

Examination of the Elbow: Current Concepts

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The elbow's complex anatomy and synergism of bony and ligamentous stabilizers make physical examination challenging. Adequate elbow assessment is essential for accurate diagnosis and initiating proper treatment. Isolated elbow injuries are rare; fractures should be interpreted as proxies for associated, often unappreciated, soft tissue injuries. A careful elbow examination informs the need for and interpretation of radiological studies, including fluoroscopy, magnetic resonance imaging, and computed tomography scanning. (*J Hand Surg Am.* 2014;39:2534–2541. Copyright © 2014 by the American Society for Surgery of the Hand. All rights reserved.)

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THE ELBOW JOINT CONSISTS OF 3 articulations, medial and lateral ligamentous complexes, common tendons of origin for the flexor and extensor muscles, and capsule. When a patient presents with elbow pathology, one or more of these components can be involved. In addition, the elbow is a common site of nerve compression or iatrogenic nerve injury.

Prior to physical examination, a complete medical history should be obtained, including activities, occupation, comorbidities (eg, systemic disease, osteoarthritis), and prior elbow surgery. This useful information helps to narrow the differential diagnosis. Even a remote history of childhood injury may be important, and any treatment that may have altered the normal course of the ulnar nerve must be considered. Common chief complaints include pain, locking, instability, stiffness, snapping, or deterioration in sport performance (especially in the overhead-throwing athlete). Pain, associated with arthrosis, should be carefully characterized as affecting the entire arc of motion or just terminal flexion and extension, because the latter can be indicative of

osteophyte impingement that can be improved with debridement.

GENERAL ELBOW EXAMINATION

Physical examination of the elbow should begin with assessing the shoulder, wrist, and hand. Comparison with the contralateral side may be helpful in diagnosing more subtle losses of motion, muscle weakness, or atrophy.

Inspection

The overall alignment of the limb is observed, noting any abnormality in carrying angle with the normal average valgus angle of 11° to 14° for men and 13° to 16° for women. A flexion contracture may obscure an abnormal carrying angle. Muscle hypertrophy or atrophy is noted, as are any cutaneous presentations of disease (eg, nodules, rashes), trauma (eg, ecchymosis, swelling), or scars from prior incisions.

Ecchymosis along the distal brachium may be a sign of distal biceps rupture, although it is not always present, especially if confined deep to the lacertus fibrosus.

Medial ecchymosis is frequently a sign of medial collateral ligament (MCL) rupture because of blood vessels along the posterior MCL forming the floor of the cubital tunnel. The ulnar nerve is palpable in the retrocondylar groove, posterior and distal to the medial epicondyle, allowing confirmation of the course of the nerve as well as palpation for tenderness and a Tinel sign (which should be compared with the contralateral side). Subluxation or dislocation of the ulnar nerve with elbow flexion and extension is evaluated.

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On the lateral aspect of the elbow, the soft spot (the triangular region bordered by the olecranon, radial head, and lateral epicondyle) normally has a subtle concavity, and a joint effusion is best seen in this area, especially when compared with the contralateral side. When the elbow capsule is distended, the elbow most commonly rests in a position of approximately 80° of flexion, maximizing potential capsular volume.¹

Posteriorly, olecranon bursitis can cause significant swelling, and olecranon fracture and triceps rupture can also be associated with swelling and a palpable defect. Triceps tendon rupture can be overlooked because continuity of the lateral fascia and anconeus muscle can preserve elbow extension, masking the tendon rupture.

Range of motion

Normal elbow motion is from 0° to 140° of flexion and 80° of pronation and supination. A functional range of motion is 30° of extension to 130° of flexion and 50° of pronation and supination.^{2,3} If there is loss of elbow range of motion, the examiner should look for crepitus or pain either at the extremes or at the midarc of motion. Also, the presence of either a firm or a soft endpoint should be observed during flexion and extension, because these suggest different pathologies (eg, osteophytes cause a firm endpoint, whereas an effusion causes a soft endpoint).

ELBOW EXAMINATION BY ANATOMICAL REGIONS

Anterior elbow

Distal biceps tendon rupture: Although distal biceps tendon ruptures usually present with loss of normal contour of the arm, absence of the palpable distal biceps tendon, swelling, ecchymosis, and pain and weakness with flexion and supination of the forearm, the diagnosis can be missed. This is especially true in muscular patients in whom a large brachialis muscle may obscure the biceps findings. Provocative tests that readily and reliably diagnose distal biceps tears have been developed (Table 1).

O'Driscoll et al⁴ described the hook test as highly sensitive and specific for diagnosing distal biceps ruptures. With the patient's shoulder abducted and the elbow flexed at 90°, the examiner hooks a finger around the lateral side of the distal biceps tendon while the patient actively supinates the forearm (Fig. 1). By having the patient supinate the forearm without actively flexing the elbow, an intact biceps tendon becomes more prominent, while the brachialis muscle remains relaxed and is less likely to be mistaken for the

TABLE 1. Examination Maneuvers for Diagnosis of Elbow Pathology

Condition	Examination Maneuver
Distal biceps rupture	Hook test
	Biceps squeeze test
	Biceps crease interval
	Passive pronation supination test
MCL tear	Valgus stress test
	Milking maneuver
	Moving valgus stress test
CubTS	Tinel sign
	Elbow flexion test
	SIRT
	Scratch collapse test
Posterolateral rotatory instability	Lateral pivot shift test
	Push-up test
	Stand-up test/chair push-up test
Lateral elbow tendinopathy	Table-top relocation test
	Chair test
Triceps rupture	Triceps squeeze test

biceps tendon. The biceps tendon is palpated laterally rather than medially to reduce the chance of hooking around a still intact lacertus fibrosus. For the experienced examiner, this test is both easily performed and found to be 100% sensitive and 100% specific for complete distal biceps tendon rupture.⁴ A negative hook test with pain on resisted supination and tenderness at the distal biceps tendon may indicate partial biceps tendon tear, tendinosis, or inflammation of the biceps bursa.³

The biceps squeeze test is similar to the Thompson test for Achilles tendon rupture. With external compression placed on the biceps muscle, the forearm is supinated if the biceps tendon is intact. With slight pronation of the forearm and the elbow flexed at 60° to 80° (to allow for spatial separation of the biceps from the relaxed brachialis), the examiner firmly squeezes the biceps with 2 hands (1 on the myotendinous region of the biceps and the other on the belly of the muscle). Lack of supination of the forearm indicates a positive test, which is 96% sensitive for tear of the distal biceps tendon.⁵

The biceps crease interval was described as an objective measurement that can help diagnose a tendon rupture. It relies on the proximal retraction of the biceps muscle for diagnosis. The distance from the antecubital crease of the elbow to the cusp of the distal aspect of the

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