

Cervical radiculopathy*

• GREEN

- **Intro:**
 - Compression or impairment of the nerve root, causing px & Ssx that extend beyond the neck
 - Px in one or both UL which corresponds to the dermatome of the corresponding affected nerve
 - Muscle weakness & impaired deep tendon reflexes are common due to nerve impingement
 - Neck pain is a common issue, up to 40% of work absenteeism attributed to it
- **Aetiology (risk factors):**
 - Conditions causing compression or irritation of spinal nerve root lead to radicular Ssx
 - In younger pts (30-40s), disc trauma & herniation are most common causes
 - In older pts, degenerative changes become more prevalent
 - 50-60s - disc degeneration is most common cause
 - 70s - foramina narrowing due to arthritic change is a frequent cause
 - Cx radiculopathy less frequent than Lx radiculopathy
 - Incidence rate: approx. 85 / 100,000
 - **C7** nerve root most commonly affected, flooded by **C6**
 - **Risk factors:** manual labour w/ heavy lifting, driving, operating vibrating equipment
 - Chronic smoking Hx increases risk of radiculopathies
- **Pathophysiology:**
 - Primarily involves inflammation
 - Inflammation often caused by *acute herniation* of a Cx disc pressing on the nerve root
 - Inflammation can worsen degenerative changes, such as osteophytes or disc dehydration, affecting the nerve root
 - Direct compression of the nerve root causes px, numbness, tingling, & weakness
- **Clinical presentation:**
 - Pts present w/ radicular px or weakness
 - Inquire: occupational risk factors, Hx of trauma, & px patterns
 - Typically unilateral, but B cases are rare
 - B presentations can complicate physical Dx
 - Cases of trauma or B involvement necessitate advanced imaging for accurate Dx



Cervical radiculopathy* (cont)

- **Physical examination:**
 - Reflexes, compare B
 - Reflexes usually reduced
 - Reduced muscle strength, innervated by the affected nerve (major sign)
 - **Spurling test:** compresses foramina to Dx radiculopathy (px radiates down ipsilateral side)
 - **Cx distraction:** in some cases may relieve Ssx
- **Diagnosis:**
 - X-rays are first step
 - CT used in traumatic scenarios
 - MRI is the preferred modality
 - Electromyography is useful in confirming dysfunction of the affected nerve
- **Management:**
 - Around 85% resolve within 8-12 weeks
 - NSAIDs
 - Cx pillows
 - Acupuncture
 - Nerve flossing
 - SMT / STW
- **Ddx:**
 - Brachial plexus injury in sports
 - Cx disc injuries
 - Cx discogenic px s.
 - Cx facet s.
 - Cx spine sprain
 - RC injuries
 - Strain injuries

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Pancoast syndrome

• YELLOW

- - Pancoast s. should be distinguished from Pancoast tumour itself
- Intro:**
- Entails: ipsilateral shoulder & arm px, paresthesia, paresis, atrophy of the thenar muscles, & Horner's s. (ptosis, miosis, anhidrosis)
 - 1° bronchogenic carcinoma is the most frequent cause of Pancoast s.
 - Manifests as radiating parascapular px, atrophy of intrinsic hand muscles, & a lung apex density w/ localised rib & vertebrae destruction



Pancoast syndrome (cont)

- **Aetiology (risk factors):**
 - 1° caused by tumours in the superior sulcus of the lung, mostly non-small cell lung cancer (NSCLC)
 - NSCLC accounts for 80-85% of all lung cancer cases, w/ Pancoast s. making up 3-5% of these
 - Squamous cell carcinoma used to be most common type of NSCLC associated w/ Pancoast s.
 - Other malignancies can also cause it
 - Rarely, benign tumours cause it
 - Lung cancer is 2nd most common cancer & is the leading cause of oncological mortality globally
- **Pathophysiology:**
 - Pancoast or superior sulcus tumours cause Pancoast s.
 - Ssx inc. shoulder & arm px due to compression of the brachial plexus
 - Initial Ssx often misDx as MSK
 - Tumour extension can lead to C8-T1 radiculopathy (px & paresthesia of the dermatomes)
 - Weakness of intrinsic hand muscles affects fine motor skills & handgrip
 - Involvement of sympathetic trunk & Cx ganglion can cause facial flushing & sweat
 - Harlequin s. may occur w. contralateral flushing & sweating due to hyperactive sympathetic reaction
- **Clinical presentation:**
 - Encompasses Ssx related to tumours affecting the lung apex
 - Ssx arise due to brachial plexus & associated structures involvement
 - 1° Ss: shoulder or arm px & paresthesia along the medial half of the 4th & 5th finger, hand, arm, & forearm (C8-T1 radiculopathy)
 - Pulmonary Ssx, e.g. SOB, develop as the tumour progresses to involve more of the lung
- **Physical examination:**
 - Ipsilateral facial flushing & sweating due to involvement of sympathetic trunk & Cx ganglion
 - Horner s. (ptosis, miosis, anhidrosis) may also develop w/ further disease



Pancoast syndrome (cont)

- **Diagnosis:**
 - **Chest x-ray:** initial screening, shows increased size of apical cap or lung mass
 - **CT:** provides additional info on tumour extent, satellite nodules, mediastinal adenopathy; crucial for staging
 - **MRI:** done after Dx & before surgery to identify vascular, brachial plexus involvement
 - **CT-guided core biopsy:** Dx test of choice due to outer tumour location
- **Complications:**
 - **Surgical:** atelectasis (partial lung collapse), px, chest wall deformity, frozen shoulder, CSF leak, prolonged air leak, injury to the brachial plexus
 - **Chemotherapy:** side effects of the drugs
 - **Radiation:** alopecia, nausea, vomiting, leathery skin, poor wound healing
- **Management:**
 - Good prognosis: early-stage Dx
 - Poor prognosis: advanced disease, poor performance status, & weight loss
 - **Standard care procedure:** chemo-radiation followed by surgical resection
 - Contraindication to surgical resection:**
 - Presence of mets
 - Involvement of ipsi/contralateral mediastinal nodes or supraclavicular nodes
 - Involvement of VB >50%
 - Involvement of oesophagus &/or trachea
 - Involvement of brachial plexus above T1 nerve root
- **Ddx:**
 - Other malignancies either 1°, or even being tumours are known to cause Pancoast s.
 - Even apical lung infections or abscesses can cause Pancoast s. if they involve the chest wall & surrounding structures

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Thoracic outlet syndrome (TOS)*

• GREEN

- **Intro:**
 - Encompasses various conditions involving compression of neurovascular structures in the Tx outlet
 - **5 types:** venous, arterial, traumatic, true neurogenic, disputed neurogenic
 - **Tx outlet:** 1st rib, scalenes, & clavicles
 - Imaging helps in Dx



Thoracic outlet syndrome (TOS)* (cont)

- **Aetiology (risk factors):**
 - Caused by increased pressure in Tx outlet, often due to anatomical abnormalities, e.g. Tx ribs, space-occupying lesions (e.g. tumours, cysts), or fibrous muscular bands from overuse
 - Past trauma & neck positioning are common causes, leading to impingement of vessels or nerves
 - 2° causes: trap deficiency or clavicle #, which can decrease the outlet space & increase pressure
 - Neurogenic TOS: most prevalent variant, constituting over 90% of cases
 - F>M & individuals w/ poor muscle development or posture
 - Incidence rate: 3-80 / 1000
- **Pathophysiology:**
 - Caused by compression of structures in the Tx outlet
 - Extra ribs from 7th vertebrae are common culprits
 - Neck trauma preceded 80% of neurological TOS cases, while 20% were 1° caused by anatomic variants
 - B TOS reported w/ B Cx ribs as 1° cause
 - Soft tissue components (fibrous muscular bands & tumours/cysts), also contribute to TOS
 - Athletes w/ repetitive motions inv. extreme ABD & ER (swimmers) are susceptible to TOS
 - Classic presentation in swimmers inc. px, tightness, or numbness in the neck or shoulder area when their hand enters the water
 - Other susceptible athletes: baseball, water polo, & tennis players
- **Clinical presentation:**
 - Manifests w/ variety of Ssx depending on its cause
 - Common complaints inc. nebulous px regardless of etiology
 - Venous obstruction Ssx may inc. UL swelling, venous distention, & px from hand to forearm
 - Persistent venous TOS can lead to UL DVTs
 - Arterial TOS may show colour changes in the UL & diminished pulses
 - Ssx may appear gradually due to collateral blood flow, exacerbated by certain positions
 - Neurogenic TOS (most common) results from brachial plexus compression
 - Ssx inc. vague px, hand muscle atrophy, weakness, & sensory deficits



Thoracic outlet syndrome (TOS)* (cont)

- **Physical examination:**
 - Quick overview of pt's posture
 - Check symmetry & ROM of both arms initially
- **Special tests:**
 - Neurological exam to evaluate n. compression
 - Brachial plexus compression test
 - Spurling's test
 - Adson maneuver for suspected arterial compression
 - Roo's stress test
 - Costoclavicular test
- **Diagnosis:**
 - Physical exam 1st, further imaging confirms Dx
 - **Chest or Cx x-ray:** 1st imaging step, providing crucial anatomical info
 - **US** only for venous TOS
 - **Venous dopplers** for detecting compression of subclavian / other veins
- **Complications:**
 - Rare complications
 - Ischemic change could manifest if vascular compromise occurs
 - Most complications arise from surgical intervention (iatrogenic n. injury, pneumothorax, bleeding complications)
- **Management:**
 - Excellent prognosis (90% of cases resolve Ssx w/ conservative care)
 - Lifestyle modifications - avoiding repetitive postural stress & workstation modification
 - SMT - Cx, Tx, & 1st rib
 - STW - scalenes & pec minor
 - Exercises phase 1: Cx retractions, ulnar n. floss, scalene stretch, corner pec stretch
 - Exercises phase 2: resisted shoulder retraction
 - Surgery in case of severe compression not responding to conservative care
- **Ddx:**
 - Pec minor s. (PMS) - commonly confused w/TOS
 - Brachial plexus injuries
 - Cx spine injuries
 - Cx radiculopathy
 - SIS
 - Elbow or forearm overuse injuries
 - AC joint injury
 - Nondescript px disorders (due to vague nature of TOS Ssx)

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 Page 6 of 12.

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Complex regional pain syndrome (CRPS)*

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- **Intro:**
 - Neuropathic px disorder w/ persistent, disproportionate px beyond typical healing times
 - Ssx inc. sensory, motor, & autonomic abnormalities
 - Often follows trauma, #, or surgery, but spontaneous cases also occur
 - Diagnostic criteria: **Budapest criteria**
 - **2 types:** no nerve trauma & known nerve trauma (clinically indistinguishable, favouring distal extremities)
- **Aetiology (risk factors):**
 - CRPS can occur due to various types or degrees of tissue trauma, inc. even w/o injury or due to prolonged immobilisation
 - Common causes: #, surgery, sprains, contusions, crush injuries, & seemingly minor interventions like intravenous line placement
 - Psychological distress during physical injury may influence the severity & prognosis
 - Incidence varies (higher rates in Netherlands compared to US)
 - F>M, peak incidence 61-70 age group
 - Upper extremities are more frequently involved than lower extremities
 - # are the most common trigger (44-46% of cases)
 - Vasomotor Ssx, e.g. swelling, temperature, & colour changes, are common
 - **Dx tests:** 3-phase bone scans & autonomic testing
 - **Risk factors:** asthma, ACE inhibitor use, menopause, osteoporosis, Hx of migraine, & smoking
- **Pathophysiology:**
 - Multifactorial mechanisms
 - Inflammatory changes
 - Immunological changes
 - Peripheral sensitisation
 - Central sensitisation & neuroplasticity
 - Autonomic changes
- **Clinical presentation:**
 - **Allodynia:** non-painful stimuli causing px
 - **Hyperalgesia:** exaggerated px from usually painful stimuli
 - **vasomotor dysfunction:** skin colour & temperature changes
 - **Sudomotor dysfunction:** swelling & sweating changes
 - **Motor Ssx:** weakness, reduced ROM, tremor, dystonia in affected extremity



Complex regional pain syndrome (CRPS)* (cont)

- **Physical examination:**
 - **Neuropsychological deficits:** executive functioning, memory, word retrieval
 - **Constitutional Ssx:** lethargy, weakness, disruptions in sleep architecture
 - **Cardiopulmonary inv.:** neurocardiogenic syncope, atypical chest px, chest wall muscle dystonia leading to SOB
 - **Endocrinopathies:** low serum cortisol, hypothyroidism
 - **Urologic dysfunction:** increased urinary frequency & urgency, urinary incontinence
 - **GI dysmotility:** nausea, vomiting, diarrhoea, constipation, indigestion
- **Psychosocial factors:**
 - Associated w/ worsening depression & anxiety
 - Poor function & diminished quality of life
 - No specific personality or psychopathology predictors
 - Px-related behaviour & catastrophic thinking in pts w/ significant comorbid psychological burden or poor coping mechanisms



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Complex regional pain syndrome (CRPS)* (cont)

- **Diagnosis:**
 - Budapest criteria**
 - A. They should report continuing px disproportionate to the inciting event**
 - B. They should report at least 1 Ssx in 3/4 following categories:**
 - Sensory: reports of hyperalgesia &/or allodynia,
 - Vasomotor: reports of temperature asymmetry &/or skin colour changes &/or skin colour asymmetry,
 - Sudomotor/edema: reports of edema &/or sweating changes &/or sweating asymmetry,
 - Motor/trophic: reports of decreased ROM &/or motor dysfunction (weakness, tremor, dystonia) &/or changes (hair, skin, nails)
 - C. Additionally, they must display at least 1 sign at the time of evaluation in 2 or more of the following categories:**
 - Sensory: evidence of hyperalgesia (to pinprick) &/or allodynia (to light touch or deep somatic pressure),
 - Vasomotor: evidence of temperature asymmetry &/or skin colour changes &/or asymmetry,
 - Sudomotor/edema: edema &/or sweating changes &/or sweating asymmetry,
 - Motor/trophic: evidence of decreased ROM &/or motor dysfunction (weakness, tremor, dystonia) &/or trophic changes (hair, skin, nails)
 - D. Finally, there is no other Dx that better explains the Ssx & Sx**
- **Complications:**
 - Dystonia
 - Cognitive executive dysfunction
 - Adrenal insufficiency
 - Gastroparesis
 - IBS
- **Management:**
 - Early treatment may improve prognosis
 - Reported cases of spontaneous improvement
 - **Treatment goal:** px & discomfort improvement, functional restoration, & disability prevention
 - PT & exercise improve ROM, function & reduce disability through endorphin release
 - Px education
 - NSAIDs / pharmacotherapy
 - Behavioural therapy (related to depression)
 - Invasive interventions



Complex regional pain syndrome (CRPS)* (cont)

- **Ddx:**
 - Arterial insufficiency
 - Guillain-Barre s.
 - Hysteria
 - Monometric amyotrophy
 - Multiple sclerosis
 - Peripheral atherosclerotic disease
 - Phlebothrombosis
 - Porphyria
 - Poliomyelitis
 - Tabes dorsalis

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Bummer or Stinger*

• YELLOW

- **Intro:**
 - Common injury in contact sports
 - Reflects upper Cx root or peripheral nerve dysfunction injury
 - Occurs due to over-stretching of upper trunk of brachial plexus or compression of C5/C6 nerve root
 - Recurrences are frequent & can result in permanent neurological deficits
 - Typically graded as Grade I or Grade II nerve injury
- **Aetiology (risk factors):**
 - 1° observed in collision or contact sports (e.g. American football, ice hockey, & rugby)
 - Affects 50-65% of collegiate American football players
 - High recurrence rate requires attention to minimise the problem
- **Pathophysiology:**
 - 3 primary mechanisms:**
 - Forceful blow causing depression of shoulder & lateral FX of the neck to the contralateral side, leading to traction of the upper roots of the brachial plexus
 - A direct blow to supraclavicular fossa or Orb's point causing a percussive injury
 - Head forced into hyperEXT, ipsilateral side FX towards trauma side → narrowing of intervertebral foramen at Cx spine, nerve root compression (common in high-level athletes)



Bummer or Stinger* (cont)

- **Clinical presentation:**
 - Immediate, acute traumatic onset of px/ burning/paresthesia/pins & needles/weakness
 - Typically presents w/ Ssx circumferentially radiating down the arm
 - Reports recent Hx of trauma to the area
 - Common in young athletes competing in contact sports
 - Previous Hx of burners
- **Physical examination:**
 - Shaking of the upper extremity
 - Holding upper extremity close to their body
 - Atrophy or asymmetry in the neck
 - Shoulder depression
 - Atrophy of deltoid or supraspinatus
 - Altered motor patterns when using the shoulder
 - **Palpation:** tenderness, muscle spasm, vertebral tenderness
 - **ROM:** possible decrease in neck & shoulder mobility
 - **Strength:** deltoid (ABD), supraspinatus (ABD - full can), infraspinatus (ER), biceps (elbow FX), pronator teres (forearm pronation), triceps (elbow EXT), & ADD digits minimi (ABD of 5th digit)
 - **Sensation:** burning, paresthesia, pins & needles (usually present circumferentially)
 - **Reflexes:** triceps & brachioradialis
 - **Special tests:** Spurling's test & Tinel test (supraclavicular fossa)
- **Diagnosis:**
 - Usually through clinical examination & past medical Hx
 - **EMG & NCS:** able to determine where the lesion is & its severity
 - **X-rays:** indicate or rule out bone injuries
- **Management:**
 - Length determined by severity of injury
 - For some recovery may take minutes, for other weeks to months
 - Commonly reoccur (up to 87%)



Bummer or Stinger* (cont)

- **Ddx:**
 - Necessary to rule out Cx #, dislocation, or spinal cord injury
- Alternative/associated Cx injuries inc:**
- Assessment & management of concussion
 - Transient quadriplegia - B Ssx
 - Muscular strain/ligament strain - unlikely to have neurological involvement
 - Brachial neuritis - insidious onset
 - Radiculopathy - differences in acute presentation

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