Elbow Complaints: Keys to Effective Examination

ABSTRACT: A thorough history taking can provide a working differential diagnosis to guide the physical examination. Inquire about the location and severity of pain, exacerbating activities, and the mechanism of injury. For example, pain on the medial side of the elbow that occurs during the late cocking or acceleration phases of throwing is often the result of injury to the medial collateral ligament. Also ask about such mechanical complaints as loss of motion, catching, locking, crepitus, and instability. Before you examine the elbow, evaluate the neck and shoulder to rule out radiculopathy or referred pain. Next, evaluate elbow strength and perform a full distal neurovascular examination. Look for such visual cues as ecchymosis, swelling, gross deformity, altered carrying angle, and muscle atrophy.

Although the elbow is not a "weight-bearing" joint, large forces are transmitted across it. During heavy lifting, the elbow's joint reaction forces reach 2 to 3 times body weight. A number of popular sports, such as tennis, golf, baseball, and weight lifting—as well as many activities of daily living—put stress on the elbow that can result in overuse injuries.

Most elbow injuries can be diagnosed based on an office examination. In this, the first of 3 articles on how to examine an injured or painful elbow, we will discuss what to ask when taking the history and give pointers on what to look for during the initial physical examination. In future issues, we will describe palpation techniques and provocative tests that can be used to diagnose some of the more common elbow injuries.

HISTORY

The patient interview is crucial in assessing an elbow injury. A thorough history taking can provide a working differential diagnosis to guide the subsequent physical examination.

Pain. This is the most common complaint. Define the location and severity of the pain, exacerbating activities, and the mechanism of injury.

Location. From a diagnostic standpoint, the location of the pain is probably the most important characteristic (Table). Lateral pain usually results from tennis elbow, radiocapitellar injury, or radial tunnel syndrome. Medial pain is typically caused by injury to the flexor-pronator muscle mass origin, the medial collateral ligament (MCL), or the ulnar nerve or, rarely, by a snapping medial triceps head. Posterior pain often represents triceps tendinopathy or posterior impingement of the olecranon in its fossa from hypertrophic spurs. Anterior pain may be associated with distal biceps pathology, anterior capsular strain, median nerve entrapment, or osteoarthritis. Once the location of the pain is identified, focus further questions on symptoms specific to the structures in that anatomic region.

Exacerbating activities. Injured structures tend to be more painful when they are stressed. The specific activity that exacerbates the pain can alert you to the identity of the injured structure.
Anatomic Features That Contribute to Elbow Stability

Both the medial collateral ligament (MCL) and the lateral collateral ligament (LCL) are important for elbow stability. The anterior portion of the MCL is of most importance. It runs from the humerus to the olecranon process of the elbow. It is a strong ligament that helps to resist external rotation of the elbow. The ulnohumeral ligament, a part of the lateral collateral ligament, provides stability by preventing posterior subluxation and posterior rotary instability and prevents varus instability.

Lateral rotatory stability in the elbow results from a rotatory constraint of the proximal radioulnar joint in which the ulna rotates away from the trochlea of the humerus. This causes the radius to become firmly attached to the ulna, to subluxate posteriorly off the capitellum.
ation. In fact, the symptoms of ulnar nerve irritation are often worst at night or on awakening, because of prolonged elbow flexion during sleep. In addition to medial elbow pain radiating down to the little finger, ulnar nerve irritation may produce paresthesias of the index and little fingers, or a heavy or clumsy feeling in the hand after throwing. A snapping medial head of the triceps may cause symptoms with repetitive elbow motion but is usually asymptomatic.

Pain at rest, including post-activity ache, typically results from synovitis but may also be associated with nerve compression. Pain that is not related to activity may be caused by a systemic inflammatory disorder, a tumor, or an infection.

Severity. Question patients about both the severity and nature of their pain. Does it stop an athlete from playing, or does it merely ache at night, after the contest is over? Does the pain lead to functional compromise? Is there associated arm weakness or a tendency to drop things from reflex muscular inhibition due to pain?

Radiation. Elbow pain may radiate proximally to the mid humerus or distally over the forearm. Radiation to the hand may be caused by tendinopathies, peripheral nerve entrapment, or cervical radiculopathy. Elbow pain accompanied by coldness or swelling in the hand may suggest obstruction of the brachial artery or vein at the elbow.

Mechanism of injury. Was there a specific traumatic event associated with acute pain, swelling, or ecchymosis? Is there a history of repetitive microtrauma or a recent increase or other change in activity level? Was there a previous injury to the elbow or ipsilateral shoulder that may have predisposed the patient to this injury?

Mechanical complaints. Inquire about mechanical complaints, such as loss of motion, locking, catching, instability, and recurrent effusion.

Loss of motion. Loss of elbow motion, especially extension, is common with both intra-articular and extra-articular pathologies of the elbow. Unless it is substantial (30 degrees or more), loss of motion is usually not a functional problem but suggests past or present injury.

Limitation of motion associated with pain at the extreme ends of the range of motion may indicate osteophytic impingement. Pain throughout the mid range of motion suggests articular wear. Decreased forearm rotation that results in loss of function points to pathology of the proximal radioulnar joint, the forearm, or the distal radioulnar joint (at the wrist).

Catching or locking. Snapping, catching, or locking may be caused by loose bodies, which commonly arise from osteochondritis dissecans; osteophytes from posterior impingement (especially in throwing athletes); or a snapping triceps.

Crepitus. Crepitus may arise from radiocapitellar or ulnotrochlear arthritis.

Instability. Feelings of instability may be caused by severe arthritis with

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Figure 2 - The lateral ligament complex provides protection against both varus instability and posterolateral rotatory instability. Injury to the lateral ulnar collateral ligament can produce a variety of mechanical symptoms, such as locking, catching, or snapping, and may result in posterolateral rotatory instability.
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One loss, MCL injury, or injury to the lateral collateral ligament complex.

Chronic MCL laxity alters the biomechanics of the elbow joint, allowing the medial olecranon to impinge on the olecranon fossa during terminal extension, as occurs during follow-through phase of over-and-throwing. The forcing of the olecranon into its fossa leads to pain, swelling, and osteophyte formation. Fractures with this pathology can be posterior elbow pain and swelling. However, posterior impingement can also occur in the absence of instability.

Injury to the lateral ulnar collateral ligament (LUCL) (Figure 2) can cause posterolateral rotatory instability. This injury may occur as the sequelae of an elbow dislocation or, less commonly, of an elbow “sprain” resulting from a fall onto an outstretched hand.

On occasion, posterolateral rotatory instability may be iatrogenically induced if the LUCL is cut during surgery for lateral tennis elbow or other procedures. The patient may complain of elbow instability, locking, catching, or snapping when the elbow is extended and the forearm supinated, or there may be an uncomfortable “clunk” with flexion and pronation as the joint relocates from a subluxed position. Following multiple recurrences, less trauma may be needed to elicit these symptoms.

Note that mechanical symptoms predominate in LUCL injury, whereas pain is often the major symptom of ICL injury.

INITIAL EXAMINATION

Neck and shoulder evaluation. Start with an examination of the neck and shoulder to rule out radiculopathy or referred pain. Evaluate the strength of the supraspinatus, infraspinatus, subscapularis, and scapular stabilizers, since shoulder girdle weakness is often associated with elbow pathology. This weakness may be primary or secondary. Secondary shoulder girdle weakness occurs when a patient responds to elbow pain with disuse and inactivity, causing deconditioning and weakening of the shoulder in general and the rotator cuff muscles specifically.

Failure to recognize shoulder weakness—and to rehabilitate and recondition the shoulder—will compromise rehabilitation of the elbow. The patient will also be predisposed to future shoulder injury and rotator cuff dysfunction, which is often noted following increased activity.

Evaluation of elbow strength. Only gross estimates of elbow strength can be made on clinical examination. Elbow flexion power is greatest between 90 and 110 degrees of flexion. Since elbow flexor power is weakest in pronation, it should be tested in supination or neutral forearm rotation.

Figure 3 – With the elbow in full extension, both epicondyles and the olecranon process lie in the same horizontal plane on the posterior aspect of the elbow (A). With the elbow flexed 90 degrees, these points form a nearly equilateral triangle (B). Extra-articular fractures do not alter these relationships. Thus, a distortion of these landmarks indicates either intra-articular fracture, malunion, or unreduced elbow dislocation.
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Extension strength is normally only 70% of flexion strength with the forearm in neutral rotation. Supination strength is normally about 15% greater than pronation strength. In normal subjects, the dominant extremity is often 5% to 10% stronger than the non-dominant side.¹⁰

Neurovascular examination. Perform a full distal neurovascular examination, since compression neuropathies are prominent in the differential diagnosis of many elbow pathologies. Of the nerves that cross the elbow—the median and musculocutaneous nerves (anteriorly), the radial nerve (anterolaterally), and the ulnar nerve (medially)—compression of the ulnar nerve most frequently produces symptoms.

Assess the median nerve by checking thumb and interphalangeal joint flexion, and sensation at the tip of the index finger. Evaluate the radial nerve by checking wrist and digital extension, and sensation in the first dorsal web space. Assess the ulnar nerve by having the patient cross his or her index and middle fingers, and then check sensation at the tip of the little finger.

OBSERVATION
Observation, which is too often rushed, can be highly revealing. Note any ecchymosis, swelling, or gross deformity.

Ecchymosis. Localized ecchymosis can reveal an area of direct impact, which may have resulted in contusions or tendon injury. On occasion, the ligaments on the opposite side of the elbow from the impact are injured because of tension overload.

Swelling. The location of swelling is a good clue to the area of injury. Severe injury, such as an elbow dislocation, will lead to extensive global swelling, while a tendon or ligament injury often results in a small localized extra-articular fluid collection. A tense hemorrhage will cause the elbow to be held in the position of maximum joint capacity, which is 80 degrees of flexion. This may explain why most stiff elbows tend to be fixed at or about that angle.¹¹,¹²

Osseous landmarks. Note any gross deformity in the osseous landmarks of the elbow. With the elbow in full extension, both epicondyles and the olecranon process should lie in the same horizontal plane on the posterior aspect of the elbow. With the elbow flexed 90 degrees, these points should form a nearly equilateral triangle (Figure 3).¹³ Extra-articular fractures do not alter these relationships. Therefore, a distortion of these landmarks indicates either intra-articular fracture, malunion, or unreduced elbow dislocation.

Anconeus soft spot. Subtle effusion is best recognized by noting any bulging or convexity of the "anconeus soft spot" (lateral infracapital recess) (Figure 4). This is located on the lateral side of the elbow in the posterior
CLINICAL HIGHLIGHTS

- Paresthesias of the little and ring fingers or posteromedial elbow pain can indicate ulnar nerve irritation. Ulnar nerve irritation may be associated with repetitive or prolonged elbow flexion, forceful triceps activity (as often occurs during weight lifting), valgus force, or direct pressure. Its symptoms are often worst at night or upon awakening, because of prolonged elbow flexion during sleep.

- Elbow pain that radiates to the hand may be caused by tendinopathy, peripheral nerve entrapment, or cervical radiculopathy. Coldness or swelling of the hand may suggest obstruction of the brachial artery or vein at the elbow.

- Limitation of motion associated with pain at the extreme ends of the range of motion may indicate osteophytic impingement. Pain throughout the mid range of motion suggests articular wear.

- Post-activity ache may be associated with synovitis or nerve compression. Pain that is not related to activity may be a sign of a systemic inflammatory disorder, tumor, or infection.

- Bulging of the “anconeus soft spot” (lateral infracondylar recess) is a clue to the presence of hemorrhage, effusion, synovitis, dislocation, or deformity of the radial head. The anconeus soft spot is also a good location for aspiration or injection of the elbow.

- Decreased forearm rotation that results in loss of function points to pathology of the proximal radioulnar joint, the forearm, or the distal radio-ulnar joint (at the wrist).

part of the triangular area outlined by the radial head, the lateral epicondyle, and the tip of the olecranon, just anterior to the lateral margin of the olecranon. This area bulges in the presence of hemorrhage, effusion, synovitis, dislocation, or deformity of the radial head. The anconeus soft spot is also a good location for aspiration or injection of the elbow. The best way to enter the joint is to aim the needle slightly anterior to this entry point.

**Carrying angle.** Note the carrying angle—the angle between the humerus and forearm—which is best viewed with the forearm supinated and the elbow extended to 0 degrees (not hyperextended, since that position tends to increase the apparent valgus of the carrying angle). The normal valgus carrying angle averages 11 to 14 degrees in men and 13 to 16 degrees in women; however, much individual variation exists. Discrepancy between the carrying angles of the right and left sides may indicate former trauma, growth disturbance, or chronic valgus overload. Baseball pitchers who started competitive throwing before reaching skeletal maturity may have a 10-15 degree greater carrying angle on their dominant side—a result of bony remodeling to adapt to chronic valgus stress. Thirty percent of professional baseball pitchers have a valgus elbow deformity. Note that accurate evaluation of the carrying angle may be difficult in the case of a flexion contracture, since the amount of apparent valgus of the carrying angle decreases with flexion. In general, changes in the carrying angle are mainly of cosmetic, not functional, significance.

- **Muscle atrophy.** Determine whether there is any atrophy of the arm or forearm muscles by measuring the girth of these muscle masses at their widest points, comparing these measurements to the contralateral arm, and noting any discrepancies. Weakness, deconditioning, and atrophy of the whole arm may occur from an injury to only 1 area if it causes disuse of the extremity.

**REFERENCES:**