

TENNIS ELBOW

LATERAL
EPICONDYLITIS



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INTRODUCTION

- Chronic pain at the lateral epicondyle of the elbow is a **relatively common** condition, particularly among **tennis players**, respectively, and among **manual laborers**.
- **Chronic pathologic changes** in the **tendon origins** are associated with such **pain**, although the underlying **causes** remain **unclear**.

TERMINOLOGY

- The **epicondyles** of the elbow are bony prominences easily palpated on the medial and lateral sides of the **distal humerus, proximal to the elbow** joint.
- The **lateral** epicondyle of the elbow is the bony origin for the **wrist extensors**.
- The **medial** epicondyle is the bony origin for the **wrist flexors**.

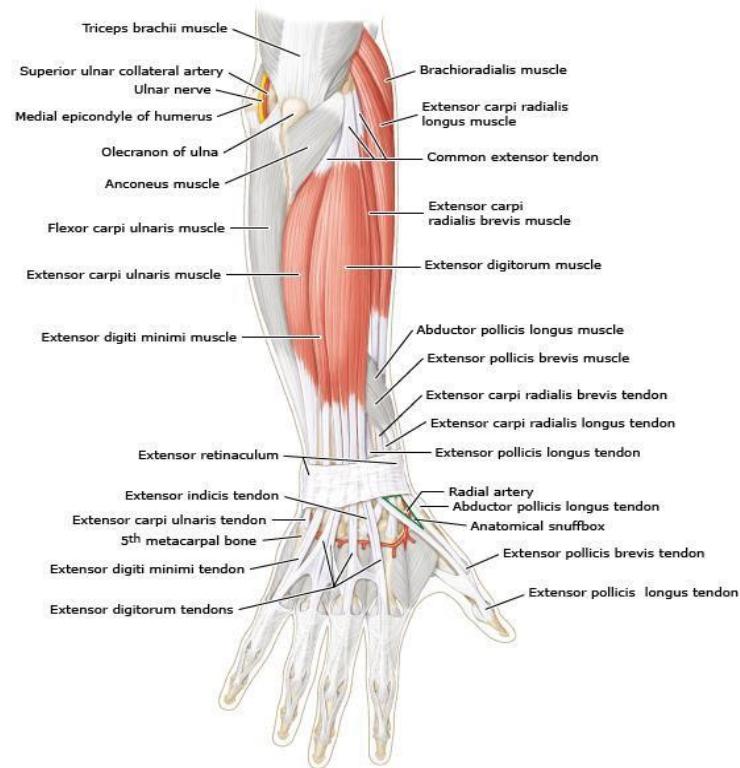
Elbow joint external landmarks



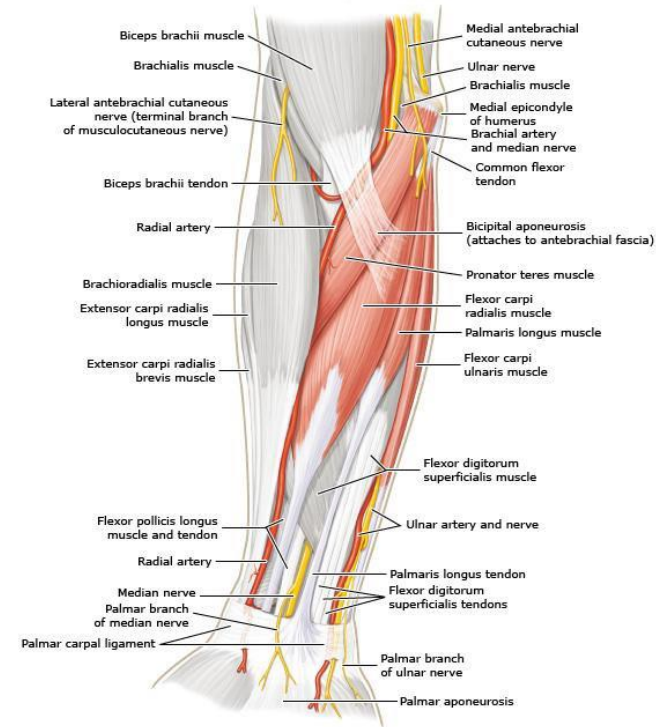
The elbow joint is best palpated at the soft spot in the middle of a triangle formed by the lateral epicondyle, olecranon, and radial head.

- Pain at the tendon insertion or myotendinous junction of these muscle groups is referred to as lateral elbow tendinopathy (LET) and medial elbow tendinopathy (MET), respectively. LET is commonly called "tennis elbow,"
- Although tennis can cause these injuries, so can a number of other occupational and recreational activities.

MUSCLES OF THE POSTERIOR FOREARM



MUSCLES OF THE ANTERIOR FOREARM



Etiology

- **Overuse injury** involving the proximal tendons of the **extensor carpi radialis brevis** (felt at tip of lateral epicondyle) and occasionally the **extensor digitorum communis muscle** (felt just posterior and distal to tip of lateral epicondyle) constitutes lateral elbow tendinopathy (**LET**)

- Tennis elbow occurs in individuals engaged in **repetitive activities** such as hand **grasping** (e.g., shaking hands) or **high-torque wrist turning** (e.g., scooping ice cream).
- It historically occurs in **tennis players** but can result from **any sports** that require repetitive **wrist extension**, **radial deviation**, and/or **forearm supination**.
It is also seen in athletes who play **squash** and **badminton**, and other sports or activities that require similar movements.
This condition is often precipitated by **poor** mechanics and **technique** or improper **equipment** in the athletic patient population.

EPIDEMIOLOGY AND RISK FACTORS

- Tennis elbow is the **most common** cause of **elbow symptoms** in patients presenting with elbow pain in general.
- The condition tends to affect **men and women equally**.
- The annual incidence is **one to three percent** in the United States.
- Despite the condition being commonly referred to as tennis elbow, **tennis players** make up only **10%** of the patient population. Half of all tennis players develop pain around the elbow, of which 75% represent true tennis elbow. It is more common in individuals **older than 40 years** of age.

- ✓ Smoking,
 - ✓ obesity,
 - ✓ age 45 to 54,
 - ✓ repetitive movement for at least two hours daily, and
 - ✓ forceful activity (managing physical loads over 20 kg)
- appear to be **risk factors** in the **general population** for the development of elbow tendinopathy.

Factors that correlate with a **poorer prognosis** include:

- ✓ high physical strain at work,
 - ✓ dominant side involvement,
 - ✓ Concomitant neck pain (with or without signs of nerve root involvement),
 - ✓ duration of symptoms greater than three months, and
 - ✓ severe pain at presentation
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- The natural course of the condition is favorable, with **spontaneous recovery** within **one to two years** in 80% to 90% percent of the patients.

Pathophysiology

- This condition is **primarily a degenerative** overuse process of the **extensor carpi radialis brevis** and the **common extensor tendon**.
- Aside from degenerative changes, the histological findings include:
 - granulation tissue,
 - micro-rupture,
 - an abundance of fibroblasts,
 - vascular hyperplasia, unstructured collagen, and
 - a notable lack of traditional inflammatory cells (macrophages, lymphocytes, neutrophils) within the tissue.

- The term has been previously described as **angiofibroblastic dysplasia** based on multiple **histologic** studies describing its **microscopic appearance** and characteristics.
- **Ultrasound** evaluation often reveals **calcifications**, **intra-substance tears**, marked **irregularity of the lateral epicondyle**, and **thickening and heterogeneity** of the common **extensor tendon**.

SIGNS AND SYMPTOMS

- Patients will typically report **pain** with an **insidious onset**, but upon further questioning, they will often relate an **overuse history** without a specific inciting traumatic event.
- The pain commonly occurs **one to three days after** an unaccustomed activity that involves **repeated wrist extension**.
- The history may reveal **new equipment** use or an **atypical workout** circumstance such as an abnormally intense or prolonged workout in an athlete.

- The **pain** is usually **over** the **lateral elbow** that **worsens** with **activity** and improves with rest.
- This pain is **constant** and is made worse with **active contraction of the wrist**.
- The pain can vary from being **mild**, for example, with aggravating activities like tennis or the repeated use of a hand tool,
or it can be such **severe** pain that simple activities like picking up and holding a coffee cup or a coffee cup sign will act as a trigger for the pain.
- **Sleep disturbance** is common.

Physical Exam

- **Localized tenderness** over the **lateral epicondyle** and proximal wrist extensor muscle mass

Palpation of the lateral epicondyle



The lateral epicondyle is palpated for tenderness and swelling with the elbow flexed at 90 degrees. Local tenderness is a hallmark feature of lateral epicondylitis (tennis elbow).

- pain exacerbated by **passive wrist flexion**;
- Many patients with tennis elbow exhibit a **bandlike thickening** within the affected extensor tendons.
- **range of motion** is **normal**, but grip strength on the affected side is diminished.

Passive wrist flexion



Pain with passive terminal wrist flexion with the elbow in full extension occurs with lateral epicondylitis.

- Patients with tennis elbow have a **positive tennis elbow test** result: (pain exacerbated by **resisted wrist extension** with the elbow in full extension)

❖ This test is performed by stabilizing the patient's forearm and then having the patient clench his or her fist and actively extend the wrist. The examiner then attempts to force the wrist into flexion. Sudden severe pain is highly suggestive of tennis elbow.

Examination of wrist extension



Pain with resisted wrist extension with the elbow in full extension is characteristic of lateral epicondylitis.

- Notably, there should be an **absence of radicular symptoms** or **numbness/tingling**. These symptoms suggest an alternative process such as **radial nerve entrapment**, although these conditions can **coexist**.

Evaluation

- **Diagnostic imaging** is often **unnecessary** for the diagnosis and treatment of elbow tendinopathy in adults and non-elite athletes with classic clinical findings.
- However, we routinely perform musculoskeletal ultrasound (**MSK US**) to assess tendon integrity and pathology. Staging **tendinopathy** using MSK US **may help** to guide treatment .
- In addition, for any patient who manifests **diminished elbow mobility**, bony **abnormalities**, or **other signs** consistent with **injury or intra-articular pathology**, we obtain **diagnostic imaging**(typically **three-view plain** radiographs of the elbow) at the initial evaluation.

- For patients with symptoms that have **persisted for three to six months** or who experience **severe or worsening symptoms** despite appropriate initial management, we generally obtain a standard three-view elbow series of **plain radiographs**, including an **axial view** if **posterior** elbow pain is present. This allows us to assess for fractures, osteoarthritis, and other bony injuries (e.g., loose bodies). The axial view is used to evaluate posterior osteophytes and calcifications within the tendons.

- **Electromyography** can help distinguish **cervical radiculopathy** and radial tunnel syndrome from tennis elbow.
- **Based on the patient's** clinical presentation, additional testing may be warranted, including a complete blood count, uric acid level, erythrocyte sedimentation rate, and antinuclear antibody testing.
- **Magnetic resonance imaging** of the elbow is indicated if **joint instability** is suspected or if the **symptoms** of tennis elbow **persist** .
- The **injection technique** described later serves as both a **diagnostic and a therapeutic** maneuver.

DIAGNOSIS

- Elbow tendinopathy is primarily a **clinical diagnosis** made on the basis of a suggestive history, consistent examination findings, and **possibly confirmatory** findings using musculoskeletal ultrasound (**MSK US**). Patients typically describe **pain localized to lateral epicondyle** that **developed** over weeks to months and describe **performing repetitive wrist movements** regularly during sport or work.
- **Examination** reveals **focal tenderness** at the origin of wrist extensors that is exacerbated by full, **passive wrist flexion** (lateral elbow tendinopathy [LET]).

DIFFERENTIAL DIAGNOSIS

Lateral elbow (extensor) tendinopathy

Loose bodies

Osteochondral defect (radiocapitellar joint)
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Arthritis (posterior osteophytes)

Valgus extension overload

Radial tunnel syndrome

Inflammatory arthritis

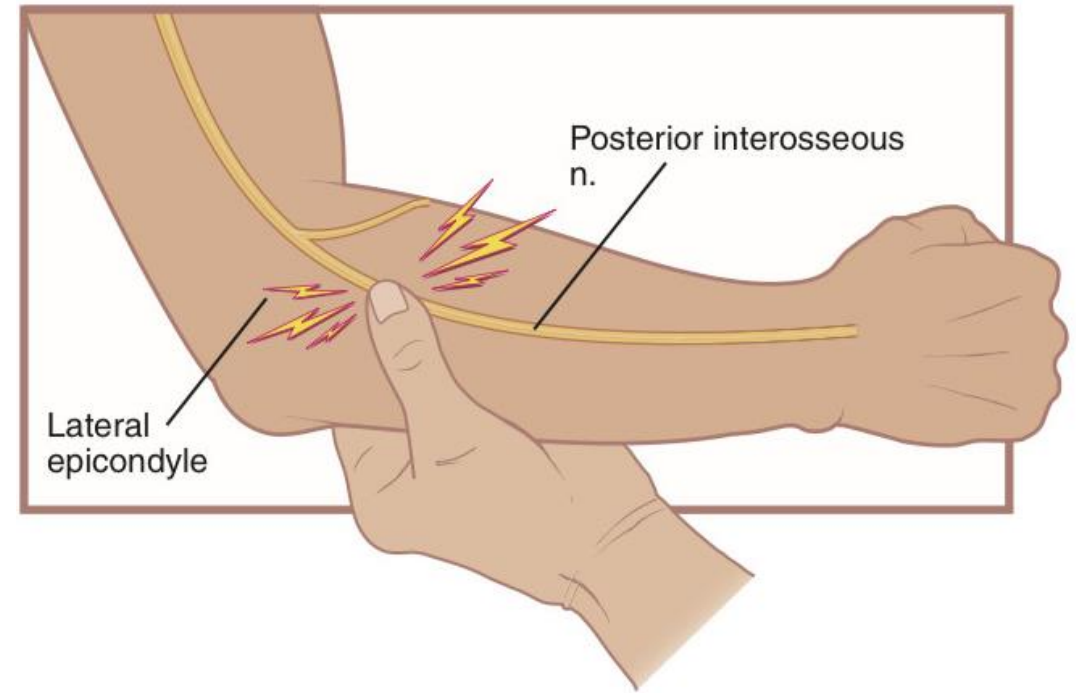
Lateral synovial plica

Cervical radiculopathy

Thoracic outlet syndrome

Myofascial pain

Radial tunnel syndrome and, occasionally, **C6-7 radiculopathy** can mimic tennis elbow. Radial tunnel syndrome is caused by **entrapment of the radial nerve** below the elbow. With radial tunnel syndrome, the **maximal tenderness** to palpation is **distal to the lateral epicondyle over the radial nerve**, whereas with tennis elbow, the maximal tenderness to palpation is over the lateral epicondyle.



Radial tunnel syndrome can be distinguished from tennis elbow by careful identification of the point of maximal tenderness.

Treatment

- Once a clinical diagnosis is made, our **initial treatment** consists of:
- **activity modification** (reduction or abstinence from inciting activities)
 - **counterforce bracing**
 - **Oral analgesics**: acetaminophen, nonsteroidal anti inflammatory drugs (NSAIDs) if not contraindicated, and
 - **physical therapy**(including wrist mobility and eccentric strength exercises)

Counterforce brace for elbow tendinopathy



counterforce brace, which applies pressure just distal to the common extensor tendon origin, thereby reducing the forces transferred to the tendon origin. Counterforce bracing may provide benefit during the first six weeks following injury and is easy to use and inexpensive. These braces are placed on the forearm approximately 2 to 3 cm distal to the point of maximal tenderness (just distal to the lateral epicondyle)

Concentric exercise for elbow epicondylitis



This photograph shows a concentric exercise for strengthening the wrist extensors. Concentric exercise involves the application of a load during the shortening of a muscle. Here the wrist extensors are contracting concentrically against the resistance of an exercise band.

Eccentric exercise for elbow epicondylitis

Eccentric exercise for elbow epicondylitis



This photograph demonstrates an eccentric exercise for the wrist extensor muscles. Eccentric exercise involves the application of a load during the lengthening of a muscle and may assist with healing of a tendinopathy. Here the wrist extensors are contracting eccentrically against the resistance of an exercise band.

Courtesy of Neeru Jayanthi, MD.

Graphic 67934 Version 2.0

➤ SECONDARY MANAGEMENT

- In patients who **do not improve** with standard initial interventions, we often obtain **imaging** studies before resorting to other treatments such as injections or other alternative therapies.

An alternative diagnosis revealed by imaging is managed as indicated;

persistent elbow tendinopathy can be managed with continued **conservative** treatment including physical therapy, antiinflammatory agents, nontraditional modalities, or surgical referral.

- Determining the **stage of tendinopathy** using **ultrasound may help** determine which treatment **options** are most suitable:

- Patients with **low-grade tendinopathy** based on ultrasound findings typically require only **basic interventions** such as load reduction, eccentric strengthening exercises, and a counterforce brace
- Patients with **more severe** tendinopathy may need additional interventions. If not contraindicated, **nitroglycerin patches**, and possibly more effective dosing of standard analgesics, may reduce symptoms and improve compliance with strengthening exercises.

For patients who do not respond to these treatment modalities, **injection of local anesthetic and steroid** is a reasonable next step. (ideally ultrasound-guided peritendinous)

Ultrasound Scan

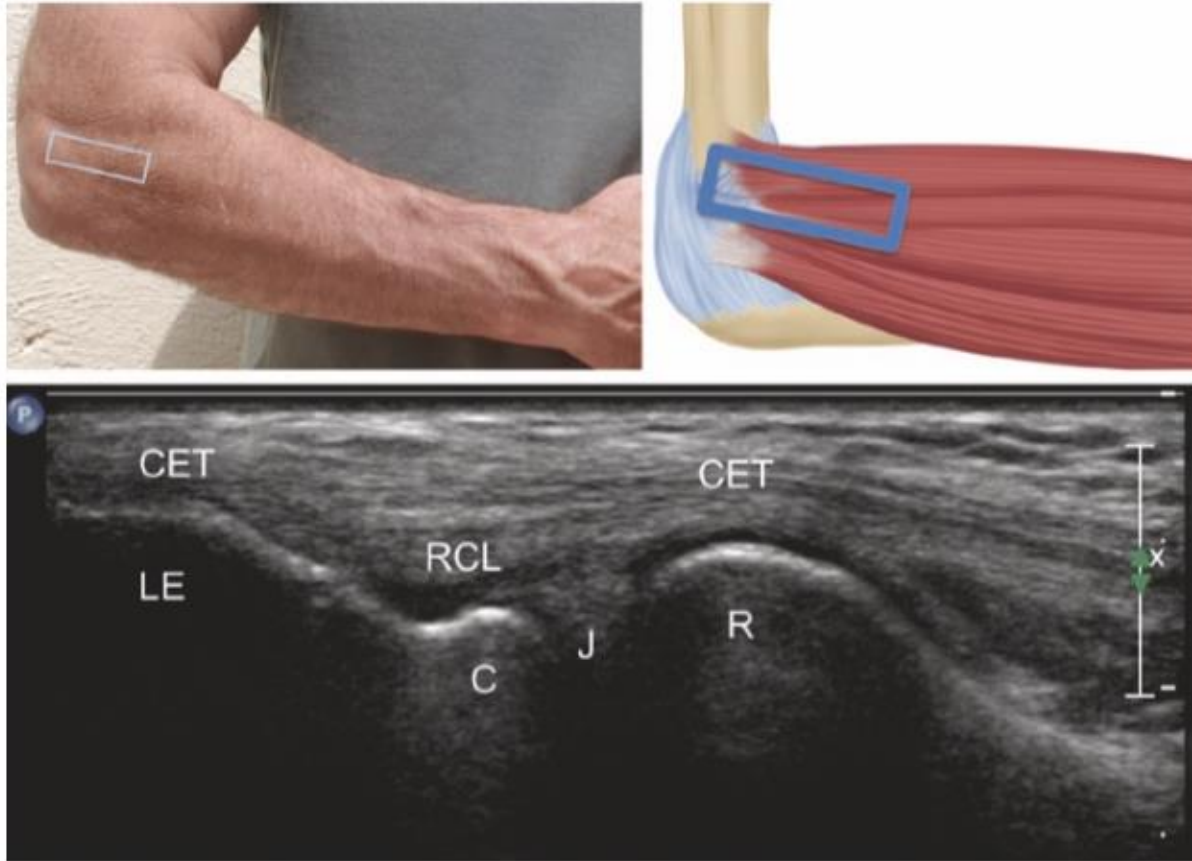
Patient position: Seated or supine, with the arm fully adducted at the patient's side, the elbow flexed, and the dorsum of the hand resting on a folded towel to relax the affected tendons .

Probe: Linear 5-12 MHZ

Needle: 1-inch, 25-gauge needle

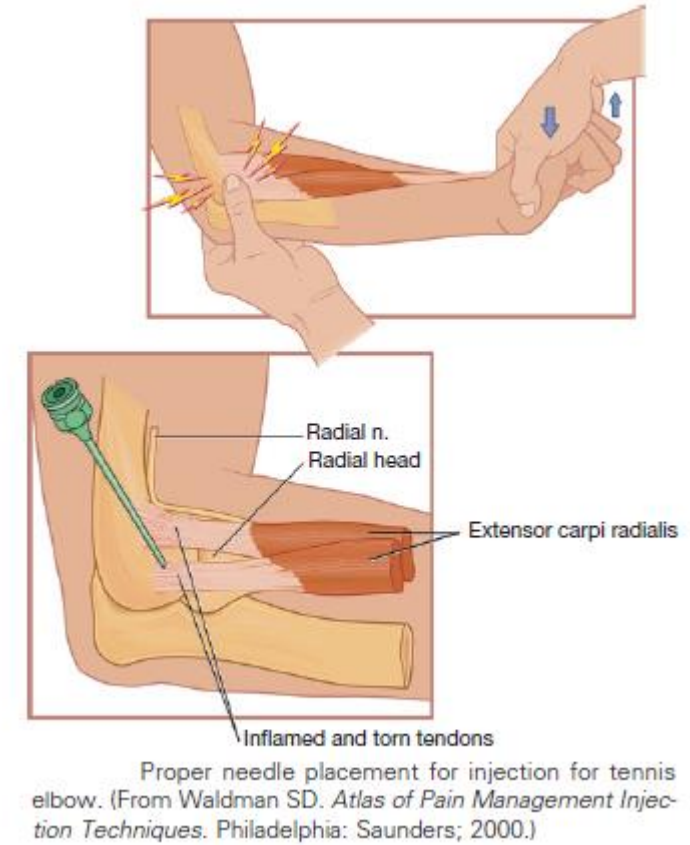
Target: The key landmark is the lateral epicondyle (LE), the origin of the common extensor tendon (CET).

Drug: A total of 1 mL local anesthetic and 40 mg methylprednisolone is drawn up in a 5-mL sterile syringe.



Sonoanatomy of the lateral elbow

The key landmark is the lateral epicondyle (LE), the origin of the common extensor tendon (CET). Additional structures include the radio-capitellar joint (J) between head of the radius (R) and capitellum (C) of the humerus, and the radial collateral ligament (RCL)



- Patients with **severe** tendinopathy may not respond adequately to basic interventions or may feel that recovery is too protracted and may seek other treatment options, such as ultrasound-guided **tenotomy**, **iontophoresis**, or **injection of biologic therapies** (eg, platelet-rich plasma [PRP]).
- **Surgical referral** is generally reserved for patients with **severe symptoms** or **larger tendon tears** that **do not improve** despite careful compliance with a well-designed physical therapy program, and possibly other interventions, **for longer than six months**.

