

Cubital tunnel syndrome (CTS)

GREEN

- **Intro:** - Entrapment neuropathy caused by compression the median nerve in the carpal tunnel
- **Aetiology** - Typically in 40 - 60 yrs
- (**risk factors**): - 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



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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 shaking 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*

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- **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

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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, palmaris 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 radiculopathy, 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 in 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 duration longer than of a sprain/strain
 - Decreased ROM
- **Management:**
 - Up to 70% of cases are asymptomatic
 - Prognosis good after surgery
 - Very little that 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

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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

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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/ Schwannoma (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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