



AMERICAN COLLEGE OF
OCCUPATIONAL AND
ENVIRONMENTAL MEDICINE

ELBOW DISORDERS

Effective Date: 2013

CONTRIBUTORS TO THE ELBOW DISORDERS CHAPTER

Editor-in-Chief:

Kurt T. Hegmann, MD, MPH, FACOEM, FACP

Evidence-based Practice Elbow Panel Chair:

Harold E. Hoffman, MD, FACOEM, FRCPC

Evidence-based Practice Elbow Panel Members:

Roger M. Belcourt, MD, MPH, FACOEM

Kevin Byrne, MD, MPH, FACOEM

Lee Glass, MD, JD

J. Mark Melhorn, MD, FAAOS, FACOEM, FAADEP, FACS, FASSH, FAAHS

Jack Richman, MD, CCBOM, FACOEM, FAADEP, CIME

Phillip Zinni, III, DO, FAOASM

Methodology Committee Consultant:

Kurt T. Hegmann, MD, MPH, FACOEM, FACP

Managing Editors:

Production: Marianne Dreger, MA

Research: Julie A. Ording, MPH

Editorial Assistant: Debra M. Paddack

Research Conducted By:

Kurt T. Hegmann, MD, MPH, FACOEM, FACP

Matthew S. Thiese, PhD, MSPH

Ulrike Ott, MSPH

Kylee Tokita

Jessica Melendez

Deborah Gwenevere Passey, BS

Atim Cecelia Effiong, BS

Riann Bree Robbins, BS

William Gilbert Caughey, BS

Holly Uphold, BS

Copyright © 2008-2016 by Reed Group, Ltd. Reprinted from ACOEM's Occupational Practice Guidelines, with permission from Reed Group, Ltd., www.mdguidelines.com. All rights reserved. Commercial use prohibited. Licenses may be purchased from Reed Group, Ltd. at www.mdguidelines.com.

simple “yes/no” criteria, and the evidence supporting them is in nearly all circumstances developed from typical patients, not unusual situations or exceptions.

Recommendations are made under the following categories:

- Strongly Recommended, “A” Level
- Moderately Recommended, “B” Level
- Recommended, “C” Level
- Insufficient-Recommended (Consensus-based), “I” Level
- Insufficient-No Recommendation (Consensus-based), “I” Level
- Insufficient-Not Recommended (Consensus-based), “I” Level
- Not Recommended, “C” Level
- Moderately Not Recommended, “B” Level
- Strongly Not Recommended, “A” Level

Table 1. Summary of Recommendations for Diagnostic and Other Testing for Elbow Disorders

TEST	RECOMMENDATION(S)
Antibodies	Antibody levels to evaluate and diagnose patients with elbow pain that have reasonable suspicion of rheumatological disorder – Recommended, Insufficient Evidence (I) . Antibody levels as a screen to confirm specific disorders (e.g., rheumatoid arthritis) – Strongly Recommended, Evidence (A)
Elbow Arthroscopy	Arthroscopy to evaluate and diagnose patients with elbow pain that have suspicion of intraarticular body, and other subacute or chronic mechanical symptoms – Recommended, Insufficient Evidence (I) Arthroscopy for diagnosing acute elbow pain – Not Recommended, Insufficient Evidence (I) Arthroscopy for diagnosis or treatment in acute, subacute, or chronic patients with osteoarthritis in the absence of a remediable mechanical defect such as symptomatic loose body – Not Recommended, Insufficient Evidence (I) Arthroscopy with chondroplasty for treatment of osteoarthritis – Not Recommended, Insufficient Evidence (I)
Bone Scans	Bone scanning for select use in acute, subacute or chronic elbow pain to assist in the diagnosis of osteonecrosis, neoplasms and other conditions with increased polyosthotic bone metabolism, particularly where there is more than one joint to be evaluated – Recommended, Insufficient Evidence (I) Bone scanning for routine use in elbow joint evaluations – Not Recommended, Insufficient Evidence (I)
Computerized Tomography (CT)	Routine CT for evaluation of acute, subacute, or chronic elbow pain – Not Recommended, Insufficient Evidence (I) CT for evaluating patients with osteonecrosis or following traumatic dislocations or arthroplasty-associated recurrent dislocations – Recommended, Insufficient Evidence (I) CT for those with need for advanced imaging but have contraindications for MRI – Recommended, Insufficient Evidence (I) Helical CT for select patients with acute, subacute or chronic elbow pain in whom advanced imaging of bony structures is thought to be potentially helpful – Recommended, Insufficient Evidence (I)
C-Reactive Protein, Erythrocyte Sedimentation Rate, and Other Non-Specific Inflammatory Markers	Erythrocyte sedimentation rate and other inflammatory markers for screening for inflammatory disorders or prosthetic sepsis with reasonable suspicion of inflammatory disorder in patients with subacute or chronic elbow pain – Recommended, Insufficient Evidence (I) . Ordering of a large, diverse array of anti-inflammatory markers without targeting a few specific disorders diagnostically is not recommended.
Electromyography and Nerve Conduction Studies (Electrodiagnostic Studies (EDS))	EDS to assist in the diagnosis of subacute or chronic peripheral nerve entrapments, including ulnar neuropathies, radial neuropathies and median neuropathies – Recommended, Insufficient Evidence (I) Quality EDS to assist in securing a firm diagnosis for those patients without a clear diagnosis – Recommended, Insufficient Evidence (I)

<p>Epicondylitis/Tendinosis</p>	<p>or wrist, repetition and postural factors</p> <p>Some cases related to acute trauma</p>	<p>[Absence of tingling/numbness.]</p> <p>[Absence of neck pain or stiffness.]</p>	<p>centimeters distal to it over the extensor carpi radialis brevis and extensor digitorum tendons</p> <p>Pain in lateral elbow with resisted extension of wrist or middle finger</p> <p>Pain in the lateral elbow with forceful grasp</p> <p>Normal elbow range of motion</p> <p>Diffuse lateral elbow pain with repeated wrist dorsiflexion</p>	<p>epicondylar area pain with resisted extension of the wrist, middle finger, index finger, and/or supination</p>
<p>Medial Epicondylalgia/Epicondylitis/Tendinosis</p>	<p>Etiology is unknown</p> <p>Theorized to parallel that of lateral epicondylalgia</p>	<p>Pain in medial elbow</p> <p>[Absence of tingling/numbness in most cases unless accompanied by ulnar neuropathy]</p> <p>[Absence of neck pain or stiffness]</p>	<p>Tenderness over medial epicondyle or 2 to 3 centimeters distal to it</p> <p>Pain in medial elbow with resisted wrist or phalangeal flexion</p> <p>Normal elbow range of motion</p>	<p>Positive resistance test results: pain with resisted flexion of the wrist, fingers, and pronation</p>
<p>Ulnar Nerve Entrapment (including Cubital Tunnel Syndrome)</p>	<p>Two main categories involving cubital tunnel and condylar groove</p> <p>Etiologies are unclear; there are no quality epidemiological studies</p> <p>Theorized mechanisms include hyperflexion of the elbow or prolonged leaning on the elbows for condylar groove segment neuropathies</p>	<p>Paresthesias in the ring and 5th digits; generally spares dorsal surfaces</p> <p>Pain may or may not be present</p>	<p>Paresthesias in ring and small fingers on 60-second elbow flexion test</p> <p>Subluxation of the ulnar nerve in the condylar groove sometimes present</p> <p>Weakness/atrophy of ulnar hand intrinsics and interosseous muscles (unusual/late)</p> <p>Hoffman-Tinel's test over the condylar groove segment is thought to not be helpful as it is often abnormal in the absence of symptoms.</p>	<p>Nerve conduction study with above vs. below elbow conduction assessment</p> <p>"Inching technique" may be helpful to document a focal decrement in a specific ulnar nerve location although it has not been rigorously examined regarding if it affects outcomes. A problem is most typically in condylar groove or cubital tunnel segments of the nerve.</p> <p>Abnormalities on EMG are later findings typical of more advanced cases.</p>
<p>Radial Nerve Entrapment</p>	<p>Etiology is unknown; there are no quality</p>	<p>Studies of the clinical presentation of this</p>	<p>Physical exam findings are not well</p>	<p>High-quality studies do not exist. Some</p>

(including Radial Tunnel Syndrome)	epidemiological studies.	disorder are not well performed. Thought to involve aching pain in extensor/supinator area of forearm.	characterized for this disorder. Pain on stressing extended middle finger Maximum tenderness 4 finger breadths anterior and inferior to lateral epicondyle Utility of Hoffman-Tinel's test undetermined	believe nerve conduction velocity decrements are uniformly present and others believe abnormal nerve conduction findings are variably present.
Olecranon Bursitis (noninfectious)	Prolonged leaning on elbow/chronic pressure Acute trauma Chronic pressure	Swelling of bursa Pain in bursa generally absent or minor	Effusion/mass effect in bursa Tenderness over bursa generally not present or minor Tenderness more likely with complications of inflammatory arthropathy	Monosodium urate or uric acid crystals if gout Calcium pyrophosphate crystals if pseudogout
Olecranon Bursitis (infectious)	Trauma with non-intact dermis Introduced infections from injection(s) Systemic infection	Progressive painful swelling of bursa Systemic signs of infection	Erythema, warmth and/or surrounding cellulitis Marked tenderness over bursa	Purulent tap, positive gram-stain results, positive culture results Portal of entry for infection
Biceps Tendinosis	Forceful flexion, particularly near maximal or repeated high force Unaccustomed forceful use	Pain in anterior elbow joint or antecubital fossa	Tenderness on palpation of biceps myotendinous junction	Pain in the biceps insertion area with resisted elbow flexion
Pronator Syndrome	Etiology unclear	Pain in proximal forearm with paraesthesias in median nerve distribution of hand	May be tender over pronator muscle	Resisted pronation augments symptoms
Non-specific Elbow Pain	Unknown	None	None	None

For most patients presenting with non-traumatic elbow disorders, special studies are not needed during the first 4 weeks. Most patients improve quickly, provided red flag conditions are ruled out. Also, of note, a number of patients with elbow symptoms will have associated disease such as diabetes mellitus, hypothyroidism, renal disease, and one or more of the arthritides which are often heretofore undiagnosed. When medical history and/or physical examination findings indicate or other risk factors are present, testing for these or other comorbid condition(s) is recommended.

Table 6. Guidelines for Modification of Work Activities and Disability Duration*

		Recommended Target for Disability Duration**
--	--	---

Evidence for the Use of C-Reactive Protein, Erythrocyte Sedimentation Rate, and Other Non-specific Inflammatory Markers

There are no quality studies evaluating the use of C-reactive protein, erythrocyte sedimentation rate, and other non-specific inflammatory markers for elbow pain.

CYTOKINES

See Chronic Pain chapter.

ELECTROMYOGRAPHY and NERVE CONDUCTION STUDIES (Electrodiagnostic Studies)

Electrodiagnostic (ED) studies have been used to confirm diagnostic impressions of other peripheral nerve entrapments, including all peripheral nerves in the upper extremity. They may be particularly helpful to distinguish a peripheral entrapment from cervical radiculopathy(137, 138) (see Cervical and Thoracic Spine Disorders chapter for discussion of ED studies for evaluation of spine-related disorders that may present as elbow pain). NCS and EMG may be normal, particularly in some mild cases of neuropathies. If ED studies are negative, tests may be repeated later in the course of treatment if symptoms persist. It is also important to recognize that ED studies are abnormal in a considerable proportion of patients who are without symptoms.(139) Thus, ED studies in a patient with a low pre-test probability of peripheral nerve entrapment may result in inappropriate diagnosis.(140, 141)

1. *Recommendation: Electromyography for Diagnosing Subacute or Chronic Peripheral Nerve Entrapments*

Electrodiagnostic studies are recommended to assist in the diagnosis of subacute or chronic peripheral nerve entrapments, including ulnar neuropathies, radial neuropathies and median neuropathies.

Indications – Patients with subacute or chronic paresthesias with or without pain, particularly with unclear diagnosis. In addition to segmental analysis (e.g., above- versus below-elbow conduction), patients with peripheral neuropathies in the elbow region should generally have inching technique performed to localize the entrapment which assists with clinical management.

Strength of Evidence – **Recommended, Insufficient Evidence (I)**

2. *Recommendation: Electrodiagnostic Studies for Diagnosis and Pre-operative Assessment of Peripheral Nerve Entrapments*

Quality electrodiagnostic studies (see above) are recommended to assist in securing a firm diagnosis for those patients without a clear diagnosis. ED studies are also recommended as one of two methods to attempt to objectively secure a diagnosis prior to surgical release.

Strength of Evidence – **Recommended, Insufficient Evidence (I)**

3. *Recommendation: Electrodiagnostic Studies for Initial Evaluation of Patients Suspected of Having a Peripheral Nerve Entrapment*

Electrodiagnostic studies are not recommended for initial evaluation of most patients as it does not change the management of the condition.

Strength of Evidence – **Not Recommended, Insufficient Evidence (I)**

Rationale for Recommendation

ED studies are the only unequivocally objective measures of nerve function.(137, 138) However, there are both false-positive and false-negative test results that demand that the physician understand the pre-test probabilities and be capable of interpreting the results and placing them in an appropriate clinical context. For example, ED studies should not be ordered in settings where the clinical history suggests a low likelihood of nerve entrapment because the probability of a false-positive test result may be well above 50%. ED studies are primarily of assistance in: 1) identifying an anatomic location of nerve conduction slowing; 2) identifying objective evidence for alternate diagnostic considerations (e.g., cervical radiculopathy); and 3) quantifying nerve function to assure the physician that an operative state such as CTS is present. A survey of 350 records of electrodiagnostic studies found only 34% compliance

with the AAEM guideline (see Table 7).(141) ED studies are not invasive or minimally invasive (depending on whether the EMG component is required), have minimal adverse effects, and are high cost. They are recommended for evaluation of select cases to assist in confirming peripheral nerve entrapments such as pronator syndrome, ulnar neuropathies at the elbow and radial neuropathies.

Table 7. Summary of American Association of Electrodiagnostic Medicine (AAEM) Practice Parameter to Diagnose Ulnar Neuropathy at the Elbow

<p>Practice standards (class A evidence)</p> <ul style="list-style-type: none"> Temperature monitored Elbow position recorded Ulnar sensory NCS Ulnar motor NCS to ADM <p>Practice guidelines (class B evidence)</p> <ul style="list-style-type: none"> Elbow flexed 70-90 degrees 10-cm distance between AE and BE stimulation sites AE-to-BE NCV of <50 m/sec AE-to-BE NCV of >10 m/sec slower than BE-to-wrist NCV CMAP decrease of >20% between AE and BE waveforms CMAP configuration change between AE and BE waveforms <p>Practice options/advisories (class C evidence)</p> <ul style="list-style-type: none"> Ulnar motor NCS to FDI Inching study around elbow in 1- or 2-cm increments Comparison of AE-to-BE NCV to axilla-to-AE NCV Ulnar motor NCS to forearm flexor muscles Needle EMG sampling that includes FDI
<p>NCS, nerve conduction study; ADM, abductor digiti minimi; AE, above elbow; BE, below elbow; NCV, nerve conduction velocity; CMAP, compound motor action potential; FDI, first dorsal interosseus; EMG, electromyography</p>

Thibault MW, Robinson LR, Franklin G, Fulton-Kehoe D. Use of the AAEM guidelines in electrodiagnosis of ulnar neuropathy at the elbow. *Am J Phys Med Rehabil.* 2005;84:267-73. Reprinted with permission from Wolters Kluwer Health/Lippincott, Williams & Wilkins.

FUNCTIONAL CAPACITY EVALUATIONS

See Chronic Pain chapter.

MAGNETIC RESONANCE IMAGING (MRI)

Magnetic resonance imaging (MRI) is considered the imaging test of choice for viewing soft tissues (including ligamentous injuries around the elbow). MRI is helpful for evaluating extent of biceps tendinosis and ruptures. MRI is considered the gold standard for evaluating osteonecrosis after x-rays.(142-151) (Scheiber 99; Helenius 06; Sakai 08; Jones 04; Koo 95; Coombs 94; Cherian 03; Radke 03; Brunton 06; Walton 11) However, for most elbow disorders, MRI is not used as an imaging procedure.

1. Recommendation: MRI for Diagnosing Osteonecrosis (AVN)

MRI is recommended for diagnosing osteonecrosis and ligamentous elbow injuries.

Indications – Patients with subacute or chronic elbow pain thought to be related to osteonecrosis (AVN) or ligamentous elbow injuries, particularly in whom the diagnosis is unclear or who need additional diagnostic evaluation and staging.

Strength of Evidence – **Recommended, Insufficient Evidence (I)**

2. Recommendation: MRI for Routine Evaluation of Acute, Subacute, Chronic Elbow Joint Pathology

MRI is not recommended for routine evaluation of acute, subacute, or chronic elbow joint pathology, including degenerative joint disease.

Strength of Evidence – **Not Recommended, Insufficient Evidence (I)**

Rationale for Recommendations