Radial Tunnel Syndrome

**THE CLINICAL SYNDROME**

Radial tunnel syndrome is an uncommon cause of lateral elbow pain that has the unique distinction among entrapment neuropathies of almost always being initially misdiagnosed. The incidence of misdiagnosis of radial tunnel syndrome is so common that it is often incorrectly referred to as resistant tennis elbow (Table 46.1). As seen from the following discussion, the only major similarity that radial tunnel syndrome and tennis elbow share is the fact that both clinical syndromes produce lateral elbow pain.

The lateral elbow pain of radial tunnel syndrome is aching and localized to the deep extensor muscle mass. The pain may radiate proximally and distally into the upper arm and forearm (Fig. 46.1). The intensity of the pain of radial tunnel syndrome is mild to moderate, but it may produce significant functional disability.

In radial tunnel syndrome, the posterior interosseous branch of the radial nerve is entrapped by a variety of mechanisms that have in common a similar clinical presentation (Fig. 46.2). These mechanisms include aberrant fibrous bands in front of the radial head, anomalous blood vessels that compress the nerve, extrinsic masses, or a sharp tendinous margin of the extensor carpi radialis brevis. These entrapments may exist alone or in combination.

**SIGNS AND SYMPTOMS**

Regardless of the mechanism of entrapment of the radial nerve, the common clinical feature of radial tunnel syndrome is pain just below the lateral epicondyle of the humerus. The pain of radial tunnel syndrome may develop after an acute twisting injury or direct trauma to the soft tissues overlying the posterior interosseous branch of the radial nerve, or the onset may be more insidious, without an obvious inciting factor. The pain is constant and worsens with active supination of the wrist. Patients often note the inability to hold a coffee cup or hammer. Sleep disturbance is common. On physical examination, elbow range of motion is normal. Grip strength on the affected side may be diminished.

In the classic text on entrapment neuropathies, Dawson and colleagues note three important signs that allow the clinician to distinguish radial tunnel syndrome from tennis elbow: (1) tenderness to palpation distal to the radial head in the muscle mass of the extensors, rather than over the more proximal lateral epicondyle, as in tennis elbow; (2) increasing pain on active resisted supination of the forearm owing to compression of the...
radial nerve by the arcade of Frohse as a result of contraction of the muscle mass; and (3) a positive result on the middle finger test. The middle finger test is performed by having the patient extend the forearm, wrist, and middle finger and sustain this action against resistance. Patients with radial tunnel syndrome exhibit increased lateral elbow pain secondary to fixation and compression of the radial nerve by the extensor carpi radialis brevis muscle (Fig. 46.3).

**TESTING**

Because of the ambiguity and confusion surrounding this clinical syndrome, testing is important to help confirm the diagnosis of radial tunnel syndrome. Electromyography helps distinguish cervical radiculopathy and radial tunnel syndrome from tennis elbow. Plain radiographs are indicated in all patients who

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**Fig. 46.1** The pain of radial tunnel syndrome is localized to the deep extensor muscle mass and may radiate proximally and distally into the upper arm and forearm.

**Fig. 46.2** Recurrent radial tunnel syndrome with posterior interosseous nerve (PIN) entrapment in a 44-year-old man with painful forearm and elbow following prior radial tunnel release. Axial T2 spectral attenuated inversion recovery (SPAIR) (A) image shows normal radial nerve (large arrow) and abnormal ulnar nerve (small arrow) at the level of elbow, consistent with cubital tunnel syndrome. Axial T2 SPAIR (B) and T1-weighted (C) images at proximal forearm show the postoperative scarring (large arrows), mildly hyperintense superficial radial nerve (small arrows), and markedly abnormal PIN (double small arrows). (From Chalian M, Behzadi AH, Williams EH, et al. High-resolution magnetic resonance neurography in upper extremity neuropathy. *Neuromaging Clin N Am*. 2014;24[1]:109–125, fig 13.)

**Fig. 46.3** Ultrasound image demonstrating the relationship of the radial nerve to the arcade of Frohse.
present with radial tunnel syndrome to rule out occult bony pathology. Based on the patient’s clinical presentation, additional testing, including complete blood cell count, uric acid, erythrocyte sedimentation rate, and antinuclear antibody testing, may be indicated.

Magnetic resonance imaging (MRI) of the elbow is indicated if internal derangement of the joint is suspected and may help identify the factors responsible for the nerve entrapment, such as ganglion cysts or lipomas (see Fig. 46.2–C). The injection technique of the radial nerve at the elbow with a local anesthetic and steroid may help confirm the diagnosis and treat the syndrome.

DIFFERENTIAL DIAGNOSIS

Cervical radiculopathy and tennis elbow can mimic radial tunnel syndrome. Radial tunnel syndrome can be distinguished from tennis elbow because with radial tunnel syndrome, the maximal tenderness to palpation is distal to the lateral epicondyle over the posterior interosseous branch of the radial nerve, whereas with tennis elbow, the maximal tenderness to palpation is over the lateral epicondyle. Increased pain with active supination and a positive middle finger test (see earlier discussion) helps strengthen the diagnosis of radial tunnel syndrome. Acute gout affecting the elbow manifests as a diffuse acute inflammatory condition that may be difficult to distinguish from infection of the joint, rather than a localized nerve entrapment.

TREATMENT

Initial treatment of the pain and functional disability associated with radial tunnel syndrome should include a combination of nonsteroidal antiinflammatory drugs (NSAIDs) or cyclooxygenase-2 (COX-2) inhibitors and physical therapy. The local application of heat and cold also may be beneficial. Patients should avoid the repetitive movements that incite the syndrome. For patients who do not respond to these treatment modalities, injection of the radial nerve at the elbow with a local anesthetic and steroid may be a reasonable next step. If the symptoms of radial tunnel syndrome persist, surgical exploration and decompression of the radial nerve are indicated.

COMPLICATIONS AND PITFALLS

The major complications associated with radial tunnel syndrome fall into two categories: (1) iatrogenically induced complications resulting from persistent and overaggressive treatment of “resistant tennis elbow” and (2) the potential for permanent neurological deficits as a result of prolonged untreated entrapment of the radial nerve. Failure of the clinician to recognize an acute inflammatory or infectious arthritis of the elbow may result in permanent damage to the joint and chronic pain and functional disability.

CLINICAL PEARLS

Radial tunnel syndrome is a distinct clinical entity that is often misdiagnosed as tennis elbow, and this fact accounts for the many patients with “tennis elbow” who fail to respond to conservative measures. Radial tunnel syndrome can be distinguished from tennis elbow because with radial tunnel syndrome, the maximal tenderness to palpation is over the radial nerve, whereas with tennis elbow, the maximal tenderness to palpation is over the lateral epicondyle.

If radial tunnel syndrome is suspected, injection of the radial nerve at the humerus with a local anesthetic and steroid gives almost instantaneous relief. Careful neurological examination to identify preexisting neurological deficits that may later be attributed to the nerve block should be performed on all patients before beginning radial nerve block at the humerus.

SUGGESTED READINGS

Clavert P, Lutz JC, Adam P. Frohse’s arcade is not the exclusive compression site of the radial nerve in its tunnel. Orthop Traumatol Surg Res. 2009;95:114–118.


