**Final revision MSME 706 (2022)**

**Module 1. Shoulder revision.**

**Differential diagnosis**

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| Common causes of shouder pain  | Less common | Not to missed  |
| * Rotator cuff: strain, tendinopathy,
* GH: dislocation, instability, labral tear,
* Referred pain
* Clavicle #,
* ACJ sprain,
* Levator scapulae syndrome
* Other muscle tears: Pectoralis major, long head biceps
* Brachial plexus: neuropraxia, neuritis .
 | * Rotator cuff: tear, calcific , tendinopathy
* Adhesive capsulitis
* Biceps: tendinopathy
* Nerve entrapment: Suprascapular, LTN
* #: scapula, neck of humerus
* Stress # coracoid process
 | * Bone tumours
* Viscera Refererd pain
* Thoracic outlet syndrome
* Axillary vein thrombosis .
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*Non shoulder DDx:* - thoracic outlet syndrome; Disorders of the aortic arch; Carpal tunnel syndrome; ulnar nerve neuropathy; Brachial plexus injury; cervical spondylosis;; Acute cervical disc herniation; Brachial neuralgia

**Shoulder anatomy**

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| Bone | Joint | Functional space  | Ligament /muscle  | Rotator cuff  | Movement of the shoulder  |
| HumerusScapula: *glenoid, acromion*Clavicle | **1.GHJ:** -ball & socket, synovial, glenoid cover 1/4 HH -HH: retroverted 20°, upward *inclincation45*°-inherently unstable: shallow, wide ROM**Static stabilizer**  1.labrum *(↑concavity, better fit, -ve pressure*),  2.GH lig.inferior portion🡪 anterior stability; Ant. Midd. Infe portion🡪thicken the capsule 3. CH lig: vertical stability 4. GH capsule: superior portion🡪vertical Sta. 5. -ve intraarticular pressure. **Dynamic stabilizer**  - Rotator cuff: ant. Sup, post. Stability - Other muscles: deltoid2**. ACJ** (Acromial clavicular Joint)- synovial joint, wedge-shaped articular disc- lined with fibrocartilage - **Stabilizer**:  a) *superior, inferior AC ligament* ( avoid *axial rotation, posterior translation*),  b) *capsule* ( *AP stability*), c) *CC lig* ( vertical) - ROM: rotation 35°, translation 3.5mm. 3. Sternoclavicular  | **Subacromial space**- clinically important space. - frequent site of shoulder pain- **SA bursa**: covers HH anteriorly, superiorly, laterally, sl posteriorly🡪 provides smooth gliding soft tissue surface Scapulothoracic space- functionally as a joint but does not have joint structure - Allowing gliding movements between 2 soft tissue plains- rarely a source of symptoms | CC: coraco-clavicular CA: coraco-acromial CH: coraco-humeral LigAC: acromio-clavicular ligGH lig: glenohuermal lig -**Shoulder girdle muscles** - Deltoid- Pec major, pec minor - Serratus anterior- Trapezius- Rhomboid major, minor - levator scapulae- latissimus dorsi | SupraspinatousInfraspinatus SubscapulasTeres minor **Function:** 1. **reinforce** ant. Sup. Post aspect of GHJ. 2. **stabilize** HH🡪 draw it in towards glenoid fossa (providing a fixed fulcrum for abduction of the arm about the HH) **Rotator cuff syndrome**-SS impingement, tendinitis-rotator cuff tear-acute calcific tendinitis- biceps tendonitis/rupture**Exam for impingement**Hawkins-Kennedy (not specific, but sensitive) Neer’s test   | Flexion 180° (167°F, 171°M) Extension 60°, ABD 180°, ER 60° IR: inferior border of scapula**Muscle couple to abduction****- deltoid + rotator cuff balance important** (*RC tear in elderly 🡪 minimal sx, in young 🡪significant sx*) - **↓muscle tone**🡪 HH sublux infer- *Scapulohumeral rhythm*: *complex synchronous coordination GH, and scapulothoracic motion*  1. initial30°: GH 2. From 70°: GH+ Scapulo-thoracic ( scapular rotation) ,3. GH: ST ratio 2:1Muscle for ABD:  deltoid, RC, pec Major, biceps. Muscle for ADD: Pec major, latissimus dosi.  |

**Shoulder test**

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| Condition  | Test  | Overall impression | Κ (kappa score)  | Sensitivity | Specificity | Odd ratio | LHR ( likely hood ratio)  |
| Subacromial impingement | Hawkins-Kennedy  | Low sen, low spec. (ACJ also +ve) | 0.39 | 0.55-0.8 (high)  | 0.29 (poor)  |  |  |
|  | Neer test  | Low sen. Low spec  | 0.4 | 80% ( high)  | 0.3-0.6 (poor)  |  |  |
|  | Painful arc | Pain at 60-120°abduction, less pain with ER |  | 0.53 | 0.76 |  |  |
|  | Empty can test ( Jabe’s )  |  |  | 0.86 ( high)  | 0.14 (poor) |  |  |
|  | Cross-body adduction |  |  |  |  |  |  |
|  | Yocum test  |  |  |  |  |  |  |
|  | Resisted ER  |  |  |  |  |  |  |
| Rotator cuff tear  | Drop arm test  |  |  | 0.12 | 0.90 |  | +LHR :2.7 (FTT), 0.6 ( PT) |
|  | External rotation lag |  |  |  |  |  | +LHR: 7.2 |

**Common shoulder pain conditions**

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| Condition | Aetiology | Pathology | History  | Signs | Investigations  | Management  |
| Frozen shoulder   | *Uncertain : +/-trivial trauma*2-10% populationF>M (70%)Mean age 40-60y.Self-resolve after 18m.40% mild-mod persistent Sx | Definition: -*Gradual development of global restriction of GHJ (Active & Passive)*.-due to Fibrovascular inflammation (*active fibroblastic, myofibroblastic proliferation*) Risk: *DM, thyroid dz, RC injury*, immobilization, autoimmune ds, RA, stroke, Dupuytren’s, Parkinson’s | 1. May follow trivial trauma2. Pain: shoulder and arm. Gradual increase. Cant sleep on affected side3. Global stiffness in all direction: esp. GH ER (anterior GH capsule thickening early stage) 4. Overlapping 3 stages- Mean duration: 8m (1-36m) (*full resolution 4-10y*)- Often bilateral 35% - Classification: idiopathic, primary, secondary. - Stages: I: freezing, II: frozen, III: Thawning | ↓active & passive ROM Slight wastingDDx: -Infection-post-traumatic stiffness-diffuse stiffness-reflex sympathetic dystrophy | X ray: normal exclude other pathology (*osteopenia*) USS:Thickened CH Lig ( *high Sen, spec*). Hypoechoic region with ↑ vascularity in rotator intervalThick inferior GH capsule*MRI:* Reliable, capsular thickening, obliteration of sub-coracoid fat triangle | **Stage I**: analgesia, GHJ CSI, physio, manual therapy**Stage II:** stretch, exercise, Hydrodilation, MUA (*Manipulation under GA*), arthroscopic release. \* *Oral steroids improve pain, ROM**\* CSI faster pain relief, ROM but similar 24 weeks outcome.* \* *stretches early don’t change course*. \* NSAIDs no better than placebo *\* more intense physio🡪 poorer outcome*\* hydrodilatation: better score at 6 months |
| RC tear   | **RC:** SupS, IS, SubS, TM**Extrinsic:** Anatomical abnormalityPoor scapular control (↓)Anterior instability (↑)Excessive load on RCM🡪narrow SA, impingement, tendinitis, SA bursitis **Intrinsic**Overuse, Overload, aging🡪intrinsic failureGenetics, Systemic factors🡪 RC pathology🡪 narrowing of SA space **Causes***Falling*, throwing, lifting, pulling, pitching, swimming, painting, after DL.*Aging.*  | -Partial vs complete-Bursal surface, articular surface, intratendinous tear. -*Crescentic*, U-shaped, L-shaped, massive full thickness tear. *Risk factors (odd ratio)* - Heavy labour 3.81- overhead work 3.83- weight training 2.39- swimming 1.98- DM 3.34- Generalized OA. 2.39  | **Pain** *with overhead activity,***Pain at night**+/- weakness **Chronic**: assoiated w/ impingement (bursal side) **Acute**: in throwers (articular side), after dislocation (>40y.o)*Hx suggesting Full Thickness Tear*- Recent trauma, severe pain, function impairment- shoulder girdle muscle wasting-significant muscle weakness  | PalpationROM: active <passivePower: Specific test: **SS**: FF, empty can, drop arm *(+LHR2.7*), External rotation lag sign (*+LHR7.2*)**IS**: ER, Hornblower, **Subscap**: IR, lift-off, belly press*Worse outcome factors*-large, FTT >1cm2- sx >1y- Sig function impairment- Sig. RC weakness  | **USS: confirm tear.** **X ray**: usually normal  *-may show tendon ca++,* *- spurs,*  *- humeral head elevation**- chronic tendinitis :* *- rough, overgrowth of acromion* *-GH OA*  . **MR** (Gold standard) T2W, contrast shows communication b/w joint & subacormial spaceCT (if pacemaker, CI MRI)  | **Activity modification****NSAIDS****PT**: ROM, RC strengthening, scapular stabilization**SA CSI (**elderly, low demand): 3x 6/52, **Surgery: (**tear>1cm, >1y, ↓function, weakness significant) \* **Refer urgently** if tear >1cm or subscapularis tear. \* **Arthroscopic** repair: *95% pain relief*. Long term good result (*better if w/I 6mon*)\* **Replacement**: >70y. +/-OA. \* **Denervation** (intractable torn, co-mobility)  |
| Impingement syndrome | Same to above  | 1.Repetitive compression or rubbing of RC2. RC & bursa trapped b/w acromion & Gr tuberosity | 1.Pain w. *overhead activities*. Lifting, etc | Neers +/- local block HawkinsPainful arcJobe (empty can) Yocum’s( *hand on opp shoulder,raise up*)IRRS test  | **X ray:** outlet view (*hooked acromion or spur)***MR:** evaluate RC tear .  | NSADsActivity modificationPhysio: RC strengtheningSA CSISA decompression surgery.  |
| Subacromial bursitis  | Common shoulder pain.RF: throwing, repetitiveCauses-repetitive stress-acute trauma- RCT/injury- inflammatory: RA,  | Inflammatory changes of SAB | Pain with overhead activities Pain at anterolateral part of joint |  | **X ray:** to exclude other dx**USS:** anechoic fluid filled structureHyperechoic wall, synovial hypertrophy +/- hyperechoid blood **MRI:** Fluid filled structure btw deltoid and acromion. . T1w hyperintense. T1W hypointense.  |  |
| **GH OA** | OA #1 > RA 1° or 2° to- T**raumatic** (fall, RA, tear, surgery)- longstanding RC lesions  |  | Pain, StiffnessUsually elderly | ↓ROA , +/- wastingCrepitus  | X ray: joint narrowing, osteophytes MR: RC evaluation  | NSAIDsPTCSIHemi vs total shoulder arthrosplasty |
| ACJ OA | DegenerationPrevious trauma, Overuse (*weight-lifter*)RC disease  |  | PainGrinding | ACJ tendernessCrossbody adduction(scarf)AC shear testBell Van Riet testHawkins |  |  |
| Calcific tendinopathy | Unknown (No trauma) Ischaemia/ overuse🡪 *fibrocartilaginous metaplasia and deposition of crystals by the chondrocytes*Affects 30-50y. F>MDM, hypothyroidism common | Soft tissue calcium deposits in the tendons of RC\*calcification is not painful \*vascular reaction (swelling, tension) in the tendon is painful | Acute or chronic shoulder pain. Severe pain following overuse within hours. Night pain. Subsides after a few days  | Severe pain Painfu arc 60-120°Too sore to do any testMay resemble acute infection.  | **X ray** ( *gold standard*) -calcium deposition in SS tendon 1-2cm proximal to insertion. -Erosion, sclerosis or cyst at cuff insertion site. **-MRI:** Not necessary, small black signal in the SS , can check RCT.  | CSI into SA space NSAIDsNeedling of the lesion***Shockwave***Needle aspiration and irrigationSurgery (severe pain>6m)  |
| Bicipital tenosynovitis  |  |  | Gradual onset anterior shoulder pain Worse with resisted forearm supination & flexionSnapping | Pain at bicept tendon grooveSpeed: *resisted shoulder flexion*Yergason: *resisted supination*Resisted elbow FL, supination |  | NSAIDsPhysioCSI to tendon sheathTenodesis vs tenotomy |
| Biceps tendon rupture | Usually, older ptOften degenerative tearAsso. w *impingement & RC tear* |  | PainDeformity | Popeye arm deformityWeak supination | X ray: usually normal MRI: usually not necessary | PhysioTenodesis ( esp. younger/ active pt) |
| SLAP lesion | Tear of Superior Labrum from Ant. To Post. **Types:** - *non-traumatic ( old pt)**- avulsion of labrum (#1)* *- bucket handle tear**- extension to LHB* | **Chronic**: with RC tear **Acute**: FOOSH (shoulder load in flexed abducted position)7 types based on extend of tear . | PainPopping, **Painful click** on lifting the arm above shoulder Weakness  | O’Brient’s: *Shoulder 90°FL,10-15° ADD, Pain in SP>PN*CrankPainful arcKim (inferior labral tear)Speed’s testYergason’s  | **X ray**: usually normal**MRI** (*gold standars*)**Arthrogram**: most senstive.  | \*Few return full function w/o surgery. Arthroscopic repair (*91% successful*)Debridement+/- tenotomy or tenodesis of biceps  |
| Scapular instability | 1. Weakness of the serratus anterior (a. neuralgic amyotrophy b.injury to brachial plexus c. direct damage to the LTN; d. fasioscapulohumeral muscle dystrophy )
2. Injury to the spinal accessory nerve🡪 trapezius weakness
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| Snapping scapula | Asymptomatic 1/3 of healthy person.  |  |  | X ray: exclude osteochondromaCT | Conservative Surgery if OCD found  |

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| Shoulder DL  | Mechanism of injury | Clinical features | Imaging  | Treatment  |
| **Anterior DL**95% | **FOOSH🡪**Common in young /athletics Associated w/ labral tears (<40y).Rotator cuff tears (>40y) Associated w/ # - Bankart lesion - Hill-Sachs lesion**Complications**-RCT tear-N. A.V injury-# (humerus, clavicle, scapular) -Shoulder stiffness,-unreduced dislocation-recurrent dislocation | -Pain is severe-Pt supports arm with opposite hand. - unable to move arm -“flattened ” shoulder, no ROM, *\*MUST check nerve, vessel injury before reduction.* Apprehension test:  | ***AP view***: HH forward, overlapping with glenoid. Head below + medial to the socket. Bankart lesion: *avulsion glenoid labrum/ tuberosity* Hill-Sachs lesion: *Posterolateral HH impression #****Lateral view*:** HH out of line with the socket. West point or axillary view | **Acute Reduction**-Stimson’s - Hippocratic method- Kocher’s method (*risk of nerve, vessel and bone damage, not recommended*) **Immobilize:**  - Sling for 3wks under 30.y.o. - Sling 1 wks. If >30y.o ( *prone to stiffness*) **Physiotherapy:** **Surgery** - If recurrent DL, instability  - early labral repair in young patients  |
| Posterior DL (<2%) | RareSeizure, electric shockFall on flexed, adducted armDirect blow to front of shoulderFOOSH.  | Often missedAP X-ray: may be normal. Arm held in IR locked in position. Front of shoulder looks flatProminent coracoid | AP X-ray: empty glenoid sign *(light bulb)* **Lateral, axillary view** essential+/- HH #. CT | Reduction ASAPPulling on arm in adduction*Complications*-unreduced dislocation-Recurrent DL or sublux |
| Inferior DL(*luxatio Erecta*) | Rare, but Serious consequences Due to weakness of deltoid muscle  | Arm in nearly full abduction/elevationSoft tissue injury may be severe ( *avulsion of the capsule, surrounding tendon, rupture of muscles, # of glenoid or proxima humerus, damage to brachial plexus and axillary artery*)  | X-rays: Humeral shaft in abducted position . head below the glenoid  | Prolonged exercise programViewed with great caution. Surgery  |
| Subluxation GHJ  |  |  |  | Surgical stabilsation |

Neurological exam

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| Level | Motor | Sensory | Reflex |
| C5 | Deltoid/biceps | Upper arm | Biceps  |
| C6  | Wrist extension | Thumb | Brachioradialis |
| C7 | Wrist extension/finger extension | Middle finger  | Triceps  |
| C8 | Finger grip | 5th finger  | Non |
| T1 | Hand intrinsic  | Medial elbow  | None  |

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|  | Ulnar N (C7-T1) | Median N (C5/6-T1)  | Radial N (C5-T1) |
| Muscles | FCU, FDP; FPB(deep), all interosseous, 3rd 4th lumbrical, Adductor pollicis | APB, OP, FPB (superficial), 1st& 2nd lumbrical; Forearm flexor (*apart from FCU FDP*) | Anconeus, mobile wad ( BR, ECRL) PIN: ECRB, All posterior compartment: |
| Branches | 1) dorsal cutaneous 2) palmar cutaneous 3) deep motor 4) superficial sensory branches | 1)AIN, 2)Palmar cutaneous, 3)Motor recurrent,  | 1)Superficial Br, 2) Deep br, 3) PIN |
| Sensory | Ulnar border 4th finger, small finger  | Palm of hand, volar 3.5 finger, Dorsal distal 3.5 fingers | Post. Forearm, dorsal wrist (4th compartment) |
| Motor  | Wrist flexion, ulnar deviation; finger adduction, thumb adduction, 4th 5th PIP extension, MCP flexion (lumbrical)  |  Thumb abd, flexion, opposition, 2nd 3rd PIP extension, MCP flexion | Finger, wrist extension, thumb abduction, extension.  |
| Specific test  | Ulnar claws, Fromen’s, Wartenburg, finger abduction, claw hand | Ape hand  |  |

**Module 2. Elbow revision**

**Elbow anatomy**

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| Bone  | Joints | Biomechanics  | Ligaments  | Muscles  | Others  |
| **Radius**： - head, neck, tuberosity**Ulna**: olecranon, coronoid process, tuberosity **Humerus** - Capitellum- trochlear- Med/ Lat. Epicondyle- Olecranon fossa(后)- coronoid fossa ( 前) | 3 joints - UH (ulnohumeral)- RC (*radiocapitellar*)- PRU (*proximal radioulnar*)**ROM**flexion/extension 0-150°, Supin./pronation 80 / 80°**Functional ROM**Flexion: 30-130° supination/rotation 50/50° | **Carrying angle** (vulgus): * 5-10° (M), 10-15° (F)
* ***trochlea Valgus*** *: 6°*
* *anterior tilt: 30°*
* *IR: 5°*

Stabilizer: **1° static:** UHJ, MCL, LCL **2° static:** RCJ, Capsule, common flexor and extensor**Dynamic**: any muscle cross the elbow (*anconeus, triceps, brachialis, biceps*)**Force across the elbow**F. on forearm x 3= F at elbow J.**Instability****PL rotatory**: injury to LCL **PM rotatory**: LUCL (*Lateral pivot shift*)**Valgus:** MCL *( valgus laxity*) | **MCL** (Medial collateral/ulnar)- **Anterior** bundle (*Most important*) - Posterior Bundle- Transverse bundle**LCL** (lateral collateral/ Radia)- **LUCL** (*lateral ulnar collateral*) *(🡪 posterolateral rotatory IS*)- LCL- Accessory collateral ligament- Annular ligaments**Other structures**- Fat pads- Olecranon bursa- Ligament of struthers(*supracondylar process-M. epicondyle*)- Arcade of Struthers(*IM septum- triceps*)- Leash of Henry (*branches of recurrent radial artery*)  | **Superficial extensor***anconeus,* ***ECU, EDM, EDC***Mobile ward: *BR, ECRL,* ***ECRB*****Deep Extensor**Supinator, APL, EPB, EPL, EIP (*Extensor indicis proprius*)**Common extensor tendon (4)**ECRB, EDC, EDM, ECU**Superficial flexor**: PT (*Pronator teres*), FCR, PL, FCU, FDS**Deep flexors** FDP, FPL, PQ (*pronator quadratus*) Common flexor tendon origin (5)PT, FCR, PL, FDS, FCU | elbow ossification CRITOE Capitellum 1y Radial head 3Y Int, epicondyle 5y Trocheal 7y Olecranon 9 y Ext epicondyle 11Y**Cubital tunnel** R: Osborne’s ligamentF: MCLP: Medial head Triceps A: Medial epicondyle L: Olecranon **Radial tunnel**: 5cm long tunnel, begins as radial N courses past the Radiocapitellar joint. Roof: brachioradialisMedial: Biceps, brachialisLateral: ECRB, ECRL, BRDistal: arcade of Frohse |

**Paeds elbow injury**

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| Supracondylar # | Very commonMost extension type | FOOSH fallPainWill not move armDeformity | Swelling +/- deformity Common: AIN > radial NVolkman’s contracture: clawing\* Must check Neurovascular  Ok—AIN N. Scissors—Ulnar N.  Star—Radial N   **Pulse** | **X ray**: elbow series, lateral Anterior humeral line: 1/3 capitellum center not in front. Fat pad sign. Gartland classification-I: nondisplaced-II: partially displaced-III: displaced  | **Grade I**: above elbow back slab/cast**Grade II:** Flex elbow >90deg, **Grade III**: Splint, refer for OT*closed reduction& percutaneous pinning*. If pulseless/unperfused: Urgent surgery |
| Medial epicondyle # | Avulsion #  | With common flexor ward | Ulnar nerve damage: scissors  |  | OT If displacement >5mm |
| Lateral condyle fracture | Lateral condyle pulled or pushed off |  |  |  | Often surgery( *intraarticular #*)  |
| Radial head # |  | FOOSH fall |  | X ray: valgus, hyperextension | OT if >30° valgus deformity |
| Monteggia | MUF: ulnar #+ radial head DL |  |  |  | Surgery  |
| Pulled elbow | Most common injury to the elbow in young children< 5y.o common | Due to forced axial traction of extended elbow on a resisting child🡪 Subluxation of the annular ligament🡪 Radial head dislocation  | -Pain in elbow-30-40° elbow flexion + sl pronation-Unable to extend or supinate the elbow  |  | HyperpronationSupination + flexion |
| Elbow dislocation | Rare in young ( <3y)  | Post. DL: Fall on ext. elbowAnt. DL: fall on flex. elbow |  |  |  |
| Little league elbow  | Medial epicondyle stress #MCL strainsFlexor ward strains  | Repetitive valgus loading to elbow (thrower) |  |  | Most settle with rest, activity modification  |
| Osteochondritis dissecansPanners disease | OCD Most common on capitellum10 y.  | Cause unknonw? repetitive microtraumaLateral compressive forces ( common in gymnasts) |  |  | Most settle with activity modificationOT if loose fragment, ORIF |
| Forearm fracture (FOOSH fall) | Treat aggressively in adult( Joint)Within 2 years of growth completion: ORIF (girl 12y. Boy 14y) | Ulnar #if >50%displacement>10deg angulation 🡪ORIF | Galleazi #: MUA🡪 ORIF |  |

**Common elbow conditions in adults**

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| Condition | Aetiology/  | Pathology | Symptoms  | Sign | Investigations | Treatment  |
| Lateral epicondylitis (Tennis elbow) | Repetitive stress 🡪 ECRB and EDC (*all deep to ECRL*) +/- PIN compression (5%) Most common cause of elbow Pain1-3% adults annuallyCommon 35-50yDominant armM=F | **Histology:**Angio-fibroblastic hyperplasia (Not inflammatory) - *Neovascularization**- infiltration by mucopolysaccharide**- disordered collagen scaffold**- bone formation**- angiofibroblastic proliferation* | Pain at lateral elbowDDx:-Radial tunnel syndrome: *pressure on RT and SN/PN forearm🡪pain*-Radiohumeral joint syndrome- C-spine RL- OA RCJ- posterolateral instability- Triceps tendonitis - Occult fracture | **Pain**  -Lateral epicondyle pain (ECRB) -passive wrist flexion**Mill’s sign**: *Resisted wrist extension with forearm pronated, elbow flexed***Maudsley’s test**: *resisted 3rd finger extension***Chair test:** *worse In pronation> supination*  | **X ray:** *usually normal* *+/- calcification in extensor muscle mass*. **MRI:** -ECRB tendon thickening, oedema, tendon degeneration 90% cases **USS:** *ECRB tendon thickened, hypoechoic;* *variable sensitivity, specificity.*  | **Activity modification****NSAIDs****Physical therapy**: effective 91% at 52w**Injection**: (CSI *good for short term pain, do not improve long term outcome;* **Bracing**: reduce tension (*cock-up wrist splint, counterforce brace*) **Acupuncture**\**no evidence of botox, autologous blood, PRP,* ESWT ( shockwave) **Surgery:** not common. - Sx >6-12 mon. night pain, - CI: inadequate conservative - Open/arthroscopy: debride, decorticate, (94%-97%successful rate)  |
| Medial epicondylitis (Golfer’s)  | Repetitive stress🡪 Pronator teres, FCR originLess common (ratio 1:6 compared with lateral)10-20% lateral epicondylitis Common 4th-5th decades Dominant arm 75%M=F | Angiofibroblastic hyperplasia (due to microtrauma, degeneration) Sports: -valgus stress-overhead throwing ( *Golfers, bowlers, weight lifters, racket sports, labour*)Occupation -doing repetitive forceful grip, manual handling of load>20kg, constant vibratory forces at elbow.  | Pain :*Anterior and distal to medial epicondyle over origins pronator teres, FCR.*-Worse with gripping, - palpation, - resisted wrist flexion, - pronation-overhead throwing, -early acceleration for thrower. Flexion contracture | -Tenderness to palpation -Resisted wrist flexion and forearm pronation🡪 pain- flexion contracture in chronic case-DDxCubital tunnel syndromeFracture MCL injury:(*distal medial epicondyle, valgus stress, milkman test*) Triceps tendonitis Ulnar neuritis: tinel,  | **X ray**: usually normal**MRI**: may show rupture of flexor-pronator origin**USS**: may show thickened and hypechoic area and tear | More aggressive ( risk of contracture ) Activity modification: refrain 6-12mIcingNSAIDx 1-2 wks **Physio:** -*Flexor-pronator strengthening stretching*- eccentric contraction avoided initially-night splinting and supportive orthoses **Needling:** 🡪 tendon trephination🡪bleeding, tendon healing. **CSI** *peritendinous, synovial tissue NOT the TENDON itself* *\*Shockwaves, PRO no evidence* **Surgery** (4-6 months. More aggressive)  |
| Cubital tunnel syndrome  | 2nd commonest compressive neuropathy Ulnar nerve compression at elbow Diagram  Description automatically generated | **Compression site**--Osbornes fascia (Common)- 2 heads of FCU- Arcade of Struthers- Medial triceps- Medial epicondyle- elbow valgus - Osteophytes - Ganglions **Cubital tunnel** R: Osborne’s ligamentF: MCLP: Medial head Triceps A: Medial epicondyle L: Olecranon  | **Tingling/numbness** in ulnar distribution **Weakness**: wrist flexion, ulnar deviation (FCU), weak pinch (thumb adduction) **Vague forearm pain +/- elbow pain** | **Paraesthesia** : 4th 5th finger**Weakness:** **-↓**wrist flexion (FCU), -finger add (interosseous),- 4th 5th PIP ext, MCP flexion, - grip strength (lumbricals 3& 4),- thumb add (Add pollicis),**Muscle wasting**: *1st web space, intrinsic (interosseous*) **Ulnar claw hand** (*wasting of intrinsic, 4th 5th PIP flexion, MCP extension,*) **Wartenburg sign**: lost little finger Add**Fromen’s sign**: Weak thumb add. (*recruit FPL*) **Tinels**: tapping on CT**Elbow flexion test**: flex elbow**Modified Tinel’s**: flex elbow + palpation | **X ray**: look for abnormal medial epicondyle**EMG**: confirm diagnosis (*negative does not r/o*)**DDx**;C8- weak triceps (*no other muscle weakness of hand*)- numbness ring, little finger T1- numbness forearm- weakness finger abduction, - wasting thenar eminence (median) **Combined Med +ulnar**Undistinguishable   | Activity modificationNSAIDsNight extension splints / rolled towelSurgery (*if fail conservative Mx, persistent neurology*) - Ulnar nerve transposition |
| Radial tunnel /PIN entrapment  | Diagram  Description automatically generated | **Compression site** - Leash of Henry- ECRB- Arcade of Frohse- Distal edge for supinator- Interosseous membrane- Between APL & EPL**Anatomy**: 5cm long tunnel, begins as radial N courses past the Radiocapitellar joint. Roof: brachioradialisMedial: Biceps, brachialisLateral: ECRB, ECRL, BRDistal: arcade of Frohse | 1.**Deep dull ache** at *dorsal proximal radial* aspect of forearm2.mild or no motor or sensory loss**PIN entrapment** *Painless (or minimal)* Fingers and thumb dropDrift of hand radially**NCV**: diagnosticMRI: muscle atrophy, denervation **Wartenberg’s syndrome**-compression of superficial radial nerve at wrist- Sensory sx only (numbness/pain) | 1)Pain with compression on radial tunnel with forearm pronation/ supination2)Passive resisted extension of middle finger3) supination against resistance | *Difficult diagnosis* **X ray**: evaluate RCJ. **MRI**: evaluate for masses **EMG:** usually normal in radial tunnel syndrome, but confirms diagnosis & locations in PIN Diagnostic block.  | NSAIDsActivity modificationPhysio: nerve gliding, USS. Heat/coldSteroids injection\**avoid using counterforce or tennis elbow braces* Surgical decompression. (*unless weakness: uncommon*)  |
| Pronator syndrome(Median N)  |  | Compression of Median nerve at 1. Ligament of Struthers
2. Pronator teres
3. Lacertus fibrosis (*bicipital aponeurosis*)
4. FDS aponeurosis/ arch
 | **Numbness** **Tingling**+/- weakness of thenar M**Pain** in wrist, forearmDDx: CTS- no nocturnal sx- -ve Tinel at wrist- -ve Phalens- EMG:- numbness at palmar triangle.  | Decreased palm sensation**Symptoms triggered** by: pronator teres, lacertus fibrosus, arch of FDS pressure.**Pain triggered by** - resisted pronation (*PT* test)- resisted elbow flexion (*lacertus fibrosis*) -resisted PIP flexion (*FDS test*)**Difference to CTS**No nocturnal sxTinels -ve at wrist, +ve proximal forearmPhalens -ve Numbness at thenar | EMG: delayed at forearm *(-ve does not rule out*)  | Activity modificationNSAIDSSplintingSurgery  |
| AIN syndrome | Rare  | Same sites at pronator syndrome  | Weakness+/- pain(No numbness) |  | X ray: usually normalEMG/NCS: confirm dx  | Same to above  |

**Module 3. Hand and wrist revision**

**Anatomy of wrist and hand**

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| Bone  | Joints | Tendons | Muscle  | Movement  | Special test  |
| **Carpal bones (8) (***held by ligaments, no muscles***)** Scaphoid, lunate, triquetrum*,* ***pisiform (sesamoid bone)*** Trapezium, trapezoid, capitate, hamate**Metacarpals (**5)**Phalanges** (14)**TFCC** (triangular fibrocartilage complex) | Wrist joint: CM (carpometacarpal) Mid-carpal J (btw 2 rows of carpus)MCP joint PIPDIP Type of grip- precision grip: pick a pin-pinch: hold a sheet of paper-side-ways pinch: key hold- chunk grip: hammer handle- hook grip: hold gag handle -span: hold a glass | **Flexors tendon sheath** -**annular pulleys (A1-A5):** (A1: MCP; A3:PIP; A5:DIP. *A2.A4 over prox. Middle phalange*)- Vincular (*系带*)- cruciate pulleys:  -**Volar plate** (palmar ligament)**Extensor tendon complex** 1.**Dorsal hood:** *sagittal, oblique, lateral bands* 2.**Extensor tendon**:  *central slip (P2)🡪 base of middle phalanx* *lateral slip(P3)🡪base of distal phalanx* *terminal extensor tendon(P3)🡪base of distal phalanx*3.**conjoined lateral bands**: lateral slip+ lumbrical + interossei (at MCP)  | **Extrinsic:**  - Long flexors: FDS, FDP, **FPL** - **Extensors**: EPL, EPB, APL, EIP, EDC, EDM**Intrinsic** - Lumbricals 1&2 (Median):  (*FDP🡪radial lateral band: Ext PIP, FL MCP*) - Lumbrical 3&4 (Ulnar): - Interosseous dorsal (ulnar) DAB ( abduction) - interosseous palmar (ulnar) PAD (adduction) **Thenar**: **APB,** **FPB** (ulnar—Deep head) **OP****Adductor pollicis (ulnar)** **Hypothenar (ulnar): PB, ADM, FDMB, ODM** | **Wrist**- Flexion/extension- supination/pronation- radial/ulnar deviation**Fingers**- Flexion/extension MCPJ 0-90° PIPJ 0-110° DIP 0-90° -abduction/adduction**Thumb**: - add (AP:*ulnar)*- abduction: APB, APL- opposition: OP- flexion: FPB (MCP), **FPL (IP)** - extension: EPB (MCP), EPL (IP)  | 1. Finkelstein’s test: de Quervain2. Radiocarpal and midcarpal drawer3. Ulnocarpal stress test :Sharpey’s4. ECU subluxation5. DRUJ compression test 6. Watson: SL dissociation7. Piano key: instable DRUJ8. **Regan test**: Lunotriquetral lig disruption. 9. **Shuck test**: lunotriquetral ballottement test: 10. Thumb instability test: (1st UCL) 11. **Elson test**: central slip injury |

**Wrist anatomy**

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| **Extensor compartment**  | **Carpal tunnel**  | **Ulnar tunnel/Guyon’s canal** | TFCC (triangular fibrocartilage complex) | Hand surface landmark: dorsal | Hand surface landmark: volar |
| I: EPB, APL (de Quervain’s)II: ECRB ECRLIII: EPLIV: EIP (*ext. indicis proprius*), EDC (*Ext. digitorium Communis*)V: EDQ/EDM (Ext. digiti minimi)VI: ECU ( Ext. carpi ulnaris)  | Volar concave arch formed by 8 bones**Roof**: flexor retinaculum**Floor**: central carpal bones(Pisiform/hamate—Scaphoid/trapezium) **Medial wall**: pisiform, hamate**Lateral wall**: trapezium, scaphoid9 tendons: 4x FDS, 4x FDP, FPL1 nerve: Median N | Floor: transvers carpal ligRoof: volar carpal ligMedial wall: pisiformLateral wall: hook of hamate Ulnar nerveUlnar artery \*usually ganglion causing issues  | Distal ulnar- ulnar proximal carpal row (*triquetrium*); Sigmoid notch (radius)- base of ulnar styloid**Blood supply**: ulnar A. AIA (10-25%)**Triangular fibrocartilage**:  - **Central disc**: *avascular*, *aneural*. Resist compress - **Dorsal radioulnar** lig. (*tight in pronation*) - **Palmar radioulnar** lig.(*tight in supination*)Meniscal homologue: *highly vascular synovial fold***ECU** tendon sheath | 1. Thumb CMC
2. ASB
3. Radial styloid
4. Distal radius
5. Lister’s tubercle
6. SLL (scapho-lunate)
7. TFCC
8. Ulnar styloid
9. Ulnar snuffbox
 | 1.Scaphoid tubercle2.Radial styloid3.Radial artery4.FCR5. FCU6.pisiform7.hamate  |

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| Conditions  | Aetiology | Pathology  | Symptoms  | Test  | Investigations  | Treatment  |
| Carpal tunnel syndrome | Most common peripheral neuropathy**RF:**DevelopmentalTrauma:#Swelling: *ganglion, fibroma, lipoma*DM, Thyroid ds, pregnancyRA, obesity, Manual work  | Median nerve compression by *transverse carpal ligament* in the carpal tunnel🡪inflammatory reaction of N* Edema, hypoxia
* Axial degeneration

Nocturnal sx- acute wrist flexion of the fetal sleeping position- altered fluid distribution when lying | Sensory disturbance (*worse at night*)-numbness-tingling at finger tips ( radial 3.5 fingers)-Wrist arm pain: burning, (*may 🡪 shoulder*) .Motor disturbance-weakness: pinch,& grip, thumb op-clumsiness of thumb: Thenar atrophy | **Sensory loss** (spare palmar triangle: *Palmar cutaneous N*)**Abductor pollicis brevis test**: **Muscle wasting****Hand elevation test***: hand held above head 2 min*Carpal compressionPhalen’s test Reversed Phalen test Tinel (above not diagnostic)  | **EMG**: confirm diagnosis (*but negative does not rule out)* **X ray**/ *specialized carpal tunnel view:* usually normal **Blood test**: ESR, BSL, UA, TSHDDx:Pope’s blessing sign (Hand of benediction *proximal medial N lesion*) Pinch sign: AIN  | 1.Activity modification2. night splints3.NSAIDx4.CSI5.surgery: (*failed conservative, constant sensory, evidence motor weakness, EMG +ve*) release of transvers carpal ligament |
| **Guyon’s canal compression** | Ulnar N compression in Guyon’s canal | Trauma ( *hypothernar eminence, repetitive occupational trauma, hypothenar hammer syndrome*)Abnormal structures: ganglion, abnormal muscle | **Numbness** (5th and half 4th at palmar side only) (If dorsal sensation impaired, cannot be Guyon’s) **Weakness**: Interossei, ADP**Impair precision grip**: *due to intrinsic M weakness & little finger sensory dysfunction)*  | **Worse Clawing hand:** \* high ulnar N compression cause - less clawing: *FDP also involved; -* *-* more loss *of sensation at dorsal ulnar hand*)  | **X ray**: look for fracture**CT**: Evaluate for fracture/malunion**MR**: useful for masses**US**: evaluate for thrombosis**EMG**: confirm diagnosis  | Night splintsAvoidance of provoking postures, activitiesCSISurgical decompression.  |
| De Quervain’s  | F, 30-50 y.oTrigger:Repetitive activity (pinching)RA, psoriatic arthritisOther inflammatory synovitidesPregnancy, postpartum | Tenosynovitis of APL & EPB (***1st dorsal*** *compartment)* | Radial wrist Pain , base of thumb painOver the tunnel radiates into forearm. Weakness: any hand function  | Tenderness & crepitus at *1st dorsal compartment*Finkelstein’s test +ve. ( *false +ve in basal joint arthrosis*) | **X ray**: usually normal**MRI:** Thickening of the peritendinous synovium whining the dorsal tunnels  | Splint ( *radial gutter light support splint*) NSAIDsCSI into sheathSurgical release  |
| Flexor tenosynovitis  |  |  | Ulnar wrist pain+/- popping/grinding  | Ten |  |  |
| TFCC tear  | Traumatic (class1)Degenerative (class2)Only periphery is vascular | FOOSH injuryTwisting injury of forearm.  | Pain, clicking, Instability in distal RUJ ( esp. twisting wrist) | +ve Foveal signBallotmen test ( piano-key sign)Sharpeys test  |  |  |
| RA  | Most commonCan affect all joints of the hand/wristMCP PIP wrist most common  | *Synovitis**Ligament stretching**Articular cartilage destruction**Characteristic joint deformities*  | Ulnar drift Swan neck Boutonniere deformityTendon ruptures: EDC, EDM |  |  |  |
| Psoriatic arthritis  | Less common DIP joints +/- Nail involvement  |  | Asymmetrical distribution**Nail** involvement Flail fingers Synovitis🡪 trigger finger.  | Arthritis mutilans: devastate small joints  | **X ray**: “pencil in cup”appearanceShortening of the bones |  |
| OA | ElderlyHx of injuryCommon: DIP, 1st CMC  | Loss of articular cartilage Due to **wear** or **posttraumatic**  | PainWorse with activity | DIP J #1 (Heberden’s nodes)PIP J #2 (Bouchard’s nodes) 1st CMC joint OA: painful grind, shuck testDecreased ROM  | X ray: joint space loss, osteophytes, sclerosis, subchondral cysts  | NSAIDsSteroids injectionArthrodesis/fusionArthroplasty |
| Dupytrens disease  | Associated with Genetics ( AD), DM, EtOH, smokingMale > 40y. **4th** >5th>3rd>2nd fingers, | **Contracture** of **palmar fascia**Myofibroblasts🡪 **thick cords** of Type III collagen🡪 MCP, PIP | Hand mass,  | **Nodule** in palm (A1 pulley)Contracture of MCP or PIP  | PE is diagnostic  | Early: reassuranceLate (contracture): surgical excision of cords  |
| Trigger finger | Associated with DM, RA, age Congenital form in paeds 1st>3rd> 4th finger | Stenosing tenosynovitis Tight /**thickened A1 pulley** entraps flexor tendon | Pain snapping, or locking esp in AM  | Tender flexor sheath, snapping with flex.ext | PE diagnostic  | Splint, occupational RxCSI into tendon sheathA1 pulley release surgery  |

**Injury to wrist /hand**

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| Soft tissue  | Bone  | Bone  | Nerve injury  |  |
| Wrist sprain | 1. Distal radius #
 | 1. Scaphoid #
 | Median N.  | Ulnar nerve  |
| FOOSH Ligaments injuryConservativeIf complete rupture (SLL) 🡪 chronic wrist pain | **Colles** #: dorsal angulation, displacement if distal fragment**Smiths** #: Volar angulation🡪 growth plate involvement in kidsMx: manipulation, short arm cast 4-6wks.  If comminuted, intraarticular #--> ORIF, bone grating**Complications**: Malunion, wrist stiffness, pain, weaklness. CTS, CRPS, rupture EPL.  | - young male. FOOSH- Painful swollen wrist,- Tender at snuff box, - x ray: may be normal-**Mx:** Immobilise wrist in plaster 2wks🡪 rex ray. Or MRI. **Complications:** delayed/ non-union; avascular necrosis of the proximal pole of scaphoid; chronic wrist pain, stiffnessOA.  | Loss of tactile gnosis to toe radial 3.5 digits  | Loss of precision grip ( paralysis of intrinsic muscle)  |
|  | Metacarpal phalangeal #  | Dislocation  | Tendon injury | Nerve damage |
|  | Manipulation, splintage Correct all angulation, displacement, rotational deformity If across joints🡪 ORIF ( risk of stiffness)  | MCP, IP J common. Ulnar collateral ligament of thumb ( skiers thumb)🡪 early repair of complete rupture  | Long flexor tendon: repair, rehabExtensor tendon: conservative in splint | Repair.  |
|  |  |  |  |  |

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| Spindle-shaped finger: PIPJ swelling | Swan-Neck: **PIP** extend, **DIP** flexed (*FDS insertion/volar plate injury*) |  Finger trauma  | **Human bite**: wash out, Never suture |
| Sausage finger: digital flexor tenosynovitis  | Boutonniere: **PIP** flexion, **DIP** extension (*central slip injury, RA*) | Mallet fingers: distal extensor tendon rupture🡪DIPJ extension splint 6wks🡪 OT | **Crush injury:** elevation, intrinsic plus position, never suture |
| Telescoped shortening of the digits: Psoriatic arthritis  | Z-shaped deformity of thumb: MCP flexion, IP extension (EPB)  | Jersey finger: forced DIP extension injury🡪 OT | **Dislocation**: MCP, IP common, 1st UCL ( skiers thumb)🡪early repair.  |
| Dupuytren’s contracture: thickened & contracture of *palmar aponeurosis.*  | 1st EPL rupture: flexed MCP, IP thumb  | Gamekeeper’s thumb: MCP UCL rupture. Partial tear: splint. Full tear: repair.  | Flexor Tendon injuries: Long flexor T🡪 repair  |
|  | Heberden’s : DIP | Extensor tendons: avulsion/ rupture (Mallet deformity DIP): splint |
|  | Bouchard’s node’: PIP  | Nerve injury: clean, repair for young but variable prognosis.  |
|  | Mucous cyst: DIP J ganglion cyst | \*\*\* Early active, passive joint mobilization encouraged  |

**Module 4. Hip revision**

**Paediatric hip problems (\*\*2018:2)**

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| **Condition** | Aetiology | Pathology/causes  | Symptoms  | Exam, investigation | **Management**  |
| **Dysplasia** (Developmental Dislocation of the hipDDH) | \* 1.5-2 /1000 live births. **Risk factors**: - Female (7:1)- First born, - breech, - Family history. - Swaddling. - high birth weight, - oligohydramnios, - With other anomalies *L>R* | Due to*- ligamentous laxity,* *- Muscle underdevelopment**- Abnormal shallow slope of acetabular roof* 🡪 dislocation, subluxation or laxity of hip  | *Exam: birth, 6mon, 12mon, 18mon* **Infant:**- asymmetry- clicking hip- difficulty in applying nappy-asymmetrical skin fold-asymmetrical leg length- limping, delayed walking**Adolescence**:1. Development of pain in adolescence 2. *Bilateral dislocation*: no asymmetry, but bilateral waddling. Trendelenburg.  | \* Clinical exam at birth, 6 weeks , 8-9 months. **1) Barlow test (***Dislocation* )**2) Ortolani’s test (***relocation* **)**: Investigation-USS: (newborn) <50% FH cover-x ray > 6m.o. (*after development of the capital epiphysis*): *- increased acetabular index,* *- a broken Shenton’s line* *- false acetabulum*- *femur lateral to Perkins’ line*  | **Aim:** to hold the joint reduced to enable normal development**<6m**: Pavlik harness **6-14m**: more difficult. MUA, Open reduction +/- femoral osteotomy**>14m**: open reduction+ osteotomy  |
| **Perthes’ disease (Legg-Calve-Perthes’ Disease)** | **-4-8 years** of age-M: F=4:1. -10-20% bilateral. -8-12% positive FHx. (Small, active boy, parents smoking etc) | cause unknownAvascular necrosis of the femoral head (the blood supply to the head of the femur is temporarily disrupted)**Prognosis factor:**  - Age of onset (*younger, the better*) (<6y) - Degree of Femoral head involvement (<50% head involvement)  | **Sx**: limp, hip or knee pain**Ix:** - Reduced **Ab**duction, IR - Antalgic or Trendelenburg gait  - Flexion contracture (stiff hip)  - Limb length discrepancy (late) **Outcome**:  - short limb,  - ↓Abduction,  - Degenerative arthritis (most by 5th decade) - Hip arthrodesis or arthroplasty  | Stages in Perthes 1. Initial/necrosis: blood supply to the femoral head is disrupted and bone cells die.2. Fragmentation (over a period of 1-2y)3. Reossification4. Healed Crescent sigh: subchondral collapse/#X rayBone scanMRI: early necrosis (sensitive)  | **Goal:** (*to preserve ROM, keep femoral head contained in acetabulum)***Mild:** avoidance of high-impact activity.  - NSAIDs,  - physio: traction  - Petrie Casting and bracing for 4-6 weeks; **Surgery** (severe cases, >8y.o. non-surgical fails): - arthrogram, - tenotomy (to release adductor longus muscle in the groin) - *osteotomy* (re-alignment of the proximal femur, occasionally, an acetabular procedure to improve femoral head cover) - followed by a cast for several weeks  |
| **Irritable hip** *(Transient synovitis)*  | Diagnosis of exclusion**Commonest** cause of hip pain( 3-8Y)  M> F. Insidious onsetMust rule out infection/Perthes  | *Aseptic hip effusion* of unknow causeCan follow viral URTI/ overuse | Hip pain in otherwise healthy child Transient: 7-10daysSynovitis: discomfort, muscle spasm around hip joint and a limp  | Routine blood test; ESR, CRP WCCUrine USS of pelvis and hip joints (may show small effusion)  | Bed rest after clinical examUsually pain will settle over 48-72hr |
| **S.U.F.E (Slipped upper femoral epiphysis)** | **10-14 y.o.****obese** (*mechanical stress)* **Male** (3:1)**Hormonal** Hypothyroidism **Genetic**: autosomal dominant**Trauma**: causes acute slip   | Acute or chronic Salter I fracture (slip of femoral epiphysis) *through plate of proximal femur***Complications**: - Progressive slip and deformity- Chondrolysis, -AVN of femoral head, -Degenerative OA | - Sudden or gradual onset - Hip pain (groin, ant. Thigh) pain + limping - Knee pain (referred pain) *Adolescent knee pain equals SUFE until proven otherwise* -Tender over joint capsule- Sl. **Shortened** leg + ER (external rotation)- **Restricted IR**, Abduction, Flexion- Whitman’s sign: *obligatory* external rotation during passive flexion of hip) - Trendelenburg sign: weakened gluteal muscles | **X ray** (AP, Frog-view. Lateral view)- Normal x ray first several weeks - Femoral epiphysis slips  \* Posterior, medial slip of epiphysis \* Klein’s line: *epiphysis slipped under*  \* AP view: widened/lucent growth plate) Diagram  Description automatically generated | 1. Immediate referral (Emergency) 2. Crutches, wheelchairs, NWB3. Urgent surgery (in situ pinning, Fixation of the contralateral epiphysis (*30 % risk of slip in opposite hip*)  |

 **Other hip issues**

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| **Hip dislocation**  | Posterior DL (most common)Anterior DL ( less common)  | 1) High-energy trauma (MVA, dashboard injury) 2) significant fall *Associated multiple injuries/fractures* **Post DL**- *Patella* #- *PCL* rupture- # posterior margin of the *acetabulum* - Femoral head and neck #- *Sciatic nerve* impairment**Ante. DL**- *obturator nerve* injuryEmergency (risk for AVN of femoral head *Due to disruption of the retinacular capsular blood supply*) | Trauma hisotrySevere pain ( *esp with motion*) Cant move hip/thighPost DL: ADDucted, fixed IR. Slightly flexed Ant. DL: ABDucted, fixed ER. Diagram  Description automatically generated | X ray: AP pelvis, frog lateral  | Early reduction essential (< 6hr) Repeat x ray & neuro examClosed reduction +/- ORIF if necessary  |
| **Femoral neck fracture**  | Common in elderly (*double every 5-7 y. over age 65y*)Fall (elderly), MVA (young) Risk factors: *osteoporosis*High morbidity & complication | Classification- subcapital # (femoral neck): high risk AVN- Intertrochanteric #- Subtrochanteric #: **Garden type ( 4 type)**I: incomplete # ; valgus impactionII: complete #, nondisplaced III: complete #, partial displacement (varus)IV: complete #, total displacement Pauwel biomechanics classificationPauwels I: <30°Pauwels II: 30-50°Pauwels III: >= 50° | History of fallPain (*hip +/-knee*) +/- Inability to bear weight/walkLeg+ Short+ abducted + ERDiagram  Description automatically generatedPain with rolling /log roll | X ray: AP pelvis, cross-table, lateral MRI: (if x ray negative) Occult fracture Diagram  Description automatically generated | **Young** ( high-energy injury)-urgent reduction-ORIF (3 parallel screws) **Elderly**- early medical evaluation- types I & II: ORIF ( 3 screws) - Type III & IV : hemiarthroplasty- Medically unstable: nonoperativeIntracapsular:  Undisplaced: fixation Displaced: young: urgent ORIF Old: replace (THJR vs hemi)Extracapsular: all fixation.  |
| AVN | M> F, 30-40’s 50% bilateral TraumaSteroids, EtOH useInflammatory disorders *Metabolic (Gaucher)**Sickle cell**Radiotherapy* *Chemotherapy**Decompression**Autoimmune**Infection*  | Necrosis of femoral head due to vascular disruption.  | Groin pain, worse with activityLimited ROM (esp IR & Abd) Antalgic gait | X ray: AP, lateral,  - Sclerosis +/- collapse ( crescent sign)  - Flat femoral head  - joint narrowing - early degenerative joint disease. MRI: most sensitive Bone scan:  | **Not collapsed**: revascularize **Collapsed:** - off load affected aera (osteotomy)Replacement  |
| **OA hip**  | **-abnormal stress** (subluxation, coxa magna, coxa vara, minor deformities, protrusion)**- Defective cartilage**, (infection, RA, calcinosis)-**abnormal bone** (#, necrosis of Femoral head, Paget’s)  | Articular cartilage becomes soft, fibrillated;Underlying bone cyst formation;Osteophytes at margin of jointsSynovial hypertrophy commonCapsular fibrosis🡪stiffness | -Groin pain +/- knee referred pain-disturbed sleep-stiffness after rest- limp due to shortening-Trendelenburg sign- ER, ADD, shortened when lying- Reduced ROM: IR *(<15°early sigh*), ABD, ET. | Xray: AP pelvic /AP/lateral hip -decreased joint space- Subchondral sclerosis- bone Cysts - Osteophytes | -NSAIDs. heat-weight loss- walking stick (*in opposite hand*)- physio, activity modification-**Surgery:** 1) Osteotomy (young) 2) Arthrodesis (young) 3) Total hip arthroplasty  |

**Module 5. Knee revision**

**Anatomy of knee**

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| --- | --- | --- | --- | --- | --- |
|  | Bone  | Joint  | Kinematics  | Ligament  | Muscle |
|  | Femur, Tibia, fibula, **Patella:** *largest sesamoid bone*. Function- protect articular cartilage- give support to the knee. - ↑ mechanical advantage of quads - disperses compressive force of quads onto the femur3x BW w/ stairs, 7x BW w/ deep bending**Meniscus**-Fibrocartilage discs btw femoral condyles and tibial plateaus.- **Thick** periphery, **Thin** centrally- Mainly type 1 collagen in circumferential fiber *resist compressive stress*Radial fibres (25%) *resist shear stress*- **3 layers**: superficial, surface, middle- Vascular supply: Peripheral 1/3-1/4. - Vascular source:  Super./ infer. med/lat. geniculate A. **Medial M**: C-shape, less mobile, tight attached to capsule &tibia (meniscal cysts common)**Lat. M**: O-shape, mobile, loose attachments. No attachment at popliteal hiatusFunction- load transmission, shock absorption- joint congruity and stability- Joint lubrication- joint nutrition- proprioception.  | FTJ3 articulations: - **Medial** & **lateral** FTJ: hinge joints (*femoral condyles+ tibial plateaus*) - **PFJ**: sellar joints (*patella, femoral trochlear groove*) **Capsules**: cover entire joint (lax at 30° FL) Synovial lining: cover all 3 compartmentsHyaline cartilage: type II**Menisci:** Medial (C), lateral (O)**Bursae**: prepatellar, semimembranosus, Baker’s cyst**Lateral Structure**ITB, biceps🡪 L. patellofemoral Lig, L patellar retinaculum🡪LCL, fabellofibular Lig,(*bursa: under biceps, LCL, ITB*)**Medial structure** Sartorius, fascia🡪MCL (*superficial*), POL, MPFL, M. patellar retinaculum, SM🡪MCL (*deep*), capsule, (*bursa: under pes anserinus, SM*)Proximal Tibiofibularl jointQ angle: male 14° Female 17°(*angle from ASIA🡪mid-patella🡪 tibial tubercle*)**Genu valgum** ( x shaped), **Genu varum** ( O shaped)  | Inherently unstable: 1.bone contact PFJ <1/3 patellar surface2.lack of bony conformity btw tibia, femoral joint surface3.lateral tibial plateau sl convex in sagittal plane🡪greater laxity lateral TFJ >medial TFJ**Stabilizer (Static, dynamic)** **Medial** (S) MCL, POL (*posterior oblique lig*) (D): SM, VMO, M. gastrocnemius, PES tendon**Lateral** (S): LCL, ITB, arcuate ligament (D): popliteus, biceps femoris, L. gastrocnemius**Patella**r: lateral ridge of trochlear groove of femur is more prominent than medial🡪avoid patellar lateral DL **ROM limited by**: **ET**: ACL, PCL, MCL, LCL, Hamstring, gastrocnemius, joint capsule **FL**: soft tissue, rectus femoris, joint capsule tautness. **Complex motions**: 6 degrees of motion- Ext/FL (inc *rolling, gliding*): -5 to 140°- IR/ER: 10° total (IR in swing🡪unlock; ER in Stance🡪lock) - Varus/Vagus: 5mm gapping laterally/medially- AP translation: *within 2mm difference*- Med/Lat translation: *minimal in normal knee*- Compression/distraction | **MCL**: 1°static restraint to valgus stress 2°restraint to anterior tibial translation- Superficial-Deep: LCL**ACL** : P.M. lateral femoral C. 🡪anterior tibial eminencePCLQuadriceps tendonPatellar tendonPatelo-femoral ligaments:  - Medial: MPFL - Lateral: LPFLPatello-tibial ligaments - Medial:  - Lateral: Patello-meniscal ligaments - Medial - Lateral Patellar retinaculum - Medial - lateral | **Anterior compartment**- Tibialis anterior- EHL-EDL-Peroneus tertius **Lateral compartment**- Peroneus longus- Peroneus brevis *(🡪base of 5th metatarsal*) **Superficial posterior compartment**- Gastrocnemius-soleus- plantaris **Deep posterior compartment**- Popliteus- FHL- FDL- TP |

**Knee conditions**

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| Conditions | Aetiology  | Mechanism /Pathology | S & S  | Physical exam  | Investigation | Treatment  |
| **Meniscus tear**  | Acute: Young, Twisting injuryChronic: old, degenerative, OAMedial > Lateral 3:1 (*posterior horn most common*)  | Usually traumatic*Twisting injury* to flexed weight bearing knee(footballer)  | **Pain.** *Usually medial knee, Worse with flexion activities***Swelling**: *some hours later.* +/- catching or **locking** (bucket handle tear)  **Recurrent** sx after trivial twist/strains**Giving way****Post-surgery outcome: future** OA(Multifactorial: *tear, removal of meniscus, pre-existing varus deformity, cruciate ligament insufficiency*)  | Joint line tenderness, Effusion McMurrayApley’s Thessaly test  | **X ray**: usually normal +/- Early OA**MRI**: sensitive. Double PCL sign for displaced bucket handle tear**Arthroscopy**Factors: better healing (post repair)1.Injury <8wks, 2.pt age < 30y3. tear length <2.5cm4. lateral meniscal tear | Small/minimal sx: conservative (*backslab 3-4wks, crutches, quads exercise*) Surgery ( *recurrent, persists locking)*Peripheral tear: repairCentral tears: partial meniscectomy, meniscal transplantation. Post OP: NSAID, quads strengthening  |
| Meniscal degeneration | >45yNo recall of injury  |  | Associated with OA or chondrocalcinosis .  |  | **Arthroscopy:** horizontal cleavage in medial meniscus; Detachment of the ant. Post horn without obvious tear.  | SutureMeniscectomy  |
| Meniscal cyst  | Medial > LateralMainly posteromedialAssoc. Horizontal meniscal tear | Probably traumatic in origin  |  | Lump at /sl below joint line |  | Arthroscopy and meniscal debridement  |
| **ACL injury**  | F> M ( *? proprioception*) associated with other injuries: meniscal tear, collateral lig.  | *Awkward land from a leap**Sudden twist*  | “**pop”** & **pain** , inability to continue playing**Swelling** after a few hours (*acute hemarthrosis*) Recurrent knee **giving-way** (*laxity of lateral knee*)**Fate of ACL deficient knee** - instability, poor knee quality of life, meniscal damage  | Lachman test +ve (*sensitive*)Anterior drawer test +ve**Pivot shift** (*high specificity*) | **X ray**: (*Segond fracture is pathognomic for ACL*) **MRI:** absent/detached ACL +/- bone bruise**Arthroceteisis**: hemathrosis | **If stable/low demand pt:**  Activity modification, PT, brace**If unstable/athletes/ active pt:**  Surgical reconstruction ( grafts: hamstring, allograft)  |
| PCL injury  | Associated with collateral and/or PL corner injury | \*Anterior ***force on tibia* (**dashboard injury) \*Sports***hyperextension*** injury | Pain Posterolateral knee instability ( usually minimal) | EffusionPosterior drawer Quadriceps active testPosterior sag | **X ray:** look for avulsion fracture **MRI**: confirm diagnosis, evaluate meniscus and articular cartilage  | Non-operative: (isolated, esp grade 1& 2 ): brace & PTSurgical reconstruction (*failed nonop tx. Combined injury, grade 3*)  |
| MCL injury  | Acco. ACL tear 95%, meniscal tear 5% | ***Valgus force*** (common in football)  | Trauma, Pain*: usually higher than joint line* /*femoral origin*instability  | Tenderness at medial epicondyle along MCLValgus stress test (30° FL) | X ray: medial epicondyle avulsionMRI: confirm diagnosis  | Hinged knee bracePT: ROM, strengthening Surgery: uncommon ( unless combined MCL +ACL) |
| **Patella DL**  | Girl >boyTends to recur*Risk:*  *- Generalized ligament laxity (MPFL)* *-underdevelopment lateral femoral condyle**- Maldevelopement of patella**-increased Q angle**-External tibial torsion**-primary muscle defects* | 1)May follow trauma: valgus+ IR of femur above fixed tibia2) underlying *anatomical abnormality* - shallow femoral trochlear- small high patella- generalised ligament laxity-increased Q-angle | Giving wayHemarthrosis or effusionMedial capsular tenderness | Apprehension sigh |  | Usually Acute: MPFL repairRecurrent/chronic: physical therapy, brace, patellar realignment surgery. |

**Module 6 Foot and ankle revision**

Foot ankle anatomy

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| Bone  | Joints | Biomechanics  | **Ligaments**  | Compartment of lower **limbs** | Gait phase |
| CalcaneusTalusNavicularCuboidCuneiform (Med. Inter. Lateral)MetatarsalPhalangesOssicles Malleoli: medial. Lateral  | **Tibiotalar**: dorsi/ plantar 45-70°**Subtalar**: inver/eversion 6°**Transverse tarsal J (**Chopart J**)**  - **TNJ**: Talonavicular:  - **CCJ:** calcaneocuboid**Midfoot joints (***5 bones***)** -NC (naviculo- cuneiform J) - IC (Inter-cuneiform joints) - TM (tarso- metatarsal / Lisfranc) | **Bohler’s angle**: lateral view 20-40°. ( *reflex calcaneal #, collapse of posterior facet*)Gissane’s critical angle: 95-105° | **Deltoid (Medial):** (4 ) **ATT** (*anterior tibio-talar*) **TN** ( tibio-navicular):   **TC** ( tibio-calcaneal)   **PTT** (posterior tibio- talar) **Lateral ligament** (3)  **ATFL** (anterior talo-fibular ) ( *commonly injured*) **PTFL** (posterior talo-fibular)  CF (calcaneo-fibular) Syndesmosis  **Achilles:** (soleus, gastrocnemius 🡪 calcaneus) | **Anterior**: TA, EHL, EDL, Peroneus tertius (*deep peroneal nerve*) **Lateral**: PL, PB (superficial peroneal nerve) **Superficial posterior**: GN, Soleus, plantaris **Deep posterior**: PT, FHL, FDL, popliteus (*Tibial nerve*)  | Stance phase ( 62%)  - Heel strike (ankle d - foot flat  - midstance - Toe off -preswingSwing phase (38%)  - toe -off - mid-swing - terminal swing  |

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| Condition | Aetiology | Symptoms  | Signs | Investigations  | Treatment  |
| Rupture of Achilles tendon(2018:1)  | Middle aged weekend warriors (70%) Common in the 4th decadeRisk activities (*running, sprinting, jumping*)Mechanism: -*sudden Dorsal flexion of PF foot* *- weakened tendon: aging, DM, gout, tight calf M, obesity* Achilles tendonitis - Insertional tendonitis (*pain & thickening at insertion)*- Retrocalcaneal bursitis+ Haglund’s deformity- Achilles tendinopathy ( *tendon thickening and inflammation. Pain throughout ROM*)  | 1.Sudden popping event 2.Described as a “*kick from behind*” or “a *sudden snap in the calf*” 3.Delayed diagnosis is common.  | **Palpable gap in the tendon** **Weakness of plantar flexion against resistance** **Thompson test:** no involuntary plantar flexion when calf is squeezed. **Matles test**: prone, knee flexion 90°, active flexion of knee🡪 No plantar flexion | **X ray:** +/- avulsion at calcaneal insertion site**USS:** acoustic vacuum at the rupture site with the presence of thick irregular edges. **MRI**: gap between ruptured end. Altered T2W signal ( normal is low intensity) | Early diagnosis and referral important**Non-operative** (functional rehab *often advised if presented within 48hrs. or elderly, frail* )  -**Equinus casting**: long leg knee 45° FL, ankle in plantar flexion🡪below knee cast after 4 wks - **physiotherapy**: improve gait and calf strength**Surgical repair** if- presented after 24-48 h, - re-rupture, - persistent tendon gapping in PF,- patient preference, - avulsion🡪 ↓re-rupture *2% vs 20%* , but complications )  |
| Ankle fracture  | **Very common** in all ages Usually due to external rotation of pronated foot 1 or 2 malleoli involved  | TraumaPainSwelling+/- inability to bear weight  | EffusionSoft tissue swelling 1 or 2 malleoli tendernessProximal fibular tenderness | X ray: ankle trauma seriosMortise view ( AP +15° IR)Stress view: syndesmosis injury | Dislocation: reduce immediatelyStable/nondisplaced/avulsion: short leg cast4-6wksUnstable/displaced: ORIF,Bimaleolar # / lateral #+medial lig rupture: ORIF.  |
| **Talus fracture**  | High energy (MVA, fall from height) Neck # most common🡪 AVN, needs ORIF. Blood supply: - 70% covered by cartilage- No muscular attachments - Direct *extra-osseous* blood supply- Artery of tarsal canal supplies most of talar body- *ANV depends on degree of displacement* **3 types** - body #- neck of talus #- osteochondral # | TraumaPainSwellingInability to weight bear **Complications** following Neck #-skin necrosis (if talus is extruded)-non-union- aseptic necrosis (blood supply interrupted)-late osteoarthrosis of the subtalar, TN joints-unrecognized osteochondral fragments🡪 loose bodies  | Oedema, Tenderness +/- DeformityCheck pulses | **X ray**: AP, lateral, **Canale** ( neck) & **Broden** ( post. Facet) view**Hawkin’s sigh**: resorption of subchondral bone (lucency on x ray)🡪 fracture healing**CT**: to better define # line .  | **Neck fracture**: risk of AVN. ( Hawkins classification) - type I percutaneous pin- type II-IV: ORIF Body/head/process #: * Non-displaced: cast
* Displaced: ORIF

Osteochondral fracture* Large bony piece: repair
* Small/cartilaginous: debride, drilling
 |
| Calcaneus fracture | \*Most common tarsal fracture **\*High energy**/ axial load ( MVA, High fall) \*Mostly intraarticular # #--> subtalar joint**\*Skin** at risk from extensive oedema \*Rule out **spine injury** in a fall **\*Poor** outcomes | Trauma, pain, swelling, inability to weight bear **Classification****Essex-Lopresti*** Joint depression
* Tongue type (Emergency)

**Sander**s: per coronal CT* I-IV: how many fragments/# line
* A-C: lateral to medial
 | Marked oedema & arch swellingFracture blistersWidened heelCheck nerve function and pulses 10% with vertebral injuries 10% contralateral calcaneus # | **X ray:** **AP****Lateral** **Harris view**:  *Bohler’s angle* <20°; *Angle of Gissane*: NL 95-105°Calcaneal shortening and varus**CT**: better define # lines, displacement, comminution.  | Extraarticular: -nondisplaced: cast 10-12weeks -displaced: percutaneous pinning**Intraarticular** **-nondisplaced :** cast 12 weeks**-displaced**: ORIF-Comminuted, low demand/elderly, smoker: closed reduction, cast- Comminuted, labourer: primary subtalar fusion.  |
| Lis Franc #/ dislocation | **Torque** (扭转) of fixed foot or axial load to vertical foot -can have # or purely ligamentous injury -“Fleck” sign is avulsion of Lisfranc ligament from 2nd MT base-easily missed injury +/- other injury ( tarsal #)  | Trauma to planted foot, pain, swelling | Oedema at mid footEcchymosis: **plantar bruising**(Highly suspicious)  | X ray: AP, lateral, oblique- >2mm btw 2nd MT base and cuneiform- Weight bear stress views if needed. - Compared to other side CT: usually not needed  | Nondisplaced (no widening) \*NWB cast 8wks  \* >2mm needs surgical fixationMinimally displaced: closed reduction, perc PinningDisplaced: * ORIF (screws, K-wires)
* External fixation if needed preliminarily.
 |
| Compartment syndrome  | Increased pressure within a fibrosseous compartment 🡪 decrease perfusion. 🡪 irreversible *muscle, neurovascular* damage if left untreated **\*\***Commonly affects *anterior common* *-increase in compartment contents**-decrease in volume*)  | Pain out of proportion to the injury sustained Post high energy injuries  | \***Pain** on passive extension of the ankle and toes (sensitive sign) \* paraesthesia, paralysis, palpable swelling, peripheral pulses absent (late sign) \*Presence of pulse does NOT rule out |  | Urgent surgical decompression--Dual incision technique.  |
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Foot and ankle non-traumatic conditions

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| Condition | Aetiology  | Symptoms  | Examination findings  | Investigation | Treatment  |
| OA ankle  | Usually post traumatic (70%)  | Restricted ROM(*Dorsiflexion first🡪 all range* )Pain  |  | **X ray:** Joint space narrowing, osteophytes, subchondral cysts, subchondral sclerosisDeformity  | Fusion vs arthroplasty  |
| Hallux valgus  | \* Genetic vs environment (high heels, pointed shoes, barefoot, Family Hx)\* F:M= (10:1) **Pathology:** 1. *Adductor hallucis* over pulls hallux
2. Capsule tight laterally, loose medially
3. Bursal thickening over prominent exostosis about the MTP joint (*bunion*)
 | **Pain** *- pressure over the bunion**-crowding of the toes* *-degeneration in the MTP joint***valgus deformity**: lateral deviation & pronation of *hallux*, varus *1st MT*Associated deformities - Claw toes - metatarsalgia- Callosities | Valgus alignment of 1st MTPJ Pronation of toe FHL/Sesamoids malaligned1st ray unstable +/- loss of arch +/- planovalgusTight calf: more forefoot load  | **X ray**AP (EB)/Lateral/Oblique**4 Angles:**- Hallux valgus (normal <15°)- intermetatarsal (Normal <9°)- Interphalangeal (normal <10°)-DMAA: distal MT articular angle(normal<15°) | **Individualised treatment plan**(*age, mobility, patient’s preference, other foot pathology*) 1: Modify shoes: wide toe box2. Orthotics: metatarsal bar, toe spacer3. Physio: calf stretching4: Operation: *stabilise 1st ray, balance forefoot, lengthen calf PRN* Excision of the osteophytes, osteotomy, arthroplasty, arthrodesisInterposition arthroplasty |
| **Metatarsalgia**  | Aetiology: - flexor tendinitis, - ligament rupture, - callus (#1)Due to Dx affecting MTP joint- Freiberg’s osteochondritis- Inflammatory/ degenerative conditions- Increased loading (congenital, post trauma)  | Metatarsal head pain2nd MT most common.  |  | X ray  Standing AP/ lateral Look for short MT.  | Metatarsal pads, MT neck supports Modify shoes Treat underlying cause **Surgery:**  - osteotomies ( *realign prominent MT head*)  - Excision of the MT head - Reorientation of the plantar fat pad.  |
| Hallux rigidus | Causes unknown Probably OA at 1st MTPJOften post traumatic  | Pain and stiffness at 1st MTPJDorsal MT head osteophyte(worse pain in toeing off phase)  | Tenderness to palpationDecreased ROM (*especially dorsiflexion*)  | X ray: dorsal osteophyte or OA findings at 1st MTP  | - NSAID. - full length rigid orthosis- Cheilectomy- fusion |
| Flat foot (Planovalgus deformity)Pes plenus(平足) | 20% population has flat feet Almost always bilateral **Acquired**: - ligamentous laxity- Tibialis Posterior tendon dysfunction- Traumatic - arthritis - calf tightness | Usually asymptomatic +/- pain with activity**Pain**:  - medial hindfoot, - lateral subfibular region  -Mid foot **Stiffness**: difficult with foot wear **Instability:**   | **Too many toes sign**Valgus heel **Pes planus** when weight bearingNon-WB arch reconstituteHeel goes into varus on heel rise - Stand on tip toes: calcaneus turns to varus (*flexible hind feet. Does not need treatment*) **Pathologic flat feet**- Deformity/tenderness ( loss of arch)- inability to heel raise- Apropulsive gait - Flexible or fixed  | X ray: Weight bearing Lat: Decreased arch, otherwise normalAP: +/- subluxation of talar headAnkle xray: valgus talar tiltUSS: ? Tib post tendonitis MRI: not generally helpful  | Observation. Parental reassurance. AnalgesiaActivity modification Arch support may help: orthoticsPhysiotherapy**Surgery**: Calcaneum osteotomy .  - indication: persistent pain  - Flexibility is key - Flexible flat foot: bone realignment, soft tissue re-balancing. - Stiff foot: fusion.  |
| Cavovarus foot  | Always pathology ( No normal variation) Neurological imbalance.  |  |  |  |  |
| Plantar fasciitis  | **Common cause** of plantar heel pain. Cause: chronic *traction injury*, repetitive trauma🡪 microtear 🡪*Perifascial* inflammation of PF *aponeurosis* F:M=2:1Related conditions: *obesity, flat foot, athletes, seronegative spondylorathropathies, RA, gout, SLE* | Pain medial heelIncreased pain with **DF** of toes/footWorse pain in the morningCalf tightness  | Medial plantar calcaneus tenderness .  | **X ray:** +/- calcaneal bone spur (*commonly asymptomatic*) **MRI:** thickening of the proximal plantar fascia, Inflammation in plantar aponeurosis; adjacent soft tissue edema, reactive calcaneal marrow edema, fluid-filled fascia; rupture at mid or proximal segments Bone scan: USS:  | Pain relief**Stretching/physio****Orthotics**: splint, casting, heel cupRarely surgical: partial fascia release. |
| Tarsal Tunnel syndrome  | Posterior tibial nerve entrapped by - flexor retinaculum- space occupying lesion in tunnel | PainNumbness/tingling around ankle or plantar side of foot Worse with walking, standing, running | Heel pain triad: TTS, PF, FFSwelling around ankleTinnel Worse pain with dorsiflexion, eversion  | **EMG/NCS** ( sensory > motor) **X ray** or **CT** : +/- osseous impingement, posteromedial process # of the talus**MRI:** SOL  | Orthotics CSISurgical release if conservative fails after 3-6 months .  |

**Radiology review**

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| Modalities  | X ray | USS | CT | MRI | Bone scan  |
| Advantages  | \**First-line* imaging modality /baseline\***MSK issues**: *fractures, arthritis, infection, bone tumours*\* Widely available, low cost \* Low radiation exposure \* Easy to monitor treatment or dx progressFluoroscopy: Real time x ray Low radiation Used in OT | \* **Multiplanar imaging**\* For **soft tissue** assessment: *tendon, muscle, ligament, nerve, effusion, collection, foreign body, lump,* \* High resolution \* Widely available; low cost\* No ionising radiation/ own side effects\* Dynamic assessment in real time\* Colour doppler/power doppler: check vascularity\* Imaging guided injection, aspiration, biopsy | \* **high spatial resolution** bone imagingEg. Occult/complex #, loose body, tumor.\* CT guided injection, biopsy \* Widely available \* Moderate cost  | \* Multiplanar cross-sectional \* *Accurate delineation* of structures: *joint, tendons, tendon sheaths, ligaments, synovial membrane, cartilage* \* Excellent soft tissue contrast resolution\* Showing inflammation: soft tissue/bone\* Good for bone marrow assessment \*No ionising radiation | \*Osteoblastic map🡪 prediction for pain generators \*Good for fracture, osteoarthritis, infection, skeletal metastases \* Can image entire skeleton with one study\* Sensitivity> specificity  |
| Disadvantages | \* low sensitivity- up to 10% fractures occult- up to 40% bone destroyed before x ray evidence (infection/tumour)  | \* Operator dependent\* Machine quality dependent \* Affected by BMI.  | \* Moderate radiation\* Moderate cost  | \* high cost\* variable availability, referral access\* long waiting lists in public hospital \* Clostrophobia for some patients \* **Contraindication**: *pacemaker, some metallic implants, older aneurysm clips, intra-orbital metallic foreign bodies* | \* Imtermediate-high cost\* variable availability and referral access\* higher radiation exposure ( *radiophamaceutical + CT*)\* Time consuming for patient |
|  |  |  |  |  |  |
| Frozen shoulder | Often normal May show OA, spur, calcified tendon | \* limited ROM: ER , supraspinatus mv\* thickened Coracohumeral ligament (CHL)\* thickening of inferior GH capsule \* echogenic material around the long head of biceps at rotator interval\* increased vascularity of LHB at rotator interval.  |  | T2WCH lig thickening >4-7mmSubcoracoid triangle singnJoint capsule thickening Abnormal soft tissue thickening at rotator |  |
| Subacromial bursitis  | Often normalto exclude other dx | **USS:** anechoic fluid filled structureHyperechoic wall, synovial hypertrophy +/- hyperechoid blood  |  | **MRI:** Fluid filled structure btw deltoid and acromion. . T1w hyperintense. T1W hypointense. |  |
| Lateral epicondyle pain  | *usually normal* *+/- calcification in extensor muscle mass*.  | *ECRB tendon thickened, hypoechoic;* *variable sensitivity, specificity.*Color dpl: tendon hyperemiaDynamic: delineate instability  |  | -ECRB tendon thickening, oedema, tendon degeneration 90% cases  |  |
| CMC joint arthropathy  |  |  |  |  |  |
| De Quervain’s  | usually normalSoft tissue swelling over radial styloidCortical erosion, sclerosis, periosteal reaction.  | DiagnosticThickening of APL, EPB tendonIncreased fluid at 1st ET compartmentThickening of overlying retinaculum, synovial sheath. Peritendinous hperemia.  |  | Very sensitive, specific Tenosynovitis: inc. T2W signal ( fluids in sheath, thickened retinaculum ) Tendinosis: thickened tendon, tendon tear, |  |