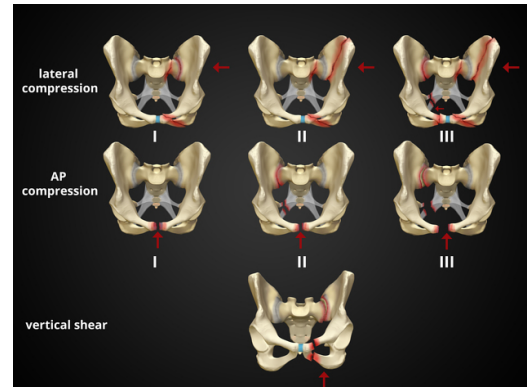
- Smith (fall on flexed wrist)** = ORIF
- Barton (dorsiflexed wrist + pronated forearm - shearing injury)** = ORIF + buttress plate
- Chauffeur's (Radial styloid)** = ORIF

GARDEN CLASSIFICATION OF HIP FRACTURES



Garden classification is used for intra-capsular neck of femur fractures:

- Grade I** - incomplete fracture and **non-displaced**
- Grade II** - complete fracture and **non-displaced**
- Grade III** - partial **displacement** (trabeculae are at an angle)
- Grade IV** - full **displacement** (trabeculae are parallel)

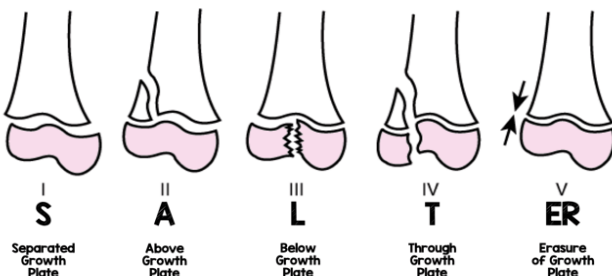


Pelvic Fractures (Young and Burgess classification)

- AP compression (pubic diastasis)
- Lateral compression (pubic rami)
- Vertical shear

NOTE: Pelvis is a ring → hence, If pubic rami fractures → also sacral fracture

GROWTH PLATE INJURIES - SALTER HARRIS CLASSIFICATION



Closed reduction

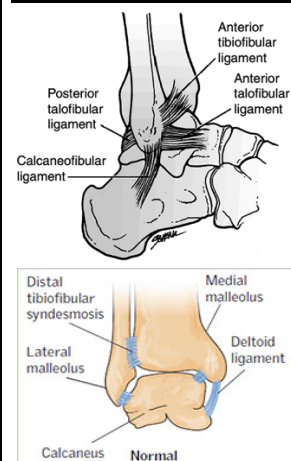
ORIF, anatomical reduction

- Children heal faster = less immobilisation time
- Restore length, alignment and rotation where possible

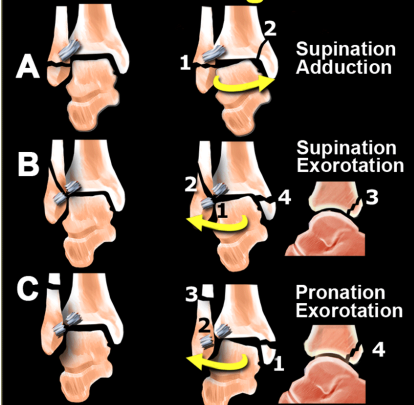
Management of growth plate fractures:

- Type 1 and 2 (most common)** = **DOES NOT** disrupt epiphyseal zone and synovial region (good) → only need closed reduction, immobilisation
- Type 3 and 4 (unstable)** → disrupt proliferative site → leading to angular growth → needs anatomic reduction, ORIF

Ankle fracture Classification



Weber Lauge-Hansen








Management of ankle fractures:

- Weber A** = benign fracture (avulsion injury = self-heal)
- Weber B** = spiral configuration (begins at tibiotalar jt line) = any displacement or talar shift in the jt (i.e. widening jt space) → surgery
- Weber C** = rips through both ligaments (twisting) → surgery









Weber C → drunk women @ 3AM and non-weight bearing

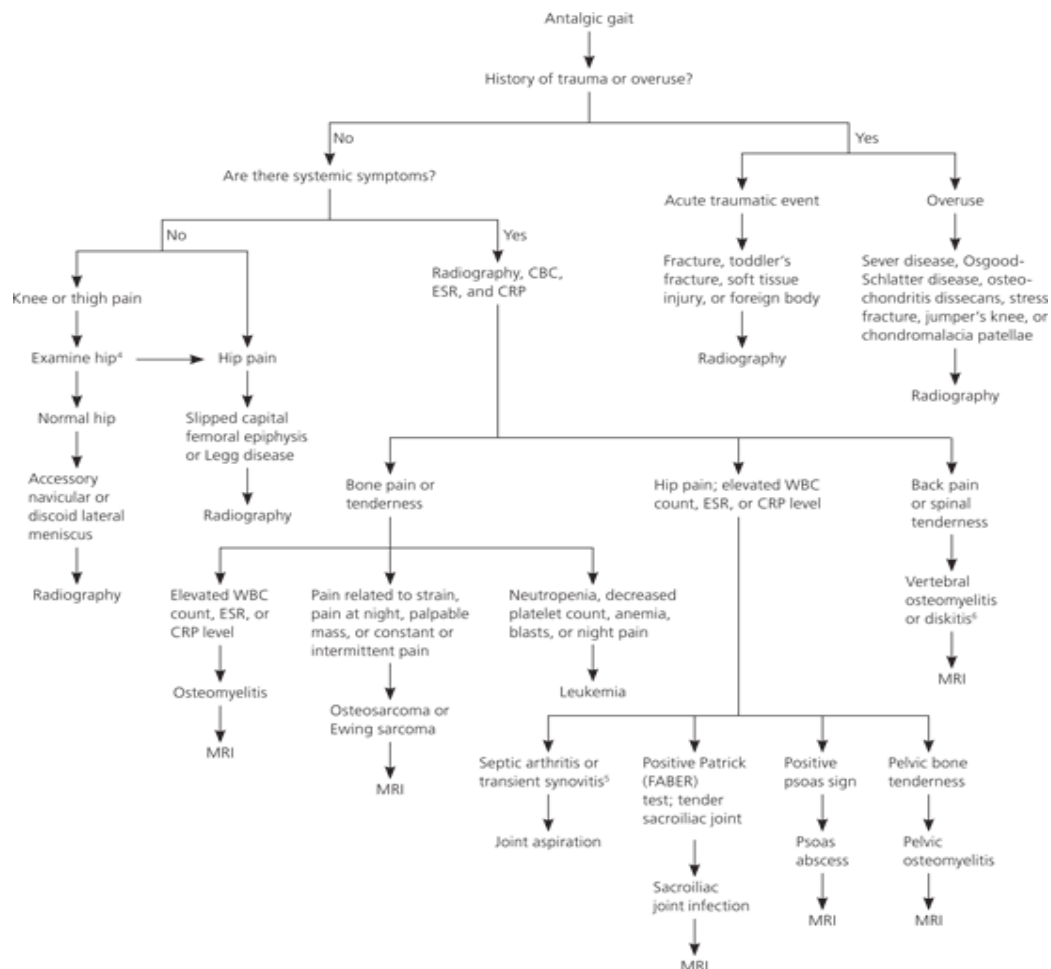
Gustillo Classification for open fractures

	I	II	III-A	III-B [high velocity]	III-C (vascular)
Energy	Low	Moderate	High	High	High
Wound Size	≤ 1 cm	1-10 cm	usually >10 cm	usually >10 cm	usually > 10 cm
Soft Tissue Damage	Minimal	Moderate	Extensive	Extensive	Extensive
Contamination	Clean	Moderate contamination	Extensive	Extensive	Extensive
Infection rate	0-2%	2-7%	7%	10-50%	25-50%
Fracture Pattern	Simple fx pattern with minimal comminution	Moderate comminution	Severe comminution or segmental fractures	Severe comminution or segmental fractures	Severe comminution or segmental fractures
Periosteal Stripping	No	No	Yes	Yes	Yes
Skin Coverage	Local coverage	Local coverage	Local coverage	Requires free tissue flap or rotational flap coverage	Typically requires flap coverage
Neurovascular Injury	Normal	Normal	Normal	Normal	Exposed fracture with arterial damage that requires repair [Any vascular compromise even if appears Grade 1 is automatically a grade IIIC]
Antibiotics	1 st generation cephalosporin (e.g. cefazolin)	Add gentamin (aminoglycoside)	1 st generation cephalosporin = gram +ve coverage Add gentamin (aminoglycoside = gram -ve coverage Penicillin (if heavily contaminated) or concerned of farm injury)		
					

NB:

- *Most **accurate way** to grade open fractures is by intra-operative examination after washout
- ****Grade III** = Automatically if MVA, farm injury (contamination), Gunshot Wound, Segmental Fracture,
- ***Tetanus booster not up to date (in last 5 years) → very high risk of complications

Hypertrophic	Oligotrophic	Atrophic
<ul style="list-style-type: none"> • Good vascular supply but inadequate stability (>10% strain) • Viable bone ends • Large callous without bridging bone with fibrocartilage in between <ul style="list-style-type: none"> ○ Elephant foot (lot of callous) ○ Horse hood (moderate callous) • Managed with ORIF (open reduction internal fixation) 	<ul style="list-style-type: none"> • Good stability but inadequate Blood supply • No callous • Viable bone ends • Managed with internal fixation may need bone graft 	<ul style="list-style-type: none"> • Inadequate stability and Blood supply • Loss of viable bone ends = pencilled • Rx: rigid internal fixation and bone graft (autologous iliac crest - osteoconductive)
  		 
Infected non-union [low healing rate if not removed]		Pseudoarthrosis
<ul style="list-style-type: none"> • Often assoc. with pseudoarthrosis • Staging essential • Need for full debridement, ABs and vacuum dressing • Beware of sig. bone and soft tissue loss 		<ul style="list-style-type: none"> • Non-union with fluid-filled cavity (assoc. with infection) • "New joint" at fracture site + peanilles motion • Rx: = excise pseudoarthrosis → rigid fixation/compression and bone graft
		



ELECTIVE JOINT REPLACEMENT

Indication	Types	Main types of joint replacement		
For joint pain that fails previous Mx (analgesia, steroid PT) • OA • Fractures • Septic arthritis • Osteonecrosis • Bone tumours • RA	<ul style="list-style-type: none"> Total joint replacement – replacing both articular surfaces of the joint Hemiarthroplasty – replacing half of the joint (e.g., the head of the femur in the hip joint) Partial joint resurfacing – replacing part of the joint surfaces (e.g., only the medial joint surfaces of the knee) 	Total Hip Replacement		
		Total Knee Replacement		
		Total Shoulder Replacement		
		lateral incision over the outer aspect of the hip	vertical, anterior incision on anterior knee + patella rotated out of the way	anterior incision along deltoid
		<ul style="list-style-type: none"> head of the femur removed metal or ceramic replacement (ball + shaft, acetabulum and spacer) uncemented (for tighter fit) or cemented stem shafts 	<ul style="list-style-type: none"> Articular surfaces of femur and tibia are removed. 2x new metal surfaces and spacer 	<ul style="list-style-type: none"> head of humerus removed metal or ceramic replacement (ball + shaft, glenoid and spacer) Nb: reverse TSR → sphere in glenoid with cup at head of humerus

Before Surgery

X-rays +/- CT or MRI scans
Pre-operative assessment (pre-op)
Consent for surgery - mark correct limb
Bloods (inc. **group + X-match**)
Med changes (e.g., stop anticoagulation)
VTE assessment
NBM before surgery

**During Surgery**

GA needed or **spinal anaesthetic** may be used for lower limb surgery.
Prophylactic ABx BEFORE procedure to reduce the risk of infection.
TXA - minimise blood loss during the procedure.

**AFTER Surgery**

Analgesia
PT - to guide when and how to mobilise
VTE prophylaxis (LMWH, aspirin, DOAC, stockings)
28 days post THR
21 days post TKD
Post-operative XR (correct location), **FBC** (anemia)
Monitoring for complications (e.g., DVT or infection)

General risks	Specific risks	Management of prosthetic infection
<ul style="list-style-type: none"> Anaesthetic risks Pain Bleeding Infection Neurovascular damage Joint dislocation or reduced ROM VTE Fracture during procedure 	Prosthetic infection (very bad!) – 1% of joint replacements – usu. Staphylococcus aureus <ul style="list-style-type: none"> Prolonged operative time Obesity Diabetes 	<ul style="list-style-type: none"> Dx <ul style="list-style-type: none"> XR, blood (raised CRP) blood cultures M/C/S joint aspirate M/C/S Repeat surgeries – joint irrigation, debridement or complete replacement Prolonged Abx