

**Fifty References and Topic Summaries  
in Upper Extremity Orthopaedics  
Suggested for Family Practice Residents  
September 2013**

## **SHOULDER Topics**

### **Shoulder Imaging**

Reference 1. Overutilization of shoulder magnetic resonance imaging as a diagnostic screening tool in patients with chronic shoulder pain. Bradley MP, Tung G, Green A. J Shoulder Elbow Surg, 2005; 14: 233-237.

In general, MRI is over-used as a diagnostic screening tool in patients with acute and chronic shoulder pain. In this study, the majority of pre-evaluation MRI scans had no impact on clinical outcome. Patients with shoulder pain should first be evaluated with a complete history, physical exam and plain radiographs (orthogonal views). MRI is appropriate for patients who demonstrate rotator cuff weakness on exam and as a preoperative planning tool as determined by the orthopaedic consultant. See imaging monograph at [www.drhearon.com](http://www.drhearon.com) for a comprehensive review of upper extremity radiographic and advanced imaging.

### **Subacromial Impingement and Rotator Cuff Tears**

Reference 2. Subacromial Impingement Syndrome. Harrison AK, Flatow EL. J Am Acad Orthop Surg, 2011; 19: 701-708.

Subacromial impingement syndrome represents a spectrum of pathology ranging from subacromial bursitis to rotator cuff tendinosis to partial- or full-thickness rotator cuff tears. Symptoms may occur spontaneously, after repetitive activity or after shoulder trauma. Both extrinsic compression by subacromial spur and intrinsic degeneration play a role in pathogenesis. Optimal management most often includes subacromial injection and, for some patients, requires arthroscopic subacromial decompression.

Reference 3. The Natural History of Asymptomatic Rotator Cuff Tears: A Three-Year Follow-up of Fifty Cases. Moosmayer S, Tariq R, Stiris M, Smith H-J. J Bone Joint Surg Am, 2013; 95: 1249-55.

Patients with symptomatic partial- or full-thickness rotator cuff tears and who are surgical candidates, should be referred for consideration of arthroscopic rotator cuff repair. Those patients with asymptomatic full-thickness tears, as studied in this article, should anticipate they may become symptomatic, tendon tear size may progress and muscle belly may atrophy without operative treatment. Most orthopaedists are proactive in their approach to rotator cuff tears. Patients with long-standing neglected tears are at risk for rotator cuff arthropathy.

## **Long Head of Biceps and Superior Labral Tears**

Reference 4. Long Head of the Biceps Tendinopathy: Diagnosis and Management. Nho SJ, Strauss EJ, Lenart BA, Provencher MT, Mazzocca AD, Verma NN, Romeo AA. J Am Acad Orthop Surg, 2010; 18: 645-656.

Tendinitis of the long head of the biceps (LHB) rarely occurs in isolation in a symptomatic shoulder. Initial treatment is rest, activity modification and oral anti-inflammatory medicines. Subacromial or bicipital tendon sheath injections may be helpful for those with persistent symptoms. Recalcitrant cases should be referred for arthroscopic debridement, possible LHB tenotomy or LHB tenotomy and tenodesis. Spontaneous rupture of the LHB, evidenced by distal retraction of the biceps muscle, should raise suspicion of associated occult rotator cuff tear.

Reference 5. Superior Labral Tears of the Shoulder: Pathogenesis, Evaluation, and Treatment. Keener JD, Brophy RH. J Am Acad Orthop Surg, 2009; 17: 627-637.

Tears of the biceps-labral attachment occur in overhead athletes including throwers, with repetitive weight-lifting and due to traction injuries of the shoulder. The diagnosis is clinical and may be confirmed with high-quality MRI or MR-arthrogram evaluation. When seen in throwing athletes with scapular dyskinesis, nonoperative treatment should consist of throwing cessation and therapy to correct the abnormal scapular mechanics. Arthroscopic debridement or repair of the superior labral tear is often required, particularly in competitive athletes with these injuries.

## **Glenohumeral Joint Dislocations**

Reference 6. Management of Mid-Season Traumatic Anterior Shoulder Instability in Athletes. Owens BD, Dickens JF, Kilcoyne KG, Rue JH. J Am Acad Orthop Surg, 2012; 20: 518-526.

Athletes and young adults who experience anterior glenohumeral joint dislocation for the first time may be treated nonoperatively with closed reduction of the dislocation and application of shoulder immobilizer. Return to competitive sport in the same season is always problematic and may lead to recurrent dislocation even with protective shoulder bracing. Second-time shoulder dislocators should be encouraged to have arthroscopic capsulolabral repair to avoid further articular damage associated with additional dislocations or recurrent subluxations.

Reference 7. Shoulder Dislocation in the Older Patient. Murthi AM, Ramirez MA. J Am Acad Orthop Surg, 2012; 20: 615-622.

Older patients (> 60 years of age) who sustain a primary anterior glenohumeral joint dislocation are much less likely than younger patients to have recurrent dislocation. However, older patients are more likely than younger patients to have rotator cuff tears or brachial plexus injuries as a result of their dislocation. Rotator cuff tears are significantly more common than nerve palsies. Older patients with persistent shoulder pain and dysfunction after dislocation should be carefully evaluated for rotator cuff pathology.

## **Glenohumeral Joint Stiffness**

Reference 8. Adhesive Capsulitis of the Shoulder. Neviasser AS, Neviasser RJ. J Am Acad Orthop Surg, 2011; 19: 536-542.

Adhesive capsulitis is characterized by painful, gradual loss of active and passive shoulder motion usually from chronic inflammation resulting in fibrosis and contracture of the joint capsule. Patients with diabetes mellitus are at increased risk for adhesive capsulitis and have a worse prognosis than non-diabetics. Anti-inflammatory medicine and physical therapy for capsular stretching are the cornerstones of non-operative treatment. Glenohumeral joint manipulation under anesthesia and arthroscopic global capsulotomy should be considered in patients who fail conservative treatment.

Reference 9. Shoulder Arthroplasty: Prosthetic Options and Indications. Wiater JM, Fabing MH. J Am Acad Orthop Surg, 2009; 17: 415-425.

Glenohumeral joint (GHJ) arthrosis has disparate pathogenesis including osteoarthritis, post-traumatic arthrosis, rheumatoid disease, rotator cuff arthropathy and osteonecrosis. The treatment options for shoulder arthroplasty are diagnosis-specific and include new implant choices. Resurfacing arthroplasty provides a more bone-sparing and minimally-invasive approach to shoulder replacement. Reverse shoulder arthroplasty may be appropriate for some patients with rotator cuff arthropathy or with severely comminuted proximal humerus fractures.

## **Shoulder Fractures**

Reference 10. Innovations in the Management of Displaced Proximal Humerus Fractures. Nho SJ, Brophy RH, Barker JU, Cornell CN, MacGillivray JD. J Am Acad Orthop Surg, 2007; 15: 12-26.

Proximal humerus fractures are becoming more common as patients are living longer. Nondisplaced or minimally displaced fractures may be treated nonoperatively in a shoulder immobilizer. Displaced fractures should be evaluated promptly by an orthopaedic consultant for consideration of operative treatment which varies from closed reduction and percutaneous pinning to hemiarthroplasty or, more recently, reverse shoulder replacement.

Reference 11. Acute Midshaft Clavicular Fracture. Jeray KJ. J Am Acad Orthop Surg, 2007; 15: 239-248.

Most midshaft clavicle fractures, particularly in adolescents and young adults, heal uneventfully and may be treated nonoperatively in a sling or figure-of-eight brace. Those high-energy midshaft clavicle fractures associated with comminution, significant shortening or 100% displacement warrant consideration for operative treatment.

## **Acromioclavicular and Sternoclavicular Joint Dislocations**

Reference 12. Acromioclavicular Joint Injuries: Diagnosis and Management. Simovitch R, Sanders B, Ozbaydar M, Lavery K, Warner JP. J Am Acad Orthop Surg, 2009; 17: 207-219.

Acromioclavicular joint (ACJ) dislocations occur as the result of a fall onto the point of the shoulder with sudden downward stress on the acromion. The severity of the dislocation depends on the extent of involvement of the ACJ ligaments and the coracoclavicular ligaments. The resulting downward displacement of the affected arm with respect to the clavicle is measured on an AP projection of the ACJ compared to similar radiograph of the uninjured side. ACJ dislocations with mild soft tissue involvement may be treated in sling for comfort followed by early motion therapy program. More severe injuries require early orthopaedic assessment and operative treatment.

Reference 13. Management of Traumatic Sternoclavicular Joint Injuries. Groh GI, Wirth MA. J Am Acad Orthop Surg, 2011; 19: 1-7.

Sternoclavicular joint (SCJ) dislocations are usually due to a fall on the lateral aspect of the shoulder with levering of the medial clavicle. The more common anterior SCJ dislocations may be managed expectantly. The rare posterior dislocations are associated with potentially life-threatening complications and should be treated emergently. Plain radiographs have been supplanted by CT scan in the evaluation of these injuries. Mid-aged and elderly women who present with prominent and tender SCJs have anterior subluxations and underlying osteoarthritis.

## **ELBOW Topics**

### **Elbow Imaging**

Reference 14. MRI of the Elbow: Techniques and Spectrum of Disease. Dewan AK, Chhabra, AB, Khanna AJ, Anderson MW, Brunton LM. J Bone Joint Surg Am, 2013; 95: 1-13.

This article updates physicians on the available MRI techniques and facilitates recognition of the MRI appearance of the most common pathologic elbow conditions. The classic MRI appearances of occult fractures, loose bodies, ulnar collateral ligament injuries, lateral collateral ligament complex injuries, biceps tendon injuries, triceps tendon injuries, lateral epicondylitis, medial epicondylitis, septic arthritis, osteomyelitis, osteochondritis dissecans, compression neuropathies, synovial disorders, and various soft-tissue masses are reviewed. Due consideration should be given to the indications for MRI evaluation of the elbow and the study must be correlated with clinical findings.

## **Elbow Tendinosis**

Reference 15. Lateral Epicondylitis: Review and Current Concepts. Faro F, Wolf JM. J Hand Surg, 2007; 32A: 1271–1279.

By far, the most common cause of lateral elbow pain is tendinosis at the common extensor origin which has been inaccurately named “lateral epicondylitis.” The pathologic lesion at the lateral epicondyle is tendinosis of the extensor carpi radialis brevis origin rather than inflammation. The clinical course of symptomatic patients may be prolonged due to relative hypovascularity at the common extensor origin. There is little consensus among orthopaedists regarding the most effective treatment modalities. Augmented soft tissue mobilization (ASTM) under the direction of a knowledgeable hand therapist may be helpful. “Aggressive” injection of local anesthetic intended to produce bleeding at the common extensor origin or injections of autologous blood at the lateral epicondyle may promote healing. Operative treatment is reserved for the few patients with persistent symptoms for more than one year.

Reference 16. Surgical Treatment of Distal Biceps Rupture. Sutton KM, Dodds SD, Ahmad CS, Sethi PM. J Am Acad Orthop Surg, 2010; 18: 139-148.

Distal biceps ruptures typically occur in the dominant elbow of middle-aged men during eccentric contraction of the biceps. Sudden, forced extension of a flexed elbow during lifting activity is the classic injury mechanism. Partial tendon tears from repetitive loading are increasingly common and may be the source of anterior elbow pain. Decreased tendon vascularity and tendon impingement at the radial tuberosity during pronosupination predispose patients to tendon rupture. Although nonsurgical management is an option, active patients with partial or complete distal biceps tears benefit from surgical repair. Orthopaedic referral of patients with complete distal biceps ruptures should be expedited.

## **Elbow Bursitis**

Reference 17. Chronic Olecranon Bursitis. Herrera FA, Meals RA. J Hand Surg, 2011; 36A: 708-709.

Olecranon bursitis may occur following elbow trauma, as a result of crystalline deposition (gout), systemic disease (rheumatoid arthritis, systemic lupus erythematosus) or may be idiopathic. Most chronic olecranon bursitis is managed supportively with compression, activity modification, protective padding and anti-inflammatory medication. Most surgeons are reluctant to perform percutaneous drainage as first-line treatment, for fear of causing a chronic draining sinus or septic bursitis. If patients return for a second visit, needle aspiration of the bursa followed by a compressive dressing for 2 weeks is offered. Intrabursal steroid injection is not recommended due to concerns regarding infection and skin problems. Elective surgical excision of a chronically inflamed bursa is offered to well-informed patients with swelling for more than 3 months.

## **Elbow Arthritis**

Reference 18. Primary Osteoarthritis of the Elbow: Current Treatment Options. Cheung EV, Adams R, Morrey BF. J Am Acad Orthop Surg, 2008; 16: 77-87.

Primary osteoarthritis of the elbow is characterized by painful stiffness, mechanical symptoms from intra-articular loose bodies and the presence of hypertrophic osteophytes. The disease typically affects middle-aged men who engage in strenuous manual activity. Arthroscopic or open capsular release and removal of impinging osteophytes are the primary surgical treatment options. The relative sparing of joint cartilage makes elbow osteoarthritis amenable to this treatment. Total elbow replacement is rarely indicated for primary elbow osteoarthritis and should be reserved for elderly patients with low demands for whom other treatment options have failed.

Reference 19. Surgical Management of the Rheumatoid Elbow. Kauffman JI, Chen AL, Stuchin S, DiCesare PE. J Am Acad Orthop Surg, 2003; 11: 100-108.

Initial management of the rheumatoid elbow consists of nonsurgical measures to address synovitis and capsular inflammation in an effort to decrease pain and maintain elbow range of motion. Disease progression may result in articular damage and ligamentous compromise, causing increased pain, elbow instability and functional impairment. For patients unresponsive to nonsurgical management, arthroscopic or open synovectomy is indicated. For selected patients with more advanced disease, total elbow arthroplasty is a reasonable alternative.

## **Elbow Fractures**

Reference 20. Fractures of the Radial Head and Neck: Current Concepts in Management. Tejwani NC, Mehta H. J Am Acad Orthop Surg, 2007; 15: 380-387.

Most radial head fractures are nondisplaced or minimally displaced and can be managed nonsurgically with emphasis on early active motion to achieve good results. Treatment of more complex radial head fractures, however, especially those associated with elbow instability, may require open reduction and internal fixation or radial head implant arthroplasty.

Reference 21. Adult Elbow Fractures. Hearon, BF. Grand Rounds presentation on 12/10/2010.

Fractures of the proximal ulna and/or distal humerus as well as fracture-dislocations of the elbow are complex orthopaedic injuries often requiring operative treatment. Patients with these injuries should be promptly referred for definitive evaluation and treatment. For more information see the outline of this Grand Rounds presentation.

## **Nerve Entrapment at the Elbow**

Reference 22. Entrapment Neuropathy of the Ulnar Nerve. Elhassan, B, Steinmann SP. J Am Acad Orthop Surg, 2007; 15: 672-681.

Ulnar nerve entrapment is the second most common nerve entrapment syndrome of the upper extremity and most commonly occurs at the elbow. Symptoms may include ulnar paresthesia with numbness of the ring and small fingers and weakness of the intrinsic muscles of the hand. Presentation and treatment vary according to the site of entrapment. Nonoperative treatment is generally not effective. Ulnar nerve entrapment at the elbow often requires ulnar nerve decompression with or without anterior transposition of the nerve. The rare ulnar nerve entrapment at the wrist is most often due to nerve compression from a ganglion cyst. Symptoms resolve after cyst excision.

## **WRIST Topics**

### **Wrist Imaging**

Reference 23. Magnetic Resonance Imaging in Evaluating Workers' Compensation Patients. Babbel D, Rayan G. J Hand Surg, 2012; 37A: 811–815.

The usefulness of upper extremity MRI evaluations obtained by referring physicians was studied in a workers' compensation population. The medical records of 62 patients with a total of 67 MRI scans were reviewed. The MRI studies did not contribute to clinically diagnosing the patients' conditions in any of the cases reviewed. The hand surgeon's clinical diagnosis disagreed with the radiologist's MRI diagnosis in 63% of patients. The MRI was unnecessary for diagnosis and did not influence the treatment for any of the 62 patients studied.

Reference 24. Prevalence of Triangular Fibrocartilage Complex Abnormalities on MRI Scans of Asymptomatic Wrists. Iordache SD, Rowan R, Garvin GJ, Osman S, Grewal R, Faber KJ. J Hand Surg, 2012; 37A: 98–103.

The prevalence of incidental TFCC findings on MRI scans of asymptomatic subjects is high. In this study, the TFCC was found to be abnormal in 39 of 103 asymptomatic wrists (38%). Therefore, the presence of an abnormal TFCC on MRI may be of no clinical significance, particularly in patients over the age of 50. Imaging results must be correlated with the clinical history and physical exam findings.

### **Triangular Fibrocartilage Complex Tears**

Reference 25. Management of Acute Triangular Fibrocartilage Complex Injury of the Wrist. Henry MH. J Am Acad Orthop Surg, 2008; 16: 320-329.

The triangular fibrocartilage complex (TFCC) refers to the stabilizing soft tissue structures on the ulnar side of the wrist. Acute injuries of the TFCC may be due to axial loading, ulnar deviation or twisting of the wrist and forearm. Tears of the articular disk or

central portion of the TFCC usually result in mechanical symptoms and may be addressed with arthroscopic debridement. Peripheral tears involving the volar and/or dorsal radioulnar ligaments which provide distal radioulnar joint stability usually require arthroscopic or open repair or open reconstruction.

## **Wrist Tendinitis**

Reference 26. de Quervain Tenosynovitis of the Wrist. Ilyas AM, Ast M, Schaffer AA, Thoder J. J Am Acad Orthop Surg, 2007; 15: 757-764.

de Quervain stenosing tenosynovitis of the first dorsal compartment of the wrist is a common wrist problem which occurs more frequently in women than in men. Pain results from resisted gliding of the abductor pollicis longus and the extensor pollicis brevis tendons in the fibro-osseous canal. Diagnosis is made clinically with tenderness along the first dorsal compartment and positive Finkelstein's test. Nonsurgical management, consisting of corticosteroid injections, is usually successful. In resistant cases, surgical release of the first dorsal compartment is curative.

## **Wrist Ganglia**

Reference 27. Wrist Ganglions. Gant J, Ruff M, Janz BA. J Hand Surg, 2011; 36A: 510-512.

Dorsal carpal ganglia may appear anywhere on the dorsum of the wrist, yet virtually always originate from the scapholunate ligament area. If sufficiently large and symptomatic, these dorsal cysts may be aspirated or excised by open or arthroscopic technique. Volar carpal ganglia appear at the volar wrist flexion crease near the FCR, but may originate from the radiocarpal, scaphotrapezial or metacarpotrapezial joints. Due to proximity of the radial artery, these volar cysts should not be aspirated, but rather should be surgically excised if symptomatic.

## **Radius Fractures**

Reference 28. Galeazzi Fracture. Atesok KI, Jupiter JB, Weiss A-PC. J Am Acad Orthop Surg, 2011; 19: 623-633.

Galeazzi fracture is a fracture of the radial shaft with disruption of the radioulnar ligaments which stabilize the distal radioulnar joint (DRUJ). It is crucially important to distinguish a Galeazzi fracture from a distal radius fracture. Virtually all adults with radial shaft fractures require open reduction and internal fixation of the fracture and intra-operative assessment of DRUJ stability. Misdiagnosis leading to non-operative treatment of Galeazzi fractures may result in radial malunion, DRUJ incongruity and instability, limited forearm rotation and/or chronic wrist pain.

Reference 29. Distal Radius Fractures: Current Concepts. Schnependahl J, Windolf J, Kaufmann RA. J Hand Surg, 2012; 37A: 1718–1725.

Closed reduction and immobilization in plaster remains an accepted method of treatment for most stable distal radius fractures. A stable fracture is one which is acceptably aligned after reduction effort and where the likelihood of displacement is small. Risk factors for loss of reduction have been identified as age over 60, greater than 20° dorsal angulation, 5 mm radial shortening, dorsal comminution, associated ulna fracture and intra-articular radiocarpal involvement. Many distal radius fractures require operative fixation for best anatomic result. Locking plate technology, usually from the volar approach, has significantly improved clinical outcomes. Practitioners managing these fractures should be aware of complications including acute carpal tunnel syndrome, distal radioulnar joint incongruity or instability, complex regional pain syndrome and late tendon rupture.

### **Carpal Fractures and Fracture-Dislocations**

Reference 30. Outcomes of Hook of Hamate Fracture Excision in High-Level Amateur Athletes. Devers BN, Douglas KC, Naik RD, Lee DH, Watson JT, Weikert DR. J Hand Surg, 2013; 38A: 72–76.

Hook of hamate fractures are seen in baseball players, golfers and athletes participating in racquet sports due to high impact loading of the volar ulnar aspect of the wrist at the base of the hypothenar eminence. Fracture treatment options include immobilization, open reduction and internal fixation with screw or surgical excision of the hook of hamate. Eleven athletes with 12 hook of hamate fractures were retrospectively studied after being treated with hook of hamate excision. All returned to full participation in sports an average of 6 weeks after surgery. Surgical excision of hook of hamate fractures in high-level amateur athletes allows for successful return to sports participation at pre-injury performance levels, achievement of normal function, significant reduction in pain and high overall patient satisfaction.

Reference 31. Evidence-Based Management of Acute Nondisplaced Scaphoid Waist Fractures. Ram AN, Chung KC. J Hand Surg, 2009; 34A: 735-738.

Scaphoid waist fractures occur commonly in adolescent and young males who fall onto an outstretched upper extremity and impact with the wrist dorsiflexed. Due to retrograde blood flow from distal pole to proximal pole, the scaphoid waist fracture will require about 12 weeks of plaster immobilization to heal, but nonunion will occur in 5 to 10% of cases. Some surgeons have offered patients immediate screw fixation of these scaphoid fractures to shorten return to work period and to minimize the risk of nonunion. Techniques for reliable percutaneous screw fixation of non-displaced scaphoid fractures have been developed and may be used in many cases.

Reference 32. Perilunate Dislocation and Perilunate Fracture-Dislocation. Stanbury SJ, Elfar JC. J Am Acad Orthop Surg, 2011; 19: 554-562.

Perilunate dislocations and perilunate fracture-dislocations usually result from high-energy traumatic injuries to the wrist and are associated with a characteristic

spectrum of bony and ligamentous damage. Radiographic evaluation of the wrist reveals loss of normal radiocarpal and intercarpal colinearity and bony insult, which may be overlooked at the initial presentation. Prompt recognition is important to optimize outcomes. Closed reduction is performed acutely, followed by open reduction and ligamentous and bony repair with internal fixation. Complications include posttraumatic arthrosis, median nerve dysfunction, complex regional pain syndrome, tendon problems and carpal instability. Despite appropriate treatment, loss of wrist motion and grip strength, as well as persistent pain, is common. Outcome studies demonstrate radiographic evidence of midcarpal and radiocarpal arthrosis, although this finding does not necessarily correlate with compromised function.

### **Carpal Instability**

Reference 33. Scapholunate Instability: Current Concepts in Diagnosis and Management. Kitay A, Wolfe SW. J Hand Surg, 2012; 37A: 2175–2196.

Injuries to the scapholunate ligament may be complete or partial tears and are the most frequent cause of carpal instability. When these injuries occur in young patients (< 35 years of age), they should be treated aggressively with arthroscopic assessment, arthroscopic debridement and open scapholunate ligament repair or reconstruction. The rationale for such treatment is to restore ligament continuity and normalize carpal kinematics, thereby preventing chronic scapholunate instability and progression to SLAC (Scapho-Lunate Advanced Collapse) wrist. SLAC wrist is characterized by proximal migration of the capitate between scaphoid and lunate, progressive radioscapoid and capitulunate arthrosis. If symptomatic, these patients may require limited or complete wrist arthrodesis as a salvage procedure. Since SLAC wrist may take 20 to 30 years to develop, treatment of acute scapholunate injuries in patients older than 50 years of age may be more conservative. These older patient may only require symptomatic, nonoperative care, since there is no single surgical procedure yields consistently good results for this injury.

### **Basal Thumb Arthrosis**

Reference 34. Thumb Carpal Metacarpal Arthritis. Van Heest AE, Kallemeier P. J Am Acad Orthop Surg, 2008; 16: 140-151.

Many patients, even with advanced trapeziometacarpal arthrosis, may be managed with nonoperative measures including anti-inflammatory medication, chondroitin sulfate and glucosamine nutritional supplementation, orthosis to stabilize the base of thumb metacarpal with respect to the trapezium and trapeziometacarpal joint injection. For those who have failed such conservative measures, operative treatment consists of trapeziectomy or hemitrapeziectomy alone or in combination with tendon autograft used to restore axial stability of the thumb and as an interposition-spacer at the base of the thumb metacarpal. Arthrodesis of the painful trapeziometarcarpal joint is also a viable surgical treatment option.

## **HAND Topics**

### **Extensor Tendon Injuries**

Reference 35. Mallet Finger. Bendre AA, Hartigan BJ, Kalainov DM. J Am Acad Orthop Surg, 2005; 13: 336-344.

Mallet finger occurs with loss of continuity of the terminal extensor tendon over the distal interphalangeal joint (DIPJ) resulting in a flexion deformity at the joint. Tendinous mallet refers to purely tendinous disruption, whereas bony mallet indicates avulsion of the terminal extensor tendon with a fragment of the dorsal base of the distal phalanx. Both tendinous and bony mallet injuries should be treated with continuous DIPJ extension splint for at least 6 weeks. Operative treatment should be offered for open injuries, when the DIPJ is rendered unstable or when the bony fragment is displaced and involves a significant portion of the articular surface.

Reference 36. Boutonniere Deformity. To P, Watson JT. J Hand Surg, 2011; 36A: 139-142.

Boutonniere deformity is a flexion contracture of the proximal interphalangeal joint (PIPJ) often due to an unrecognized or untreated central slip disruption from the base of the middle phalanx. The typical patient is a young athlete who has “jammed” his PIPJ trying to catch a football or basketball. Acute central slip disruption should be treated with continuous PIPJ extension splinting, allowing the DIPJ to be free for active flexion. Neglected injury results in volar subluxation of the lateral bands, imbalance of the extensor mechanism and inability to fully straighten the PIPJ. Established boutonniere deformity may be treated with PIPJ dynamic extension splinting to improve digital extension. Recalcitrant deformity should be referred for operative consideration.

Reference 37. Extensor Tendon Injuries. Matzon JL, Bozentka DJ. J Hand Surg, 2010; 35A: 854–861.

Every clinician evaluating upper extremity injuries should understand the intricate anatomy of the extensor mechanism and the zones of extensor injuries (see Figures 1 and 2 of this article). All extensor tendon lacerations should be seen promptly and surgically repaired if indicated. Some extensor mechanism disruptions such as mallet and boutonniere deformities are best treated non-operatively (see previous articles). Extensor zone V injuries include radial sagittal band ruptures which are often treated acutely with operative repair. Chronic or neglected radial sagittal band rupture may lead to ulnar subluxation of the extensor tendon and loss of digital extension. Such cases require extensor tendon realignment and stabilization over the metacarpal head.

## **Flexor Tendon Injuries and Tendon Sheath Conditions**

Reference 38. Avulsion Injuries of the Flexor Digitorum Profundus Tendon.

Ruchelsman DE, Christoforou D, Wasserman B, Lee SK, Rettig ME. J Am Acad Orthop Surg, 2011; 19: 152-162.

Virtually all flexor tendon lacerations or ruptures require operative treatment. Flexor digitorum profundus (FDP) avulsion from the base of the distal phalanx is a common type of flexor tendon injury which may be overlooked in the clinical setting. The mechanism of injury is forced hyperextension of the distal interphalangeal joint (DIPJ) while the finger is actively flexing. “Jersey finger” is the common term for the affected finger and is derived from the classic injury scenario: as an athlete forcefully grabs the jersey of a running opponent with the terminal aspect of the digit, the DIPJ is suddenly extended and the FDP tendon is avulsed from its insertion on the distal phalanx. The ring finger is most commonly affected. As the FDP may retract proximally through the tendon sheath, urgent surgical evaluation, tendon advancement and repair are required.

Reference 39. Trigger Digits: Principles, Management, and Complications. Ryzewicz M, Wolf JM. J Hand Surg, 2006; 31A: 135–146.

Stenosing tenosynovitis or trigger finger is generally caused by a size mismatch between the digital flexor tendon(s) and the stenotic flexor tendon sheath at the first annular (A-1) pulley. For patients with intermittent triggering, the most effective conservative management is corticosteroid injection into the flexor tendon sheath. In diabetic patients, trigger finger often is less responsive to injection which may, in fact, be relatively contraindicated in brittle diabetics. For those with repetitive digital locking in the flexed position or those who fail to respond to injection, operative treatment in the form of A-1 pulley release is indicated. Surgical complications following this simple procedure are rare. Patients with rheumatoid arthritis and triggering require flexor tenosynovectomy rather than A-1 pulley release.

Reference 40. Volar Retinacular Ganglions. Foret AL, Chhabra AB. J Hand Surg, 2012; 37A: 566-567.

Volar retinacular ganglion is a pea-sized cyst which occurs on the flexor tendon sheath usually at the A-1 or A-2 pulley. The cyst suggests underlying flexor tenosynovitis, may be due to repetitive manual work and is usually aggravated by grasping activity. Retinacular cysts often rupture spontaneously or with direct pressure applied to the cyst. Persistent symptomatic cysts may be aspirated or surgically excised.

## **Hand Infections**

Reference 41. Acute Fight Bite. Shoji K, Cavanaugh Z, Rodner CM. J Hand Surg, 2013; 38-A: 1612-1614.

Penetrating wounds over the dorsal aspect of the MCPJs should be considered a fight bite until proven otherwise. Patients will often not acknowledge that they have been involved in an altercation when they present for treatment. Prophylactic antibiotics are typically given for fight bite injuries. The human mouth contains as many as 50 species of bacteria, with the most common species being *Staphylococcus aureus*, followed by *Streptococcus* species, *Corynebacterium* species and *Eikenella corrodens*. Based on this microbiology, patients are typically started on broad-spectrum antibiotics and combination therapies, such as cephalosporins or a combination of gentamicin and a penicillinase-resistant penicillin. Many hand surgeons will debride and irrigate these wounds in the operating room to prevent serious hand infection.

Reference 42. Flexor Tendon Sheath Infections of the Hand. Draeger RW, Bynum DKJr. J Am Acad Orthop Surg, 2012; 20: 373-382.

Suppurative flexor tenosynovitis is most often caused by penetrating injury to the flexor tendon sheath. Kanavel described four cardinal signs which characterize such an infection: (1) symmetric swelling of the entire digit, (2) exquisite tenderness along the course of the flexor tendon sheath, (3) digit with a semiflexed posture and (4) pain on passive extension of the digit. Nonsurgical treatment may be appropriate for patients with flexor tendon sheath infections who present early, typically within several hours following penetrating trauma to the hand. Since most of these patients will require incision, irrigation and drainage of the affected flexor tendon sheath, immediate consultation with a hand surgeon is mandatory. Even those treated expeditiously may experience chronic digital stiffness as a complication of the infection.

## **Hand Fractures**

Reference 43. Fractures of the Proximal Phalanx and Metacarpals in the Hand: Preferred Methods of Stabilization. Henry MH. J Am Acad Orthop Surg, 2008; 16: 586-595.

Stable fractures of the phalanges and metacarpals may be treated non-operatively with 3 to 4 weeks of immobilization followed by early range of motion. The clinician's challenge is to determine which among the many fracture types is stable and which is not stable. Non-displaced fractures are not necessarily stable fractures. The classic example of this truism is the non-displaced unicondylar proximal phalanx fracture which is likely to displace if treated non-operatively (see Figure 1 in this article). A good rule of thumb is to promptly refer all intra-articular hand fractures and all potentially unstable hand fractures for surgical consultation.

## Dupuytren's Disease

Reference 44. Dupuytren Disease: An Evolving Understanding of an Age-old Disease. Black EM, Blazar PE. J Am Acad Orthop Surg, 2011; 19: 746-757.

Dupuytren's disease is a progressive thickening of palmar and/or digital fascia often resulting in digital flexion contracture and compromised hand function. The disease is of genetic origin, occurring in those of Scandinavian or Northern European descent and sparing those of Middle Eastern, Asian or African descent. The major contractile element in Dupuytren's disease is the myofibroblast, a cell which shares characteristics of both fibroblasts and smooth muscle cells. Patients with MCPJ or PIPJ flexor contractures of 30 degrees or more should be referred for evaluation by a hand surgeon. Surgical treatment of these contractures includes partial palmar and/or digital fasciectomy. These open procedures may be complicated by the complex anatomic relationships between cords (pathologic contracted fascia) and adjacent neurovascular structures. Recent advances in the management of Dupuytren's disease involve less invasive treatments, such as percutaneous needle fasciotomy and injectable collagenase *Clostridium histolyticum*. Postoperative management focuses on minimizing the cellular response of cord disruption and maximizing range of motion through static or dynamic extension splinting.

## Hand Tumors

Reference 45. Benign Bony and Soft Tissue Tumors of the Hand. Payne WT, Merrell G. J Hand Surg, 2010; 35A: 1901–1910.

The overwhelming majority of tumors of the hand are benign. Clinicians should be familiar with the common types of soft tissue and bony lesions described in this article. Many benign tumors have characteristics that enable the clinician to arrive at a diagnosis without biopsy. Certain lesions with a characteristic appearance and benign features may be managed nonsurgically with observation alone. However, signs of malignancy, such as rapid growth, increasing pain, or other atypical features, mandate a thorough work-up and surgical management. Generally, if a malignant diagnosis is suspected, *both the biopsy and the definitive surgical excision* should be performed by a tumor surgeon experienced in the management of these lesions.

## **MISCELLANEOUS Topics**

### **Compartment Syndrome**

Reference 46. Acute Compartment Syndrome of the Upper Extremity. Prasarn ML, Ouellette EA. J Am Acad Orthop Surg, 2011; 19: 49-58.

Acute compartment syndrome occurs when pressure within a fibroosseous space increases to a level that results in a decreased perfusion gradient across tissue capillary beds. Compartment syndromes of the hand, forearm and upper arm can result in tissue necrosis and devastating loss of function. The etiology of acute compartment syndrome in the upper extremity is diverse. Timely and accurate diagnosis requires the clinician maintain a high index of suspicion for the diagnosis. Pain out of proportion to injury is the most reliable early symptom of impending compartment syndrome. Diagnosis is particularly difficult in obtunded patients and in young children. Early recognition and expeditious surgical treatment are essential to obtain a good clinical outcome and prevent permanent disability.

### **Gouty Arthritis**

Reference 47. Gout Affecting the Hand and Wrist. Fitzgerald BT, Setty A, Mudgal CS. J Am Acad Orthop Surg, 2007; 15: 625-635.

Gout is the clinical syndrome caused by an inflammatory response to monosodium urate monohydrate crystals. Hyperuricemia, the metabolic disorder underlying gout, is defined as a serum urate > 2 standard deviations above the mean. Gout is a common cause of acute monoarticular arthritis. Tophaceous gout in the hand and wrist often presents de novo as the first sign of the disease process in the elderly. Tophaceous material may present in a liquid, pasty, or chalky/granular state. Treatment may be as simple as aspirating the liquid or squeezing out pasty tophaceous material. Other nonsurgical treatment options include lifestyle and dietary modifications and drug therapy. Surgery is often indicated for the patient with significant tendon and joint compromise as well as skin breakdown and for decompression of compressive peripheral neuropathy.

### **Hemophilic Arthropathy**

Reference 48. Musculoskeletal Care of the Hemophiliac Patient. Vanderhave KL, Caird MS, Hake M, Hensinger RN, Urquhart AG, Silva S, Farley FA. J Am Acad Orthop Surg, 2012; 20: 553-563.

Hemophilia is caused by a deficiency of clotting factor VIII or IX and is inherited by a sex-linked recessive pattern. von Willebrand disease, a common moderate bleeding disorder, is caused by a quantitative or qualitative protein deficiency of von Willebrand factor and is inherited in an autosomal dominant or recessive manner. The most important clinical strategy for the management of patients with hemophilia is the avoidance of recurrent, destructive hemarthrosis by intravenous hematologic prophylaxis. Early hemarthrosis should be aggressively managed with aspiration and clotting factor concentrate until the joint examination is normal. Starting prophylactic

factor replacement in infancy may prevent chronic synovitis and arthropathy. The natural history of poorly controlled disease is polyarticular hemophilic arthropathy, which is associated with a poor functional prognosis. Patients with chronic synovitis may be treated effectively with synovectomy. Those who develop joint surface erosions may require realignment osteotomy or joint arthroplasty.

## **Immobilization**

Reference 49. Cast and Splint Immobilization: Complications. Halanski M, Noonan KJ. J Am Acad Orthop Surg 2008; 16: 30-40.

Most stable upper extremity fractures and partial ligament tears may be treated satisfactorily with splint (as opposed to cast) immobilization. Splint immobilization minimizes the possibility of complications resulting from cast immobilization described in this article. Cast complications range from minor skin irritation to more serious pressure sores, full-thickness skin loss, compartment syndrome, nerve palsy and complex regional pain syndrome. Clinicians who plan to treat patients with musculoskeletal problems with splint and/or cast immobilization should be well-versed in the proper application of plaster or fiberglass and the recommended position of immobilization for the injury treated. Patients and caregivers should be educated regarding potential risks of immobilization.

Reference 50. Driving with an Arm Immobilized in a Splint: A Randomized Higher-Order Crossover Trial. Chong PY, Koehler EAS, Shyr Y, Watson JT, Weikert DR, Rowland JH, Lee DH. J Bone Joint Surg, 2010; 92A: 2263-2269.

The aim of this study was to determine whether immobilization of an arm has detrimental effects on driving performance. Thirty-six healthy officers-in-training were assigned a sequence of fiberglass splints (left-sided and right-sided above-the-elbow thumb spica and below-the-elbow splints). Driving performance as measured with a standardized track and scoring system was significantly degraded with splint immobilization, particularly with an above-the-elbow thumb spica splint on the left arm. Patients should be cautioned to not drive while immobilized in an upper extremity splint (or shoulder immobilizer).

References selected and  
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