Cubital tunnel syndrome (CTS)

GREEN

• **Intro:**	- Entrapment neuropathy caused by compression the median nerve in the carpal tunnel
• **Aetiology (risk factors):**	- Typically in 40 - 60 yrs - 1-5% in general population - F>M (3:1) - **Risk factors:** carpal tunnel modifications, fluid imbalance, neuropathic factors - Examples: carpal dislocation/subluxation, radius #, arthritis, cysts/tumours, pregnancy/menopause, obesity/kidney failure/hypothyroidism, oral contraceptives/heart failure/diabetes/alcoholism, vitamin deficiency/toxicity
• **Pathophysiology:**	- Caused by various factors - Involves compression & traction affecting the **median n.** - Compression leads to increased pressure, obstruction of venous outflow, localised edema, & impaired microcirculation of the median n. - Lesions on the myelin sheath & axon cause inflammation & loss of normal physiological functions of surrounding tissues - Worsening structural integrity of the nerve exacerbates the dysfunctional environment - Repeated traction & wrist movements further injure the nerve - Inflammation of any of the 9 flexor tendons passing through the carpal tunnel can compress the median nerve - Sensory fibres are often affected before motor fibres, & autonomic nerve fibres may also be affected

Cubital tunnel syndrome (CTS) (cont)

• **Clinical presentation:**	- Numbness, tingling, & px in the thumb, 2nd, & radial portions of the 4th digits - Ssx worsen at night - Variability in Ssx distribution from wrist to shoulder - Initially intermittent, worsen w/ activities like driving, reading, painting - Nighttime exacerbation, relieved by shacking hand/wrist - Leads to permanent sensory loss, muscle weakness, & clumsiness - Challenges in tasks like opening doorknobs & buttoning clothes - Dominant hand usually affected first
• **Physical examination:**	- Sensory loss or weakness in median n. distribution - Thenar eminence spared in sensory loss - Diminished thumb ABD & opposition strength, thenar eminence atrophy - Tinel's sign - Carpal tunnel compression test - Phalen's test - Median n. tension test - Motor & sensory testing
• **Management:**	- 70-90% of mild to moderate cases respond to conservative care - Some degree of recurrence, even after surgery - Pts w/ CTS 2° to diabetes or wrist # have less favourable prognosis - SMT / STW - Nerve release - Support brace at night - Taping

Cubital tunnel syndrome (CTS) (cont)

• **Ddx:**	- Brachial plexopathy - Cx myofascial px - Cx spondylosis - Compartment syndrome - Ischemic stroke - Mononeuritis multiplex - Multiple sclerosis - Median neuropathy in the forearm - Motor neuron disease - Diabetic neuropathy - Cx radiculopathy - Overuse injury - Traumatic brachial plexopathy - Neuropathies - Tendonitis - Tenosynovitis - TOS

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Extensor tendinopathy*

GREEN

• **Intro:**	- Also known as *tennis elbow* & *lateral epicondylitis* - Overuse injury - Occurs due to eccentric overload of the extensor carpi radialis brevis (ECRB) tendon - Results from repetitive strain during activities involving gripping, wrist EXT, radial deviation, & forearm supination - Common in tennis, squash, & badminton
• **Aetiology (risk factors):**	- Most common cause of elbow Ssx - F=M - More common in pts >40 yrs - **Risk factors:** smoking, obesity, repetitive movement for at least 2 h daily, & vigorous activity (loads >20kg)
• **Pathophysiology:**	- **Condition:** degenerative overuse process - **involves:** extensor carpi radialis brevis & common extensor tendon - **Findings:** granulation tissue, micro-rupture, abundance of fibroblasts, vascular hyperplasia, instructed collagen, lack of inflammatory cells

Extensor tendinopathy* (cont)	
• **Clinical presentation:**	- Px w/ an insidious onset - Overuse Hx is common, often w/o a specific traumatic event - Px occurs 1-3 days after unaccustomed activities involving repeated wrist EXT - Triggers: new equipment use or atypical workout circumstances - Acute injuries or strains (e.g. lifting heavy objects, hard backhand swing) - Acute injuries may lead to chronic overuse injury - Px is usually located over the lateral elbow - Worsens w/ activity, improves w/ rest - Px severity varies, from mild discomfort during activities to severe px triggered by simple tasks (e.g. picking up coffee)
• **Physical examination:**	- Point of max. tenderness usually over lateral epicondyle or slightly distal - Discomfort may extend along the tendon, w/ tightness in connecting muscle - Px exacerbated by resisted wrist EXT, especially w/ EXT elbow & pronated forearm - Resisted middle finger EXT w/ EXT elbow particularly painful, indicating increased tendon stress - Absence of radicular Ssx or numbness/tingling - Suggests alternative process such as radial n. entrapment if present, though conditions can coexist
• **Management:**	- Spontaneous recovery within 1-2 yrs in 80-90% - RICE - NSAIDs - Bracing - Forearm stretching & strengthening - Progression to eccentric muscle strengthening of the common extensor tendon - Invasive techniques if conservative care fails - Surgery (if no improvement after 6-12 months)

Extensor tendinopathy* (cont)

• **Ddx:**	- Elbow bursitis - Cx radiculopathy - Posterolateral elbow plica - PLRI - Radial n. entrapment - Radial n. syndrome - Occult fracture - Capitellar osteochondritis dissecans - Triceps tendinitis - Radiocapitellar OA - Shingles

link text

Flexor tendinopathy

GREEN

• **Intro:**	- Also known as *medial epicondylitis*, *pronator tendinopathy*, & *golfer's elbow* - Overload or overuse of the medial common flexor tendon - Medial epicondyle is a common origin: pronator teres, flexor carpi radialis, palmar is longus, flexor digitorum superficialis, & flexor carpi ulnaris - Innervated by **median n.** - Together, they form the conjoined FX tendon (3cm long) - This tendon crosses the medial ulnohumeral joint & acts as a 2° stabiliser parallel to the ulnar collateral ligament
• **Aetiology (risk factors):**	- 90% of cases are not sports related - F>M - 45-64 yrs - Athlete risk factors: training errors, improper technique, equipment, lack of strength, endurance, flexibility - Occupation risk factors: heavy physical work, excessive repetition, high BMI, smoking, comorbidities, high psychosocial work demands - General risk factors: smoking, overuse, dominant arm, DM 2

Flexor tendinopathy (cont)

• **Pathophysiology:**	- Caused by overuse tendinopathy from repetitive loading of wrist flexors & pronator teres - Leads to angiofibroblastic changes in the affected tendons - Repetitive activity causes microtears in the tendon, resulting in **tendonosis** - All muscles may be affected equally, except for palmaris longus - Bony inflammation is not involved in this condition - Microtears lead to collagen fibre remodelling & increased mucoid ground substance - Focal necrosis or calcification can develop in the tendon - Collagen strength decreases over time, leading to increased fragility & scar tissue formation - Acute trauma can also cause medial epicondylitis from sudden violent muscle contractions, though less common
• **Clinical presentation:**	- Hx of acute traumatic blow or repetitive elbow use, gripping, or valgus stress - Aching px on the medial or ulnar side of the elbow, which radiates from the epicondyle into the forearm & wrist - Exacerbated: forearm motion, gripping, or throwing activities (overhead throwing, tennis, golf) - Relief: rest - Elbow stiffness, weakness, numbness, or tingling, 1° in an **ulnar n.** distribution - Chronic cases may exhibit weakness w/ grip strength - Ulnar n. Ssx in up to 20%
• **Physical examination:**	- Acute cases: swelling, erythema, or warmth - Chronic cases: less likely to show abnormalities - Tenderness: 5-10mm distal & anterior to medial epicondyle - Pronator teres & flexor carpi radialis involvement - Px elicited by resisted pronation or FX of wrist - Weakness in affected arm - ROM typically normal - Golfer's elbow test: px during manoeuvre - Tinel's test: +ve for ulnar neuropathy - Valgus stress test: stressing ulnar collateral ligament (especially throwing athletes)

Flexor tendinopathy (cont)

• **Management:**	- Good prognosis - RICE - NSAIDs - Conservative care: aims for full, painless motion at wrist & elbow - Strength exercises w/ focus on eccentric activity - Dry needling, shock wave therapy, etc. - STW/SMT - Night splinting - Elbow taping - Corticosteroid injections, US, platelet-rich plasma injections - Surgery
• **Ddx:**	- **Neuropathy:** C6 or C7 radiculogpthy, CTS, ulnar/median neuropathy, ulnar neuritis, anterior interosseous n. entrapment, tardy ulnar n. palsy - **Ligamentous injury:** ulnar / medial collateral ligament instability, sprain, tear - **Intra-articular issues:** adhesive capsulitis, arthrofibrosis, loose bodies - **Osseous concerns:** medial epicondyle avulsion fracture, osteophytes - **Myofascial difficulties:** flexor / pronator strain - **Tendinopathy:** lateral epicondylitis, triceps tendonitis - Synovitis - Valgus extension overload - Herpes zoster (dermatological)

link text

Myositis ossificans (MO)

YELLOW

• **Intro:**	- Benign, self-limiting ossifying lesion that can affect any type of soft tissue - Most common form of heterotrophic ossification (HO), usually within large muscles
• **Aetiology (risk factors):**	- M>F - 1° in young adults as result of trauma

Myositis ossificans (MO) (cont)

• **Pathophysiology:**	- Metaplasia of the intramuscular connective tissue resulting ion extra osseous bone formation (w/o inflammation) - Histologically can appear similar to osteosarcoma, thus, can lead to inappropriate management
• **Staging:**	**3 stages:** **Stage 1 (0-4 weeks):** - Following injury - Inflammatory cascade that preceded ossification - Calcification not apparent radiographically **Stage 2 (4-8 weeks):** - Calcification becomes radiographically seen **Stage 3:** - Peripheral bone formation - Lamellar cortical & trabecular bone
• **Clinical presentation:**	- Onset followed by trauma, repetitive trauma - Px, joint stiffness, oedema - Lesion causes mechanical irritation of bursa, tendon, joint
• **Physical examination:**	- Px durance longer than of a sprain/strain - Decreased ROM
• **Management:**	- Up to 70% of cases are asymptomatic - Prognosis good after surgery - Very little than can be done to accelerate the resorptive process (i.e. process of removing bone from the bruised region) - Rest from aggravating activities - Implementation of gentle px-free ROM exercises - Surgical resection of mature bone once it has fully matured - Can take 12-18 months after initial presentation - Surgery only if there will be improvement in function as demonstrated by mobility, transfers, hygiene, & ADLs
• **Ddx:**	- Osteosarcoma

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Olecranon bursitis / Miner's elbow

YELLOW

• **Intro:**	- Inflammation of the synovial bursa - Susceptible to trauma & infection due to superficial location, limited vascularity
• **Aetiology (risk factors):**	- M>F - 30-60 yrs - Underlying inflammatory conditions: RA, psoriatic arthritis, gout, etc - Chronic medical conditions: diabetes, alcoholism, HIV - Infection usually occurs through a transcutaneous route due to poor vascularity, often from direct inoculation via mild trauma
• **Pathophysiology:**	- Inciting events (trauma or infectious), trigger reactive inflammation in the bursa - Leads to the extravasation of protein & synovial type fluid into the affected bursa - Consequence is the development of a pronounced round swelling characteristic of this condition - Trauma causes bleeding within bursa & release of inflammatory mediators, increasing recurrence risk
• **Clinical presentation:**	- Swelling over the olecranon process - Initially, doesn't restrict elbow movement, setting it apart from swelling within the joint - Swelling can progress & eventually limit elbow movement - Characteristic appearance is round or "golf ball" shaped due to fluid confinement within the bursa
• **Physical examination:**	- Caused by infection shows signs of erythema & tenderness - Systemic Ssx like fever & malaise can accompany infectious bursitis - Fever is present in around 70% of septic bursitis cases, but its absence doesn't rule out infection entirely

Olecranon bursitis / Miner's elbow (cont)

- **Management:**
  - Low risk of progression to systemic infection from infectious bursitis in healthy pt

  Non-infective:
  - Self-limiting & managed conservatively
  - RICE
  - NSAIDs
  - Elastic bandage application
  - Corticosteroid injections (risk of iatrogenic infection)
  - Bursectomy considered for related episodes, especially w/ underlying bone spur
  - Recurrent non-infective bursitis w/o a spur may benefit from surgical bursa excision

  Infective:
  - Requires antibiotics
  - Aspiration & drainage are recommended
  - Oral antibiotics for 7 days (longer courses don't reduce recurrence)
  - Bursectomy may be necessary
  - Systemic infection warrants further evaluation & appropriate treatment for sepsis or septic shock
- **Ddx:**
  - Cutaneous abscess
  - Hematoma
  - Olecranon fracture
  - Cellulitis
  - Tendon rupture
  - Septic arthritis
  - Gouty arthritis
  - Neoplasm
  - Ligament rupture

link text

Posterior interosseous nerve entrapment

GREEN

- **Intro:**
  - Compression neuropathy of the posterior interosseous n. (branch of *radial n.*)
  - Passes through radial tunnel (Arcade of Frohse)
  - Results in paresis & paralysis of the finger & thumb EXT
  - Preserves wrist EXT due to innervation patterns

Posterior interosseous nerve entrapment (cont)	
• **Aetiology (risk factors):**	- M>F (2:1) - Dominant arm - Trauma or space-occupying lesions (RA, brachial neuritis, spontaneous compression) - Most common site: Arcade of Frohse (proximal edge of supinator) - Also repetitive pronation/supination
• **Pathophysiology:**	- Nerve injury severity varies based on compression severity **3 categories of nerve injury:** - **Neuropraxia:** mildest form, demyelination, from compression/traction, slows conduction, may cause muscle weakness, -ve Tinel sign, recovery prognosis: days to 12 weeks - **Axonotmesis:** demyelination & axon damage, muscle weakness, may have +ve Tinel sign - **Neurotmesis:** severe, nerve completely transected, no nerve conduction, surgical correction needed for recovery
• **Clinical presentation:**	- Hx of trauma or fracture of the extremity - Can be present in Monteggia fractures or radial head fracture-dislocations
• **Physical examination:**	- Weakness w/ finger EXT - When asked to make a fist, wrist may deviate **radially** due to extensor carpi ulna's weakness - Depending on injury severity, may be +ve Tinel sign
• **Management:**	- Pretty good prognosis - Pts continue to improve months after surgery - Athletes may return to play once full ROM & strength **Conservative:** - Splinting - NSAIDs - Physical therapy - Activity modification **Surgical:** - Unsuccessful conservative therapy for at least 3 months

Posterior interosseous nerve entrapment (cont)

• - **Radial tunnel syndrome:** same sites of compression, however presents w/ forearm px w/o motor weakness

Ddx: - **Wartenberg syndrome:** compression of superficial sensory radial n., no motor weakness, may present w/ paresthesia / numbness / ill-defined px over the dorsal radial aspect of hand

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Pronator teres syndrome (PTS)

GREEN

• **Intro:**	- Compression of the **median n.** by the pronator teres muscle in the forearm - Innervation: C6-7 -
• **Aetiology (risk factors):**	- Rare & often overlooked & mistaken for CTS - M>F - Especially common in pts w/ additional fibrous bands - PTS can occur due to: local trauma, compression w/ Schwanoma (rare tumour), & pts undergoing anticoagulation therapy & renal dialysis
• **Pathophysiology:**	Quick & repetitive grasping or pronation movements can lead to PT muscle hypertrophy & entrapment of the median n.
• **Clinical presentation:**	- Px in volar forearm region - Weakness may be significant - Muscle wasting rare, but mild weakness in: flexor pollicis longus (FPL), abductor pollicis brevis (APB), some involvement of flexor digitorum profundus (FDP) in 2nd & 3rd digits - PT commonly spared due to early innervation
• **Physical examination:**	- Reproduction: resisted pronation + FX of elbow - +ve Tinel sign over proximal edge of PT - +ve Phalen test over PT muscle in 50% **Variable sensory loss:** - Involving palm or mimicking CTS - Including thenar eminence, thumb, index, middle, & ring fingers

Pronator teres syndrome (PTS) (cont)

• **Management:**	- Good prognosis - Light duty in 3-6 weeks (conservative care speeds up) - Surgical cases: light duty in 6-8 weeks, regular duty in 10-12 weeks - Rest, activity modification, NSAIDs, physical therapy - Pts may usually continue work unless prominent motor or sensory deficits are present - Surgery considered after fail of >6 weeks of conservative care
• **Ddx:**	- CTS - AIN s. - Ligament entrapments - MN entrapment of hypertrophied lacertus fibrosis (bicipital aponeurosis) - Brachial plexus injury - Cx radiculopathy

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Pulled elbow

RED

• **Intro:**	- Also *Nursemaid elbow* or *radial head subluxation* - Common injury in young children - Radial head subluxation caused by axial traction resulting in px & inability to supinate forearm
• **Aetiology (risk factors):**	- 1-4 yrs - 20% of upper extremity injuries in children - Less common in >5 yrs because annular ligament strengthens w/ age - F>M - Recurrence rate: 20%
• **Pathophysiology:**	- Trauma: axial traction on pronated forearm + elbow EXT - Lifted/swung by arms or pulling child's arm to prevent fall - Displacement of the annular ligament leads to discomfort & px during arm movement - Longitudinal traction (e.g. baby rolling onto their arm) can also lead to radial head subluxation (<6 months old)

Pulled elbow (cont)	
• **Clinical presentation:**	**Child's behaviour:** - Often nervous & may support affected arm protectively w/ opposite hand - Arm held in complete or almost complete EXT + pronation - Refusal to move the arm & becoming upset during examination - Generally no px unless the arm is manipulated **Caregivers may report:** - Arm pulled upwards by the wrist or swung around by the arms prior to Ssx onset - No known trauma or awareness of the incident causing the injury - Onset of Ssx after FOOSH (less common)
• **Physical examination:**	- Tenderness at radial head - Resistance to forearm pronation, supination, FX, & EXT - Absence of ecchymosis, erythema, edema, or signs of trauma - Intact circulation, sensation, & motor ability distal to the elbow - Possible lack of cooperation w/ the exam - Spontaneous reduction: radial head may spontaneously reduce before exam, reassurance to parents after exam is usually sufficient
• **Management:**	**Closed reduction (brief but potentially painful):** - Px resolves post-reduction (within minutes) - Techniques for reduction: hyperpronation (preferred) & supination/FX - Arm function should be regained post-reduction; imaging if not - Referral to orthopaedic surgeon if arm not used post-reduction - No splinting or sling required **Post-treatment instructions:** - Avoid activities causing axial traction to arm to prevent recurrence - Excellent prognosis post-reduction

Pulled elbow (cont)

• **Ddx:**	- Elbow fracture - Fractured wrist - Green stick fracture - Hand injury - Monteggia fracture - Sypracondylar fracture - Soft tissue damage of hand

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Medial collateral ligament sprain*

• **Intro:**	- Stretching or tearing of ligaments, due to abnormal or excessive forces applied to a joint - Classified in 3 grades
Grade 1:	- Mild stretching of the ligament complex w/o joint instability
Grade 2:	- Partial rupture of the ligament complex w/o joint instability
Grade 3:	- Complete rupture of the ligament complex w/ instability of the joint
Causes of MCL injury:	- Overstretched in a single incident, e.g. unnatural bending or twisting of elbow - Repetitive ligament stretching, e.g. overhead throwing activities
Outcome of MCL injury:	- Increased valgus stress
Prognosis:	- **Grade 1-2:** 2-6 weeks & high-end sports in 8 weeks - **Grade 3 ruptures:** significantly longer rehabilitation depending on whether surgical intervention was required & how much damage is present

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