Upper Limb - Clinical Disorders

INTRODUCTION

The ***Upper Limb - Clinical Disorders*** will focus on helping you understand common disorders involving the upper extremity that present throughout the life span. The syllabus is divided into three sections focusing on the Shoulder, Elbow, Wrist and Hand. Each section is organized to provide an Overview of the Disorder, Presentation, Imaging, and Treatment. You should review the pertinent section of the ***Upper Limb Anatomy*** **Course Packet** while reading about the common disorders so you can appreciate the underlying anatomy and its function in the setting of the disorder. Focus on the important information, which has been **BOLDED.** The document will be helpful for the **Large Group Case Presentation and Small Group Case Discussions.**

SHOULDER

Shoulder pain is a common presenting complaint to primary care offices and sports medicine clinics. Estimates of the prevalence of shoulder pain range from 16 to 34 percent in the general population.

Little League Shoulder

OVERVIEW – "**Little League Shoulder**" is secondary to repeated overhead throwing in athletes between the ages of **11 and 14 years during peak proximal physis growth** (Figure 1). It represents an **injury to the shoulder growth plate**. It is thought to be due to rotational torque during maximum external rotation when throwing overhead and seems to be the primary cause of growth plate injuries in the shoulder. **Risk factors for injury include poor mechanics, high pitch counts or repetitive loading on the arm.**

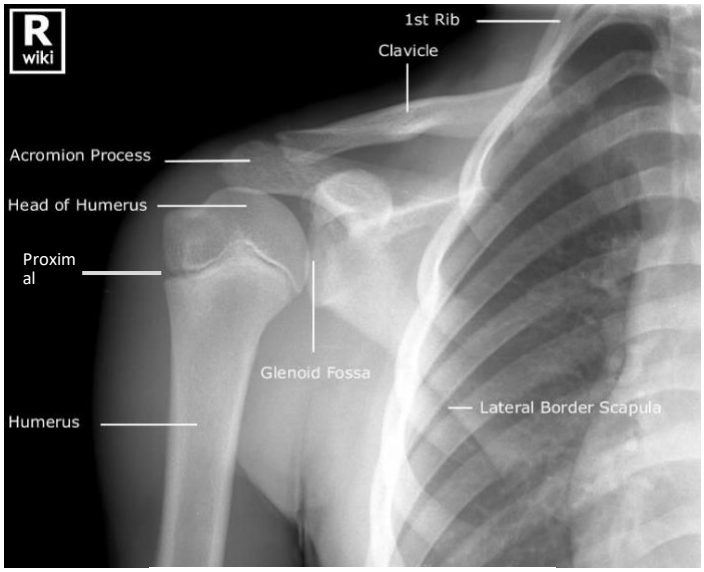

Figure 1

PRESENTATION – Patients will experience the **gradual onset of diffuse shoulder pain**, **worsened with activity** (i.e. pitching). The pain will not radiate into the distal extremity. Physical examination reveals **pain involving the shoulder with movement in all planes.**

IMAGING – **Radiographs** of the shoulder may be normal or show **widening of the proximal humeral growth plate** compared to the unaffected shoulder (Figure 2a). **MRI** of

the Shoulder will show **widening of the proximal humeral growth plate with edema** (Figure 2b and 2c).

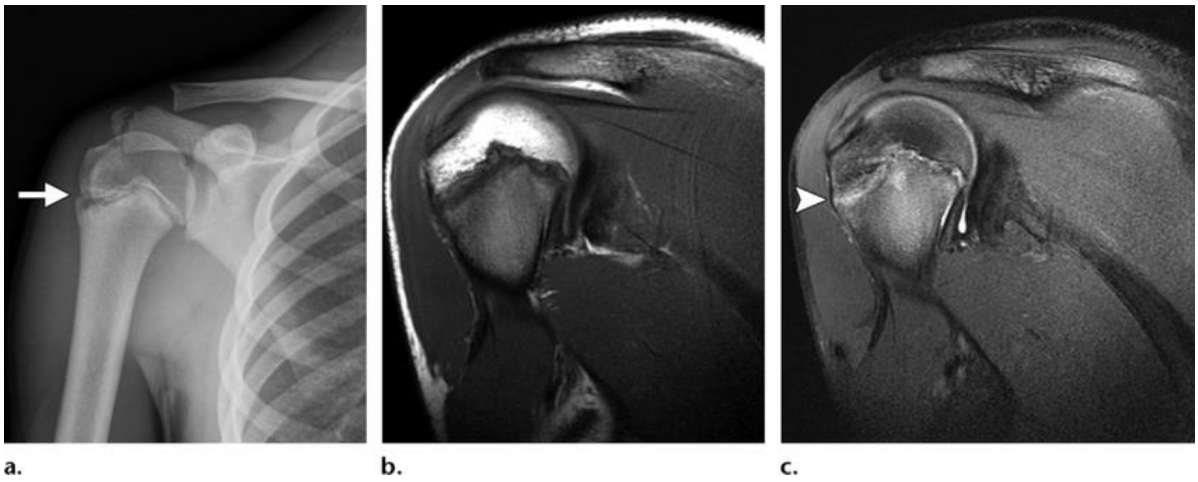

Figure 2

TREATMENT - Most patient will require a significant amount of rest. Athletes should **not throw until they are asymptomatic and have corrected any biomechanical issues contributing to overuse**. It will take at least 2-3 months before an athlete returns to throwing. Physical therapy is helpful in correcting any inflexibilities or strength deficits. Athletes, parents, and coaches should be informed about pitching and throwing rules (https://www.mlb.com/pitch-smart/pitching-guidelines).

Anterior Glenohumeral Dislocation

OVERVIEW – Among **active children and adolescents**, the incidence of shoulder injuries increases with age during participation in overhead activities, such as football, baseball and volleyball. Shoulder dislocations (Figure 3) account for 50 percent of all major joint dislocations, and **anterior dislocation is most common, accounting for 95 to 97 percent of cases**.

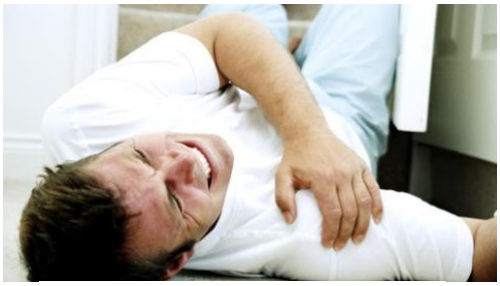

Figure 3

The shoulder is an inherently unstable joint due to the shallow glenoid and small portion of the humeral head that articulates with the glenoid. The surrounding structures, including the labrum, ligaments, capsule and rotator cuff muscles maintain stability and motion. The axillary nerve runs inferiorly to the humeral head and wraps around the surgical neck of the humerus. (Figure 4) Axillary nerve injury is common in up to 42% of shoulder dislocations.

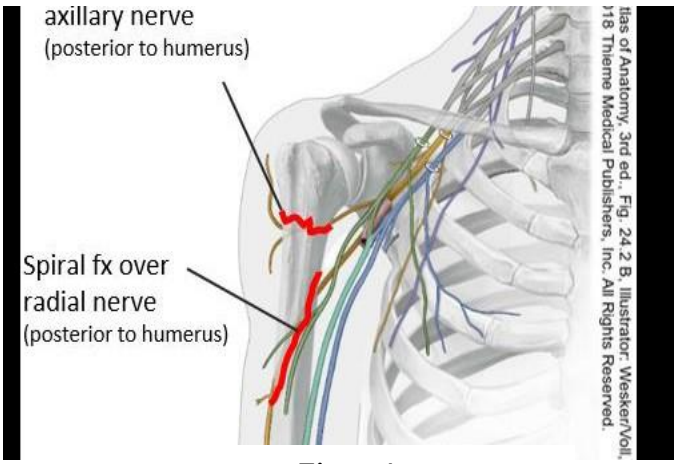

Figure 4

PRESENTATION – An **anterior shoulder dislocation** is usually caused by a **blow to the abducted, externally rotated, and extended arm (e.g. blocking a basketball shot) or a fall on an outstretched arm**. Patients with an anteriorly dislocated shoulder will **present with the arm slightly abducted and externally rotated**. They will resist all movement due to the pain. A thorough neurovascular examination is crucial, **paying particular attention to distal pulses and the function of the axillary nerve**.

Figure 5

IMAGING – **Plain radiographs** (anteroposterior (Figure 6a), scapular Y (Figure 6b) and axillary (Figure 6c) views) should be obtained to **confirm the dislocation, exclude fractures** and **confirm successful reduction. CT scans may be necessary to assess fractures**. MRI or US could show any associated rotator cuff tears.

Figure 6a (left), 6b (center) and 6c (right)
Anterior humerus dislocation

TREATMENT – **Once fractures have been ruled out, treatment will focus on relocating the humerus.** There is no clear evidence exists supporting the superiority of any one of the many methods used to reduce anterior shoulder dislocations. (Figure 7)

Figure 7

After successful reduction of an anterior shoulder dislocation, the shoulder is immobilized in adduction and internal rotation with a sling and referred to a specialist for further management. Some patients will elect to rehabilitate their shoulder with physical therapy. Others may need surgical repair for an irreducible dislocation or fracture that would create glenohumeral instability. The **most common complication of shoulder dislocation is recurrent dislocation, which occurs in 50 to 90 percent of patients under the age of 20 and in approximately 5 to 10 percent of patients over age 40.**

SHOULDER IMPINGEMENT / BURSITIS

OVERVIEW – **Shoulder impingement is secondary to compression of structures (Figure 8) around the glenohumeral joint that occur with shoulder elevation**. It is the most **common cause of shoulder pain, often presenting in younger athletic patients or middle-age patients**. **Repetitive activity involving the shoulder from work or sports is a risk factor for developing impingement**. The impingement is **secondary to abnormal shoulder mechanics due to weakness and dysfunction of the glenohumeral and scapular stabilizers**. **Abnormal motion leads to increased translation of the joint and compression of the subacromial bursa or rotator cuff tendons**.

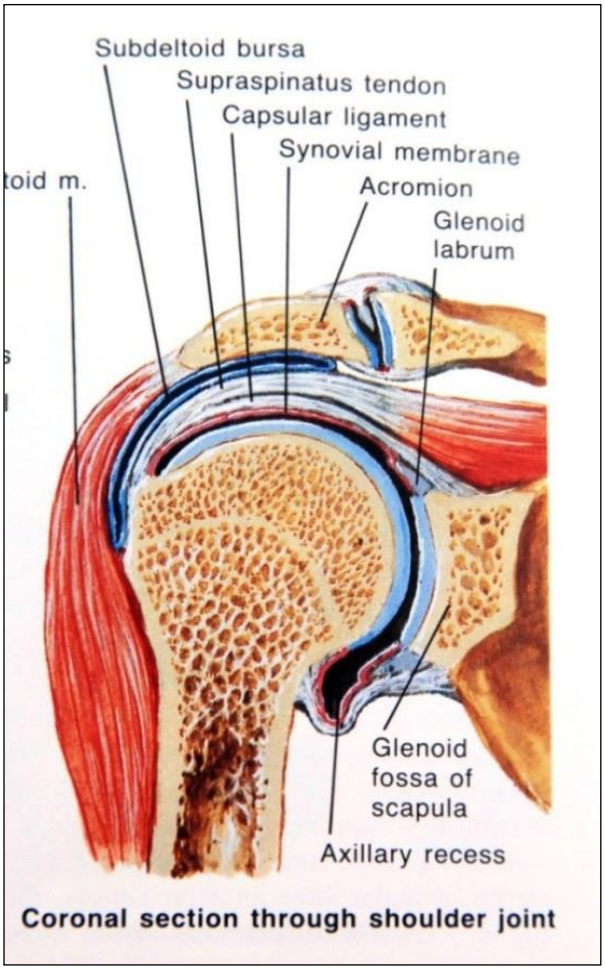

Figure 8

PRESENTATION – Patients will typically complain of **pain with overhead activity**. The pain will **localize to the deltoid area of the lateral arm**. Symptoms may occur when lying on the affected shoulder or at night. Physical examination will reveal a painful arc with overhead motion and positive impingement signs: Neer's (Figure 9) and Hawkins (Figure 10)).

IMAGING – **Radiographs** are not necessary, though can **rule out other causes of shoulder pain** (e.g. arthritis). Musculoskeletal **ultrasound can accurately evaluate the rotator cuff tendons, muscles, shoulder bursae,** and

Figure 9

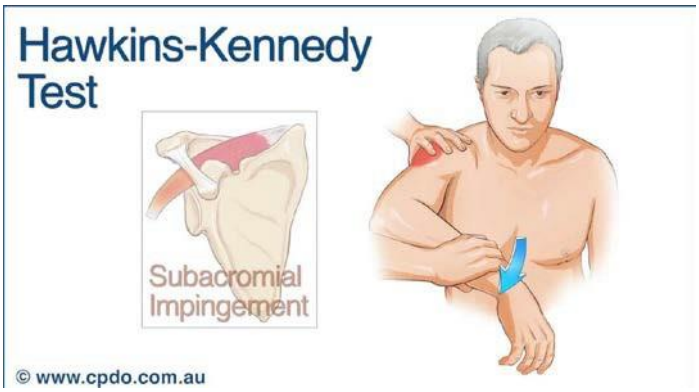

Figure 10

ligaments while allowing a dynamic examination. **MRI can detect abnormalities** associated with **impingement, including bursitis or rotator cuff tendinosis.**

TREATMENT – Treatment focuses on **correcting biomechanical issues (inflexibility and strength deficits) through physical therapy exercises, modification of training, medication and injections. Surgery is indicated for recalcitrant cases**.

ROTATOR CUFF TEAR

OVERVIEW — **Rotator cuff pathology** is the **most common condition** of the shoulder for which **middle aged or older patients** seek treatment. The cause of rotator cuff tears is likely multifactorial (degeneration, impingement, and overload). **Most often, rotator cuff lesions begin as partial tears of the undersurface or articular portion of the supraspinatus tendon**. Over time they **can progress to full thickness tears to include the supraspinatus, infraspinatus, subscapularis, and biceps tendons**. Acute tears will occur after traumatic events such as a fall.

PRESENTATION – The most **common complaints are pain and weakness**. **Pain** will develop over the **lateral deltoid region** and is **worsened by overhead activities or sleeping on the shoulder at night**. Patients who experience an **acute tear will typically have significant weakness and an inability to raise their arm overhead**. Physical examination will reveal pain with motion, impingement signs and a positive drop arm test (inability to hold the arm at 90 degrees abduction).

IMAGING – **Plain radiography will not show a rotator cuff tear,** but may reveal a high riding humerus, which is suggestive of a tear. **Musculoskeletal ultrasound** (Figure 11) **or MRI** (Figure 12) can help **visualize the location and extent of a tear.**

TREATMENT – Treatment will be based on the acuteness, pain symptoms and loss of function. **Most patients can be treated with activity modification, medication (NSAIDs), physical therapy and exercise. Injections with steroids** should be used cautiously due to the tear. Regenerative injections with platelet-rich plasm or stem cells may be used to help manage symptoms. **Surgery is indicated for patients who have a significant acute tear with retraction or impairment** of shoulder function and intractable pain due to a chronic tear.

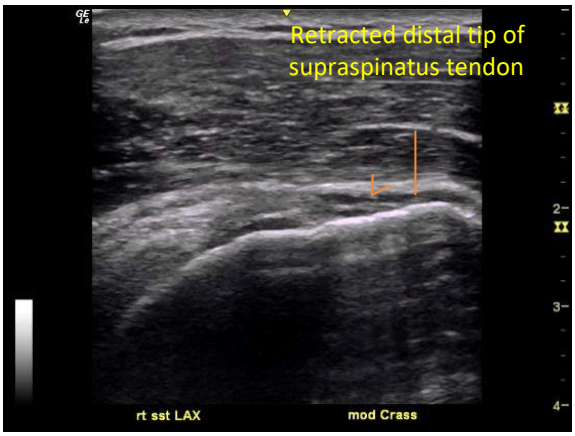

Figure 11

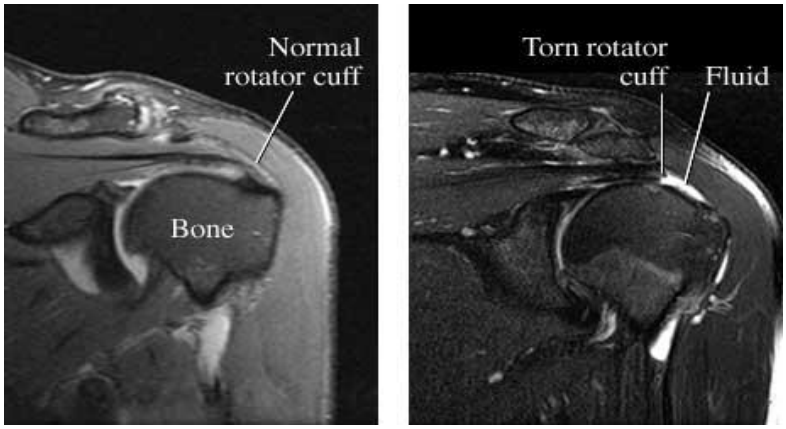

Figure 12

Biceps Tendinitis / Tendinopathy

OVERVIEW – **Injuries to the tendon of the long head of the biceps tendon** injuries include a spectrum of disorders **ranging from mild tendinitis to complete tendon rupture**. The **biceps muscle (Figure 13) is made up of a long and short head, the long head having a unique proximal tendon origin on the scapula, whereas the two heads share a distal attachment on the bicipital (radial) tuberosity. Proximal ruptures occur most frequently at the long head of the biceps tendon. Isolated tendonitis usually presents in the young or middle aged, while degenerative tendinosis and biceps tendon rupture are usually seen in the older population**.

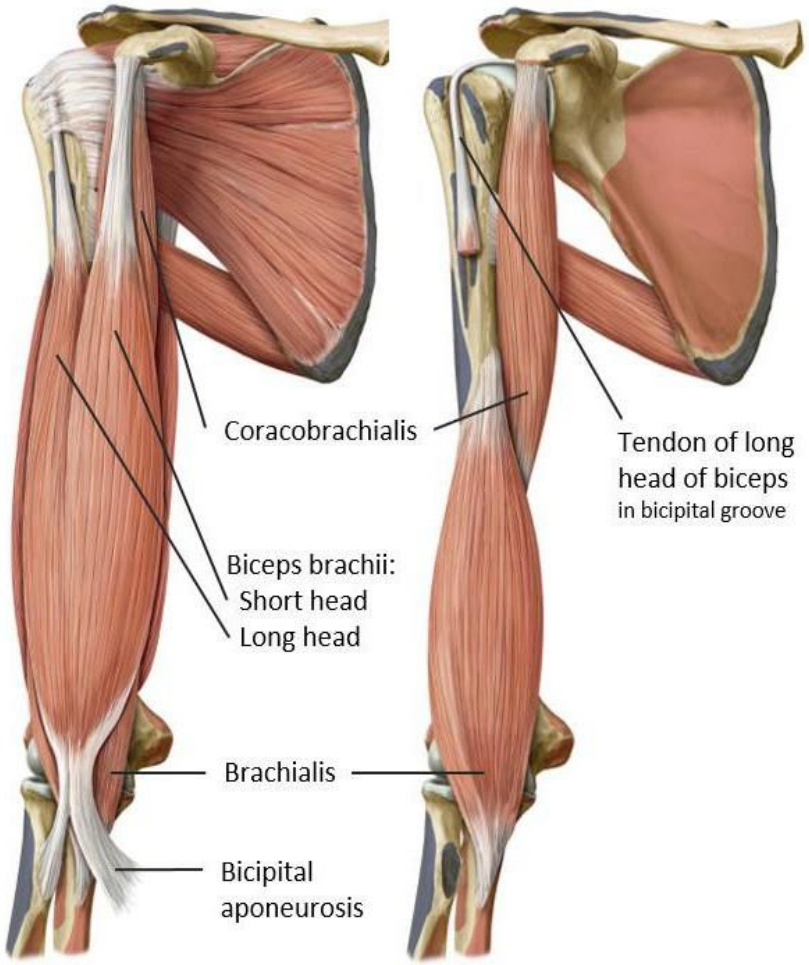

Figure 13. Muscles of the anterior arm

PRESENTATION – Patients with biceps tendon pain typically describe **pain at the anterior shoulder with radiation distally over the biceps muscle**. The pain is **aggravated by lifting, pulling, or repetitive overhead activities**. **In traumatic ruptures, patients will note an inability to flex the shoulder**. Physical examination will reveal tenderness to palpation over the long head of the biceps tendon and a positive Speed's test or Yergason's test can help support the diagnosis of bicep tendinopathy. Patients with a **proximal tendon rupture may experience a "Popeye Sign"** (Figure 14). Patients with a **distal tendon rupture will have difficulty supinating and flexing the elbow.**

Figure 14

IMAGING – **Plain radiographs are of little value** in assessing biceps tendinopathy or rupture, but may rule out other causes of shoulder pain. **Musculoskeletal ultrasound (Figure 15) is useful in detecting tendon tears.**

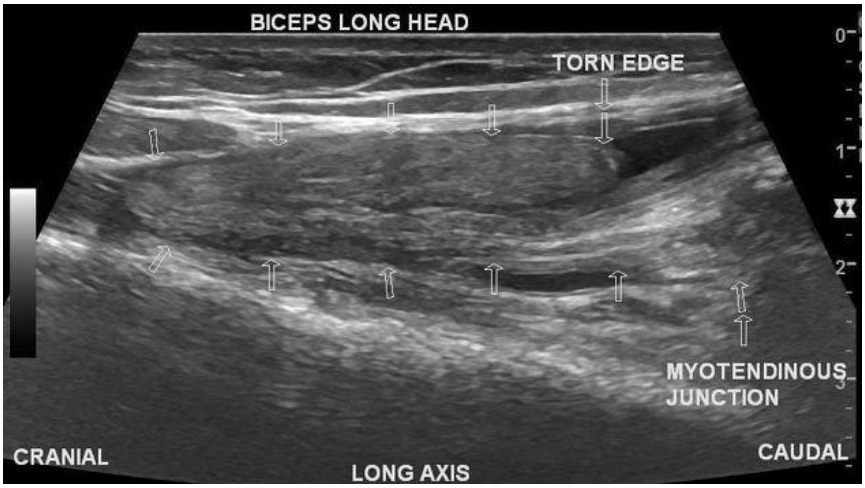

Figure 15

TREATMENT – Treatment modalities will depend upon the location and severity of the biceps injury.

- Proximal biceps tendon injury - The majority of patients can be **managed with conservative treatment including activity modification, physical therapy and injections**. Patients with full tears can function quite well with non-operative treatment. Surgery is reserved for patients with prolonged pain and decreased function.
- Distal biceps tendon injury - All patients with **distal biceps tendon rupture should be referred for surgical consultation** as early as possible.

GLENOHUMERAL JOINT ARTHRITIS

OVERVIEW – **Glenohumeral joint osteoarthritis represents wear-and-tear of the articular cartilage of the humeral head and glenoid labrum. Primary glenohumeral osteoarthritis is more common in patients over the age of 60 and in women.** Secondary glenohumeral osteoarthritis is often associated with trauma including previous dislocation, humeral neck or head fracture and large rotator cuff tendon tears.

PRESENTATION – Patients with **glenohumeral joint osteoarthritis** will often **complain of the gradual onset of shoulder pain and stiffness over a period of months to years**. The **pain will be aggravated by activity including overhead motion and relieved by rest.** Patients may have difficulty sleeping at night due to the pain. Physical examination will reveal **loss of range of motion, especially with internal or external rotation, pain with active and passive range of motion, and crepitus**. These findings are similar to adhesive capsulitis ("frozen shoulder").

IMAGING – For most patients, **plain radiographs of the shoulder (such as PA, external rotation, Grashey and axillary views) will reveal changes consistent with arthritis (joint space narrowing [normal 3-4 mm], sclerosis and osteophytes) of the glenohumeral joint** (figure 16). MRI, ultrasonography (US) and CT scans are only needed if there is concern about a rotator cuff tear (MRI or US) or fracture (CT).

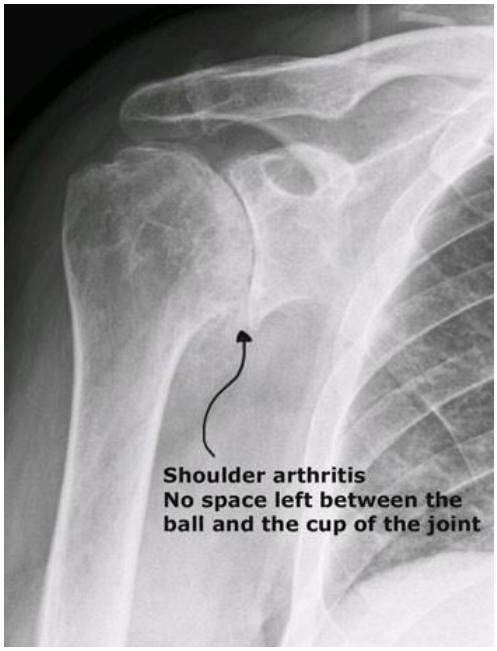

Figure 16

TREATMENT – Glenohumeral joint osteoarthritis is a slowly progressive disorder that can be treated with **activity modification, medication (NSAIDs), physical therapy and exercise.**
Injections including intra-articular steroids or regenerative techniques [platelet-rich plasm or stem cells] may be used to help manage symptoms. Shoulder replacement surgery is indicated for patients who have significant impairment of shoulder function and intractable pain.

Frozen Shoulder

OVERVIEW – **Frozen shoulder is characterized as the gradual development of global limitation in both active and passive motion of the shoulder**. It affects **women more than men, often occurring the fifth and sixth decades of life, with the peak age in the mid- 50s.** Typically, frozen shoulder occurs unilaterally and is usually self-limited, though symptoms can take several 1-2 years to resolve.

Frozen shoulder can be primary (or idiopathic), though is often **associated** with other diseases such as **diabetes mellitus** (prevalence of 10 to 20 percent). Frozen shoulder may be **secondary to shoulder injuries**, such as a rotator cuff tear, proximal humerus fractures, or shoulder surgery. The pathophysiology is not completely understood, though thought to be due to inflammation involving the joint capsule and ligaments leading to the development of adhesions and fibrosis of the synovial lining.

PRESENTATION – **Frozen shoulder commonly progresses through three phases** as noted below. Physical examination will demonstrate a significant **reduction in active and passive range of motion in multiple planes** compared to the unaffected shoulder.

- **Phase 1 (Painful):** Diffuse, severe pain that is quite disabling and worsens at night. Phase 1 is associated with stiffness and loss of motion lasting two to nine months.
- **Phase 2 (Stiffness):** The predominant symptoms are stiffness and loss of shoulder motion, while the pain gradually lessens. This phase can last four to twelve months.
- **Phase 3 (Resolution):** A gradual improvement in range of motion and pain. This phase can last five to 24 months.

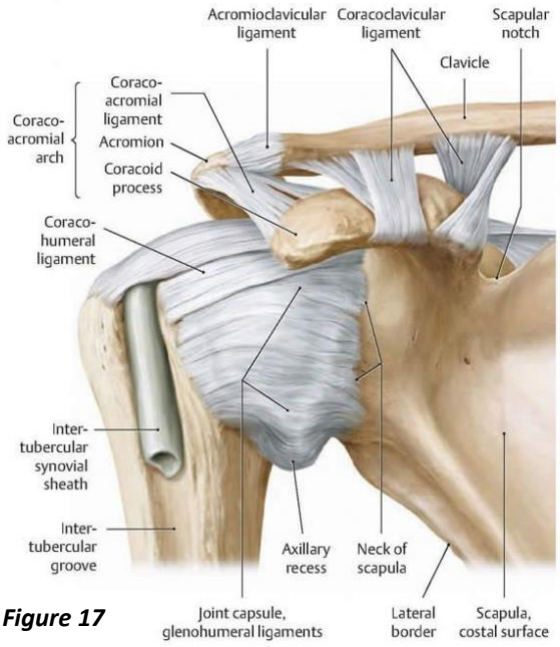

Figure 17

IMAGING – **Plain radiographs are often normal** in patients with primary frozen shoulder. They are helpful in evaluating secondary causes of frozen shoulder, such as arthritis or fracture.

TREATMENT – In most cases, frozen shoulder is a **self-limiting condition that will resolve within one to two years.** Non-operative treatment utilizes **medication (NSAIDs or Tylenol) or injections for pain and physical therapy to address loss of motion**. Recalcitrant cases may require surgical manipulation under general anesthesia.

DIAGNOSIS	AGE	SYMPTOMS	PHYSICAL EXAM	IMPORTANT STRUCTURES
Little League Shoulder	Adolescent	Diffuse pain with activity	Tenderness over the proximal humerus	Proximal Humerus Growth Plate
Anterior Glenohumeral Dislocation	Adolescent to Middle Age	Acute pain with no motion	Abnormal contour to shoulder	Glenohumeral Joint
Shoulder Impingement / Bursitis	Adult	Pain with overhead motion	Painful arc, positive impingement signs	Subacromial Bursa
Rotator Cuff Tear	Middle Age to Elderly	Pain and weakness	Weakness with testing of rotator cuff	Rotator Cuff – Supraspinatus, Infraspinatus, Teres Minor and Subscapularis
Biceps Tendinitis/Tear	Adolescent to Young Adult	Pain with flexion or supination	Pain with shoulder/elbow flexion and elbow supination	Biceps Tendon
Glenohumeral Arthritis	Elderly	Pain and stiffness with loss of motion	Loss of active and passive ROM	Glenohumeral Joint
Frozen Shoulder	Middle Age	Pain and loss of motion	Loss of active and passive ROM	Glenohumeral Joint Capsule

ELBOW

Little League Elbow

Figure 18

OVERVIEW – "**Little League Elbow**" (LLE) is secondary to repeated overhead throwing in athletes between the **ages of 11 and 14 years during peak proximal physis growth** (Figure 18). LLE is due to a **valgus overload to the medial elbow that causes injury to the growth plate at the medial epicondyle**. Risk factors include year-round participation in sport, conditioning and training errors, and non-adherence to pitch counts.

PRESENTATION – Patients will typically present with **pain at the medial epicondyle region of the elbo**w. Athletes will note **pain during throwing** (cocking/acceleration phase). The pain will not radiate into the distal extremity. Physical examination will reveal pain involving the elbow with movement in all planes.

IMAGING – **Radiographs (Figure 19) will often reveal widening of the medial epicondyle** compared to the non-injured side. **MRI** of the elbow will show **widening of the growth plate with edema.**

Figure 19

TREATMENT – **Most patients will require a significant amount of rest.** Athletes should not throw until they are asymptomatic and have corrected any biomechanical issues contributing to overuse. Most cases can be managed with rest from sports and physical therapy to correct flexibility, strength and abnormal biomechanical motions that overload the elbow. Mild cases may return to sport in 4-6 weeks, while severe cases may require 4-6 months of rest and rehabilitation. **Athletes, parents, and coaches should be informed about pitching and throwing rules**

(http://web.usabaseball.com/documents/2/3/8/289120238/NTISPitchingRules.pdf).

Tennis Elbow / Golfer Elbow

OVERVIEW – **Pain at the myotendinous junction of the muscle groups of the wrist extensors (bony origin- lateral epicondyle) or wrist flexors (bony origin - medial epicondyle) is often secondary to overuse**. Pain at involving the **lateral epicondyle is** often called **tennis elbow** while **pain involving the medial epicondyle** is often called **golfer's elbow**. Research suggests an incidence of 1-3% in the general population, with tennis elbow occurring more frequently than golfer's elbow. Athletes often exhibit training errors or abnormal biomechanical motions that lead to overuse.

Injury to the extensor carpi radialis brevis muscle (ECRB) (at tip of lateral epicondyle) and occasionally, the extensor digitorum muscle (just posterior and distal to tip of lateral epicondyle) causes lateral epicondylar pain (Figure 20). **Injury to the pronator teres and flexor carpi radialis muscles, which originate at the medial epicondyle, causes medial epicondylar pain** (Figure 21 on next page)

PRESENTATION – **Repetitive or explosive athletic movements involving eccentric contraction (muscle lengthening while contracting) may increase susceptibility to injury**. Pain severity will vary from minimal effects on sport or work to severely impairing basic tasks. Symptoms are exacerbated by repetitive motions of the wrist and elbow.

Lateral epicondylar pain is worsened with resisted wrist extension or passive wrist flexion with the elbow in full extension. **Medial epicondylar pain is worsened with resisted wrist flexion or passive wrist extension with the elbow in full extension.**

IMAGING – **Plain radiographs are often normal** but are helpful in evaluating other causes of elbow pain. U**ltrasound** (Figure 22 on next page) is a cost- effective way to **visualize the soft tissue to assess for degenerative tendon changes.** MRI will also show degenerative tendon changes but is much more expensive.

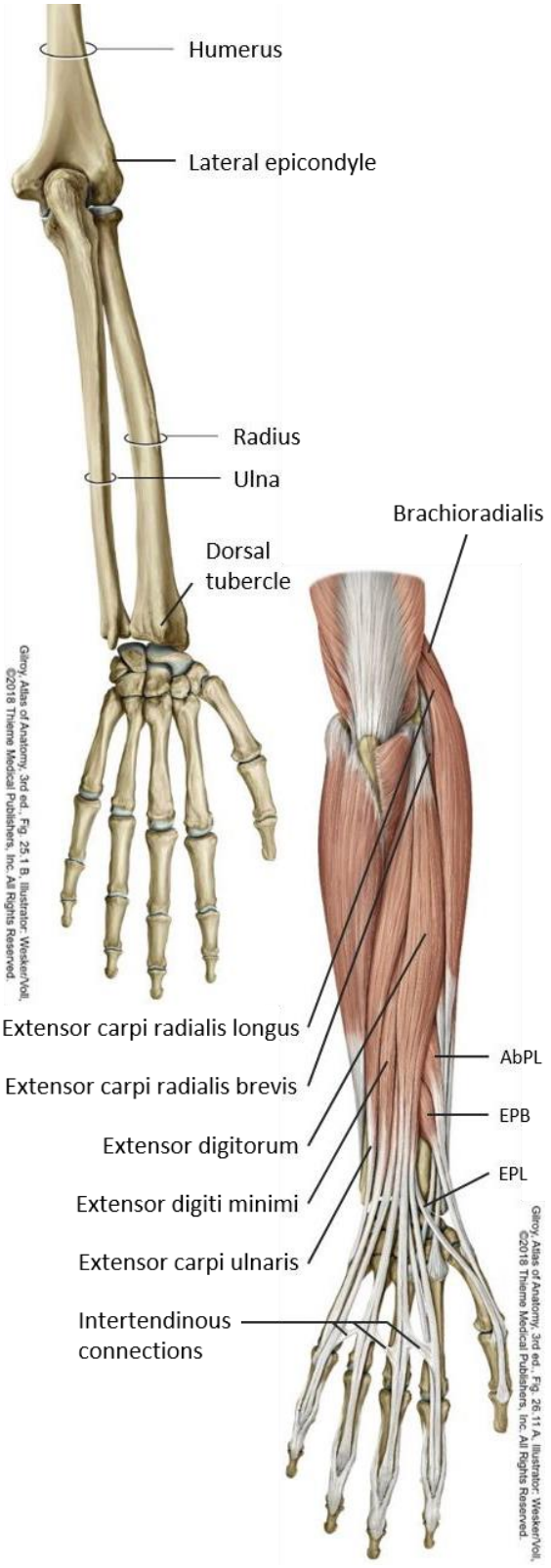

Figure 20. Bones and superficial muscles of the posterior arm

TREATMENT – **Non-operative treatment utilizes medications (NSAIDs or Tylenol), bracing, and physical therapy to correct flexibility, strength, and abnormal biomechanical motions that overload the specific tendon**. Regenerative techniques such as platelet rich plasma injections or percutaneous tenotomy and surgery may be considered in recalcitrant cases.

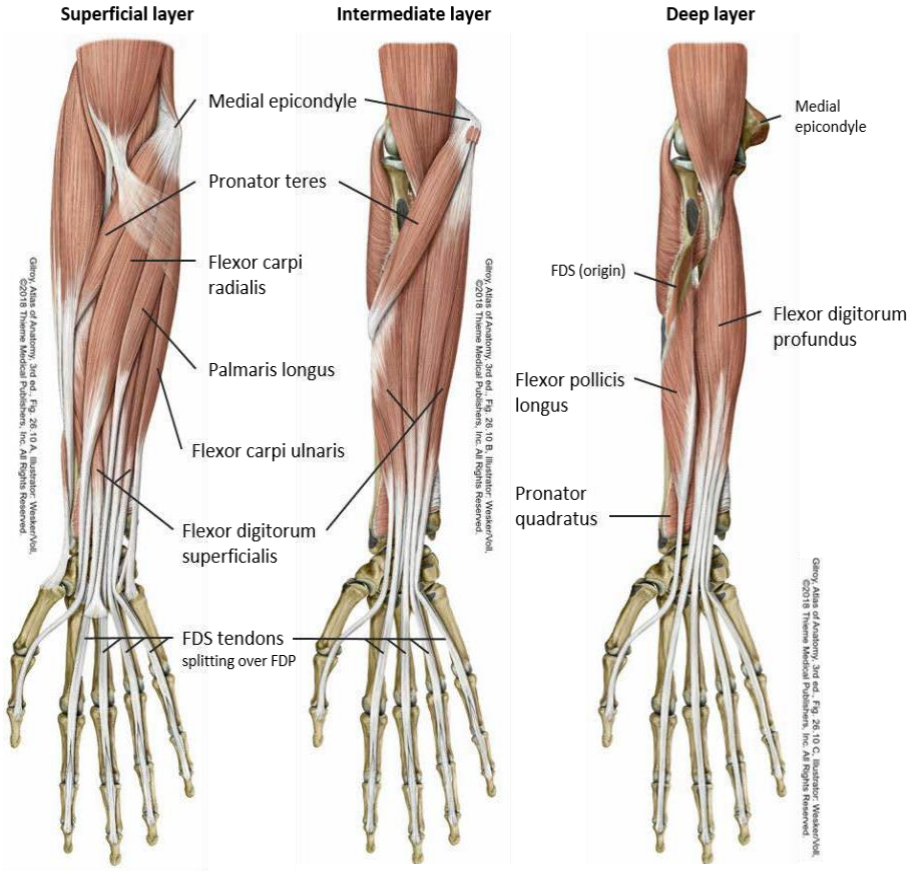

Figure 21. Muscles of the anterior arm

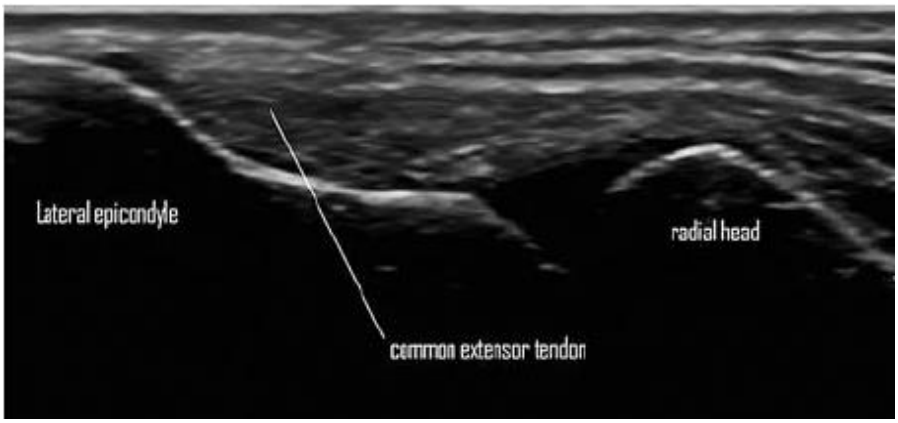

Figure 22 a. Normal Ultrasound of the elbow

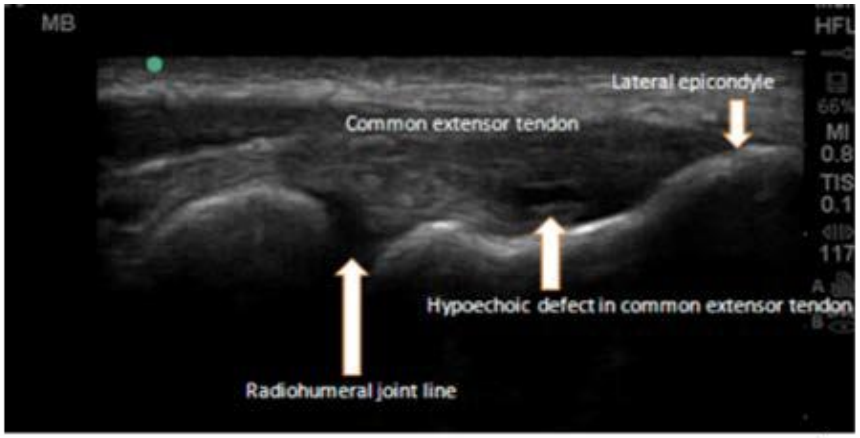

Figure 22 b. Abnormal Ultrasound of the Elbow

Arthritis

OVERVIEW – The **elbow is a non-weight bearing joint, so degenerative processes are not as common compared to the lower extremity**. When arthritis **does occur, it may often be in the setting of a prior intraarticular fracture or in conjunction with an inflammatory arthritis.**

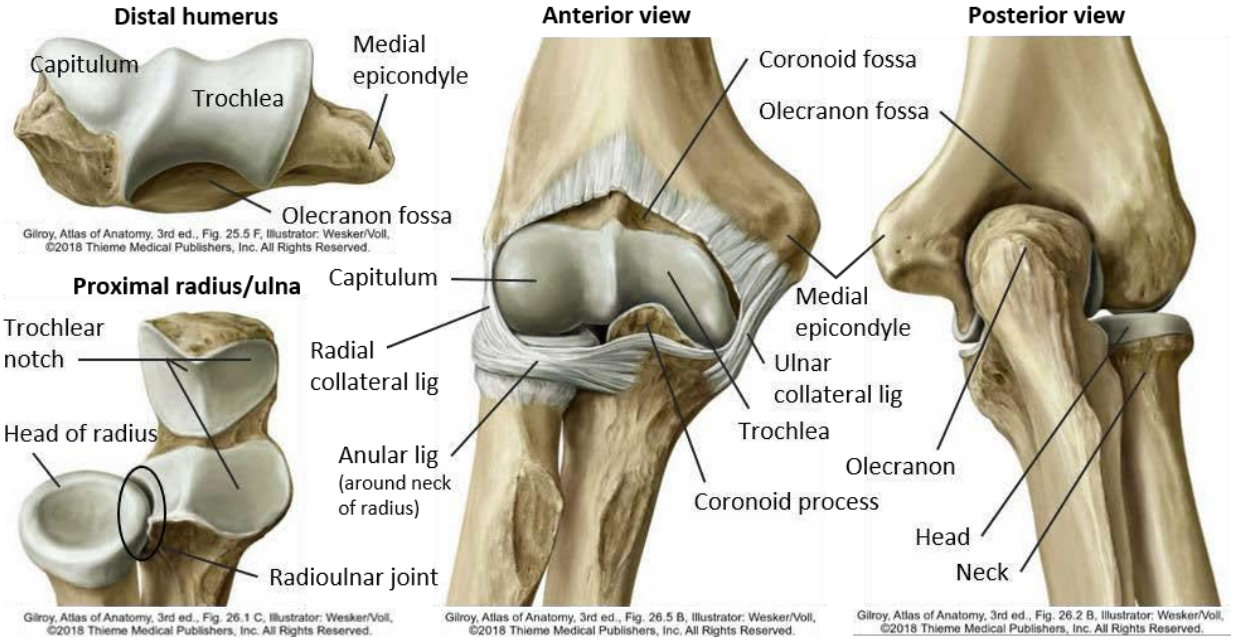

Figure 23. Surfaces and ligaments of the elbow joint

PRESENTATION – Most patients will present with **pain and stiffness involving the elbow joint**. They may **initially report loss of full extension with end-point stiffness**. Progression will lead to **loss of flexion, pronation and supination**. Physical examination will confirm the loss of motion and assist in assessing stability.

IMAGING – **Radiographs** (Figure 24) **of the elbow will typically show evidence of arthritis (joint space narrowing, osteophytes).** Further imaging such as an MRI may be warranted if there are concerns about other entities involving the elbow.

TREATMENT – **Non-operative treatment focuses on activity modification, medication for pain relief, physical therapy and injections.** Surgery is reserved for recalcitrant cases.

Figure 24

Ulnar Neuropathy

OVERVIEW – **Entrapment or compressive neuropathies** are common problems that may lead to functional impairment and disability of the upper limb due to weakness, altered sensation, loss of dexterity, and sometimes pain. **Ulnar neuropathy**, **especially at the elbow** (Figure 25), is a common focal neuropathy affecting the upper extremity and is **second in frequency only to entrapment of the median nerve at the wrist (carpal tunnel syndrome**). The **ulnar nerve travels within the cubital tunnel through the two heads of the flexor carpi ulnaris muscle. The nerve then pierces the aponeurosis lining the deep heads of the flexor carpi ulnaris and runs between the tendons and muscle planes of the medial forearm to the wrist.** The etiology of ulnar nerve lesions at the elbow includes acute trauma (e.g., distal humeral fracture, nerve lacerations, perioperative injury) and nerve compression, traction, or friction from leaning on the elbow or from prolonged elbow flexion

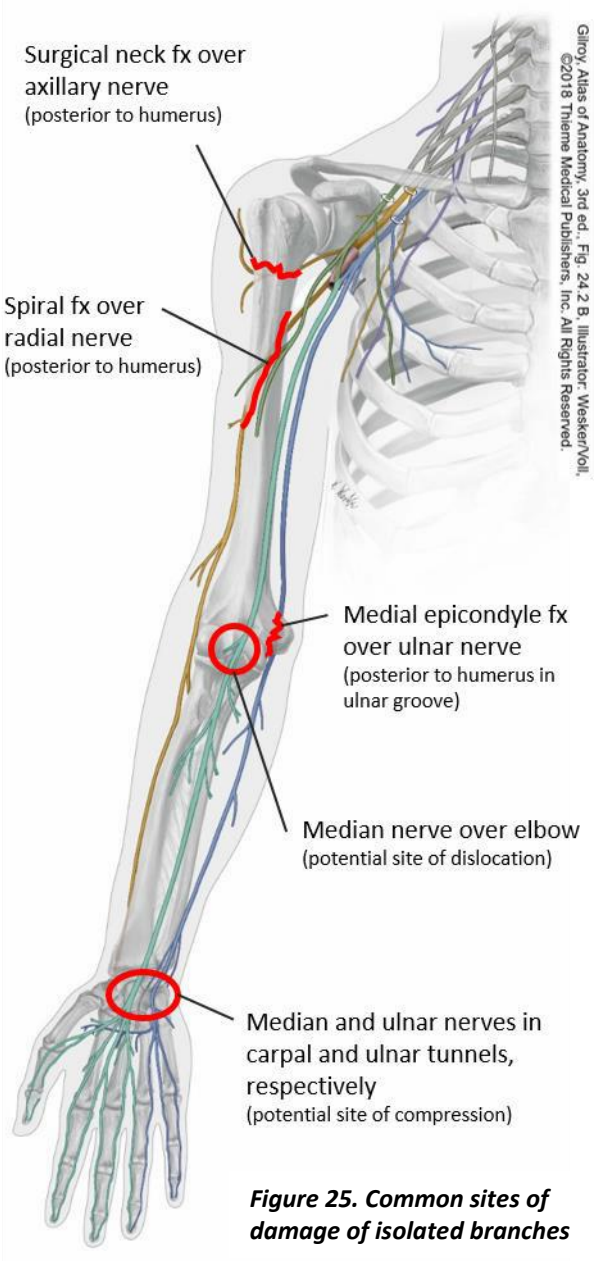

Figure 25. Common sites of damage of isolated branches

PRESENTATION – **Ulnar lesions at the elbow** typically present with **numbness and tingling in the fourth and fifth digits, medial elbow pain, nocturnal numbness and paresthesia, and worsening of symptoms with elbow and/or repeated wrist flexio**n. Sensory symptoms from ulnar neuropathy at the elbow are often brought on by sustained elbow flexion. **Tinel's sign at the elbow (i.e. tapping at the cubital tunnel) will reproduce a tingling into the ulnar side of the hand.**

IMAGING – **Radiographs of the elbow are utilized to help identify bony structures that might compress the ulnar nerve** (i.e. arthritis).
Ultrasonography is a cost-effect method for evaluating ulnar nerve compression at the elbow. **Electrodiagnostic testing (nerve and muscle test)** is used to **localize the site of compression to the ulnar nerve at the elbow, determine the character and severity of the injury**, **aid in prognosis,** and examine for the presence or absence of alternative diagnoses.

TREATMENT – Treatment will vary and depend upon the severity of symptoms. **Conservative therapy will include activity modification, bracing, physical/occupational therapy or injections.** Surgery is warranted to recalcitrant cases or progressive neurologic compromise.

DIAGNOSIS	AGE	SYMPTOMS	PHYSICAL EXAM	IMPORTANT STRUCTURES
Little League Elbow	Adolescent	Diffuse pain with activity	Tenderness over the medial epicondyle	Medial Epicondyle Growth Plate
Tennis Elbow	Adolescent to Middle Age	Pain with wrist extension	Tenderness over the lateral epicondyle	Extensor carpi radialis brevis muscle (ECRB) Extensor digitorum muscle
Golfer Elbow	Adolescent to Middle Age	Pain with wrist flexion and pronation	Tenderness over the medial epicondyle	Pronator teres Flexor carpi radialis muscles
Arthritis	Middle Age to Elderly	Pain and stiffness	Loss of elbow motion	Elbow Joint
Ulnar Neuropathy	All ages	Numbness in the 4th and 5th digit of the hand	Positive Tinel's at the elbow or wrist	Ulnar Nerve

Wrist and Hand

Scaphoid Fracture

OVERVIEW – Scaphoid fracture represent 5% of all fractures and 18% of hand fractures. **Scaphoid fractures are the most common fracture involving the carpal bones** (Figure 26). It is often **injured with a fall on to the wrist resulting in direct axial compression with the wrist in hyperextension**. The scaphoid is the **largest bone of the proximal carpal row**. It is important to note that the **palmar carpal branch of the radial artery supplies the scaphoid via the bone's distal pole and then retrograde to the proximal pole**.

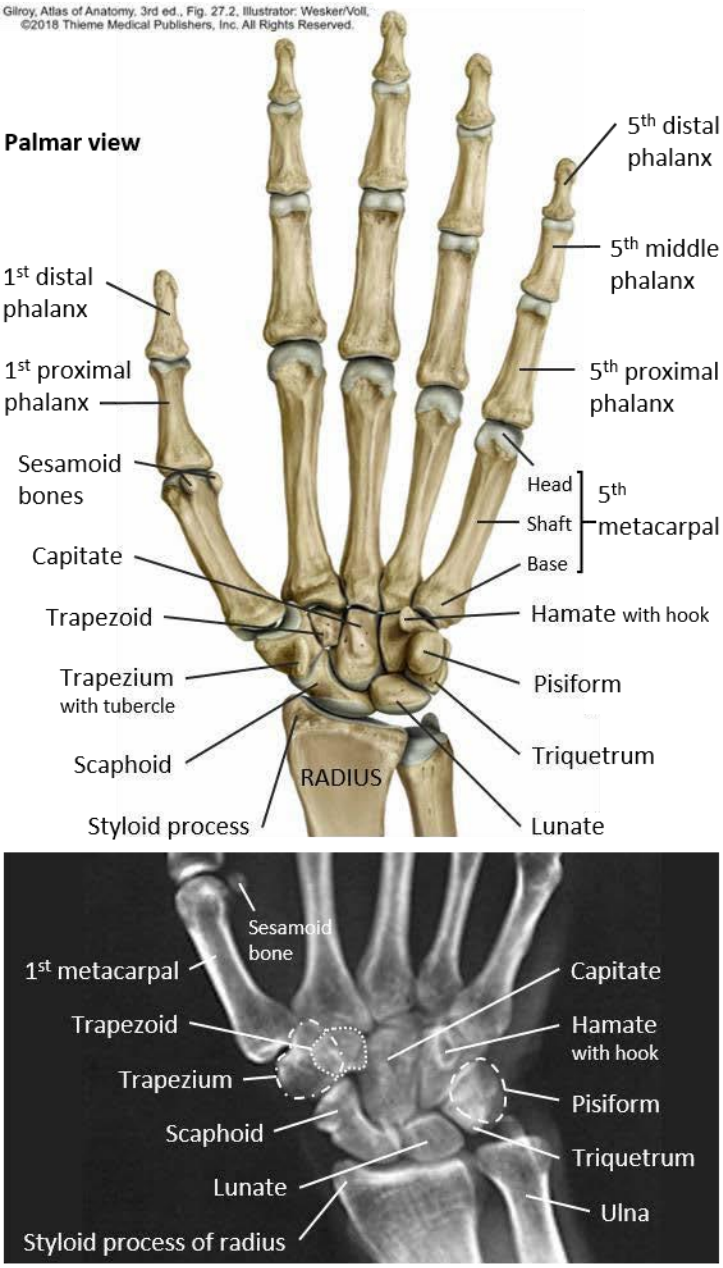

Figure 26

Figure 27

PRESENTATION – Patient will present with **pain localizing to the snuff box, swelling and loss of motion**. The **snuff box is the anatomical region overlying the scaphoid and trapezium bones. Its borders are formed by the extensor pollicis longus (ulnar side) and the extensor pollicis brevis and abductor pollicis longus (radial side).**

IMAGING – **Radiographs should be performed in any patient with pain in the snuff box** (Figure 27). **If initial x- rays are normal, then x-rays should be repeated in 10-14 days. If there is still concern for a fracture, then an MRI should be obtained.**

TREATMENT – If x-rays are normal and snuff box tenderness is present, treat like there is a **scaphoid fracture by placing in a thumb spica splint and repeat an x-ray in 10-14 days. Missed scaphoid fractures can have very bad outcomes and are susceptible to avascular necrosis.**

Boxer's Fracture

OVERVIEW – **Metacarpal fractures (see Figure 26 above) are among the most common hand injuries** and account for 30-40% of all hand fractures. They are usually due to direct trauma, such as punching a wall or a solid object.

PRESENTATION – Patients with a **metacarpal neck fracture typically present with complaints of pain and/or deformity along the dorsum of the hand overlying the involved metacarpal**. There is evidence of dorsal **hand swelling and focal bony tenderness over the fractured metacarpal**. Significant tenderness or ecchymosis on the palmar (volar) surface is highly suggestive of fracture.

IMAGING – **Plain radiographs are performed to establish the diagnosis of metacarpal neck fracture and to determine the degree of fracture angulation** (Figure 28).

Figure 28

TREATMENT – The **majority of cases can be treated with cast immobilization.** Referral to an orthopedic surgeon is indicated for an open or complex fracture that is considered unstable.

De Quervain's Tenosynovitis

OVERVIEW – **De Quervain tenosynovitis affects the abductor pollicis longus (APL) and extensor pollicis brevis (EPB) tendons in the first extensor compartment at the styloid process of the radius** (Figure 29). You can remember this by using the **mnemonic ALL PEOPLE LIKE to EAT PEANUT BUTTER**. It is characterized by **pain or tenderness at the radial side of the wrist**. De Quervain tenosynovitis is a common cause of wrist pain in adults. It is **most common among women between the ages of 30 and 50 years of age**, including a small subset of women in the postpartum period.

PRESENTATION – Patients will present with **pain or tenderness at the radial side of the wrist**. The pain will occur with the **Finkelstein maneuver** (Figure 30), which involves **active or passive stretch of the thumb tendons over the radial styloid in thumb flexion.**

IMAGING – **Radiographs of the wrist are used to help identify bony structures that might compress the tendon** (i.e. arthritis). **Ultrasonography** is a cost-effective method for **evaluating the tendon structures and guiding injections.**

TREATMENT – The goal of treatment is to relieve symptoms and limited disability. **Conservative therapy will include activity modification, bracing, physical/occupational therapy or injections.** Surgery is warranted to recalcitrant cases or progressive neurologic compromise.

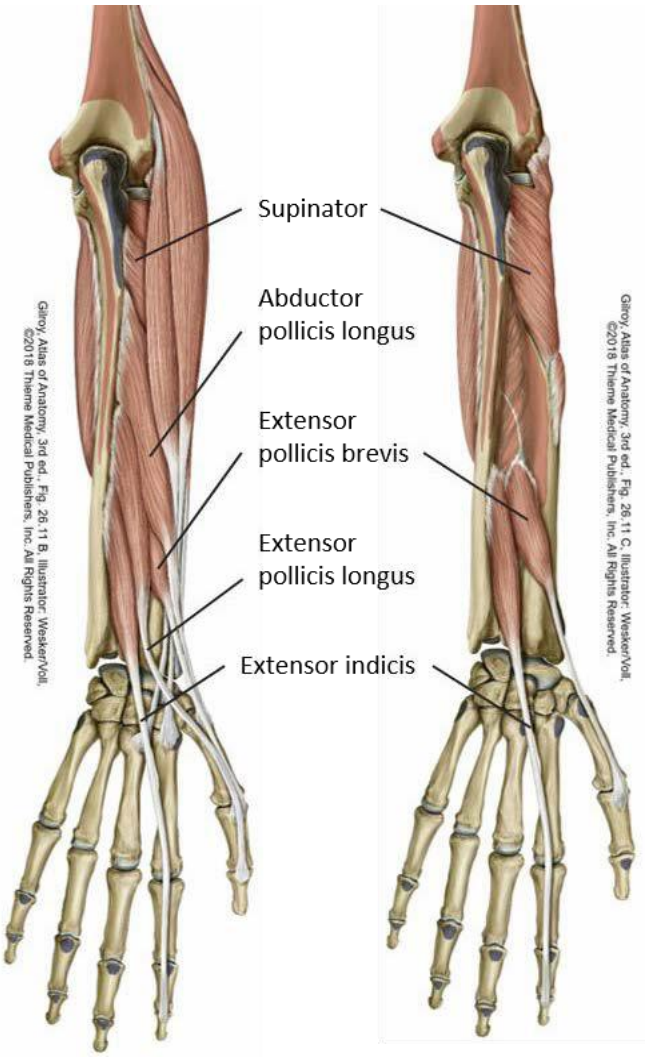

Figure 29 Deep muscles of the posterior arm

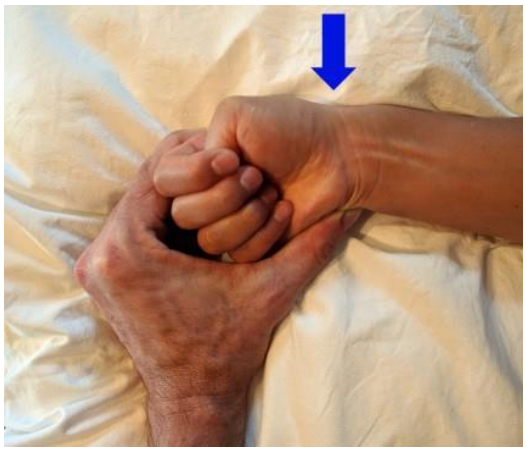

Figure 30

Gamekeeper's / Skier's Thumb

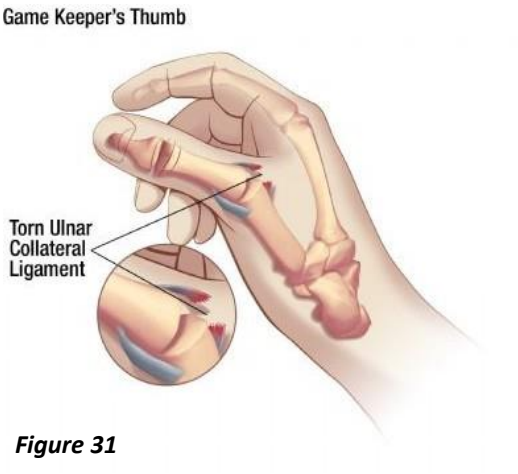

Figure 31

OVERVIEW – **Gamekeeper's thumb** (or skier's thumb) represents an **acute or chronic degeneration of the ulnar collateral ligament (UCL) of the 1st metacarpophalangeal joint** (Figure 31). Skiing accidents in which the thumb strikes a fixed ski pole and other athletic injuries involving thumb abduction are the most common cause of ulnar collateral ligament tears. **Forced abduction and hyperextension of the thumb metacarpophalangeal joint is the usual mechanism causing injury of the thumb ulnar collateral ligament (UCL).**

PRESENTATION – Patients with an **ulnar collateral ligament (UCL) injury complain of pain, which is exacerbated by thumb extension or abduction, and swelling along the ulnar aspect of the thumb metacarpophalangeal (MCP) joint**. Physical examination will reveal MCP joint tenderness is localized to the ulnar side of the joint. The entire joint may be swollen or swelling may be localized to the ulnar side. Valgus stress testing reveals a loss of integrity of the UCL.

IMAGING – **Radiographs of the thumb are indicated in patients with suspected ulnar collateral ligament (UCL) injury to identify bony avulsions at the ligament's insertion at the base of the proximal phalanx,** and other potential fractures. **Musculoskeletal ultrasound can be used to assess UCL injuries of the thumb.**

TREATMENT – Most often, these injuries can be **treated with a thumb spica splint and rehabilitation. Referral to an orthopedic hand surgeon should occur if there is evidence of a fracture or no improvement from non- operative treatment**.

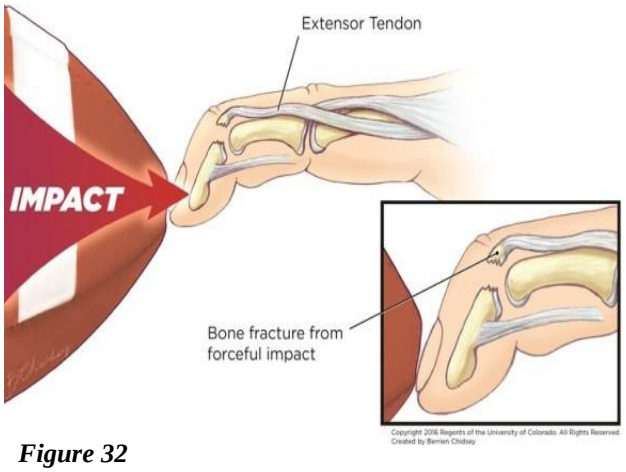

Figure 32

Mallet Finger

OVERVIEW – Mallet finger (Figure 32) occurs most commonly during collision sports or ball-handling sports, such as basketball and baseball. The injury is usually caused by a **direct blow to the tip of the finger,** such as when a ball strike the fingertip or the fingertip strikes a rigid surface. The **axial load from the blow causes sudden, forceful flexion of the distal phalanx that damages the extensor tendon where it attaches to the proximal portion of the distal phalanx. It results in a traumatic disruption of the terminal slip of the extensor tendon at the DIP joint**

PRESENTATION – Patients complain of **pain over the dorsum of the DIP joint**. There will be associated swelling, ecchymosis and a deformity, especially if there is a concurrent fracture. There is an **inability to extend the DIP joint fully, leading to a flexed DIP at rest**. The patient with a mallet finger will be unable to extend the distal phalanx actively but the joint usually can be extended passively.

Figure 33

IMAGING – Radiography should be performed to evaluate for fractures of the distal phalanx and for lignment abnormalities (figure 33)

TREATMENT – Most cases are treated with **splinting in extension for 6-8 weeks. Surgery should be considered if there is an associated fracture or no improvement after 3 months**.

Carpal Tunnel Syndrome

OVERVIEW – Carpal tunnel syndrome is the **most common nerve entrapment disorder of the upper extremity**. It is caused by **compression of the median nerve as it runs through the carpal tunnel** (Figure 34). Impingement often results in pain, numbness, and tingling in

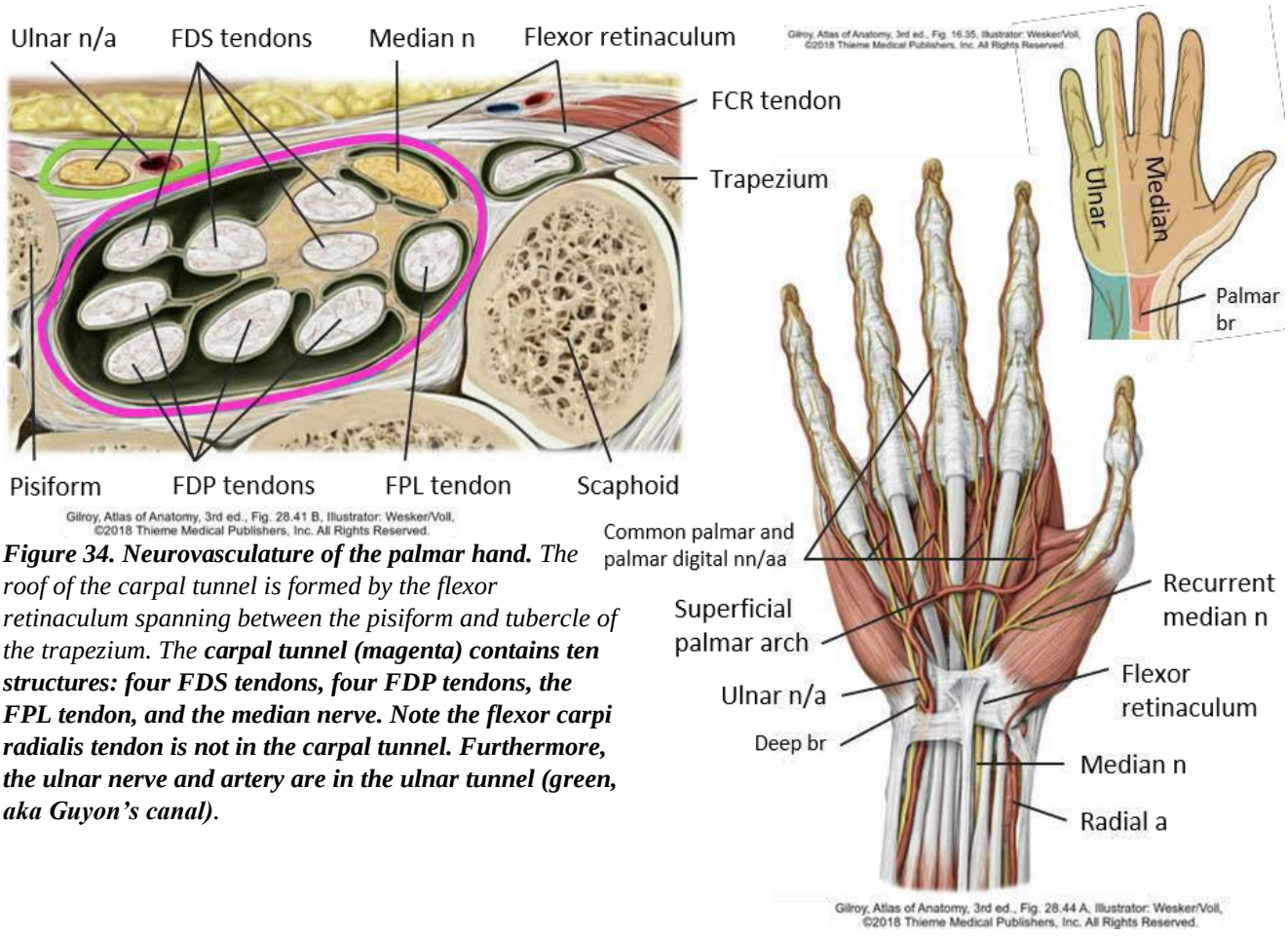

Figure 34. Neurovasculature of the palmar hand. *The roof of the carpal tunnel is formed by the flexor retinaculum spanning between the pisiform and tubercle of the trapezium. The* ***carpal tunnel (magenta) contains ten structures: four FDS tendons, four FDP tendons, the FPL tendon, and the median nerve. Note the flexor carpi radialis tendon is not in the carpal tunnel. Furthermore, the ulnar nerve and artery are in the ulnar tunnel (green, aka Guyon's canal)****.*

the hand and arm. There can be several causes of the **entrapment of the nerve by the volar carpal ligament**. Some patients can even develop weakness in the median nerve distribution.

PRESENTATION – Impingement often results in **pain, numbness, and tingling in the hand (thumb, index and middle finger)**. (Figure 34) There can be several causes of the entrapment of the nerve by the transverse carpal ligament. Some patients can even develop weakness in the median nerve distribution.

IMAGING – Radiographs of the wrist are utilized to help identify bony structures that might compress the nerve (i.e. arthritis). Ultrasonography is a cost-effective method for evaluating nerve compression at the wrist. Electrodiagnostic testing is used to localize the lesion to the median nerve at the wrist, determine the character and severity of the injury, aid in prognosis, and examine for the presence or absence of alternative diagnoses.

TREATMENT – Treatment will vary and depend upon the severity of symptoms. **Conservative therapy will include activity modification, bracing, physical/occupational therapy or injections**. Surgery is warranted to recalcitrant cases or progressive neurologic compromise.

DIAGNOSIS	AGE	SYMPTOMS	PHYSICAL EXAM	IMPORTANT STRUCTURES
Scaphoid Fracture	All ages	Pain along the radial wrist	Tenderness at the snuff box	Scaphoid
Boxer's Fracture	All ages	Pain along the metacarpal region	Tenderness over the metacarpal region	Metacarpal Bones
De Quervain's tenosynovitis	All ages	Pain with wrist ulnar deviation and extension	Tenderness over the radial wrist Positive Finklestein test	Abductor pollicis longus (APL) Extensor pollicis brevis (EPB) tendons
Skier's Thumb	All ages	Pain and swelling involving the proximal thumb	Pain over the metacarpophalangeal joint of the thumb	Ulnar Collateral Ligament
Mallet Finger	All ages	Pain involving distal interphalangeal joint	Loss of distal interphalangeal joint extension	Extensor tendon where it attaches to the proximal portion of the distal phalanx.
Carpal Tunnel Syndrome	All ages	Numbness in the 1st-3rd digits of the hand	Positive Tinel's at the wrist	Median Nerve