

# Posterior Interosseous Nerve Compression Syndrome: Imaging Findings Highlights

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**Abstract** Posterior interosseous nerve (PIN) compression syndrome is a condition resulting from the compression of the deep branch of the radial nerve, which may lead to paresis or paralysis of the fingers and thumb. Anatomically, there are five potential sites for nerve compression in its course along the radial tunnel, the “Arcade of Fröhse” being the most usual. Clinically, patients start feeling pain in the lateral aspect of the elbow, which may be confused in the initial clinical diagnosis with lateral epicondylitis. The aim of this study is to present the case of a patient with clinical posterior interosseous nerve compression syndrome and to demonstrate that imaging studies can be used to localize and distinguish compressive neuropathy from other possible causes.

**Keywords:** *peripheral nerves, nerve compression syndromes, magnetic resonance imaging, ultrasound*

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## 1. Introduction

Posterior interosseous nerve (PIN) compressive syndrome, also known as supinator syndrome, is a condition resulting from the compression of the deep branch of the radial nerve immediately distal to the elbow joint, which may lead to paresis or paralysis of the extensor muscles of the fingers and thumb [1].

Imaging studies, as ultrasound (US) and magnetic resonance imaging (MRI), may be used to localize and characterize this compressive neuropathy.

We present the case of a patient with PIN compressive syndrome showing characteristic sonographic and MRI signs.

## 2. Case Presentation

Female patient, 44 years old. She stated that two years ago she began to experience pain in the left elbow radiating to the fingers, combined with episodes of paresthesia and slight loss of fine motor skills, denying loss of distal strength. She reported having a similar condition four years before in the contralateral limb, when she allegedly received conservative treatment.

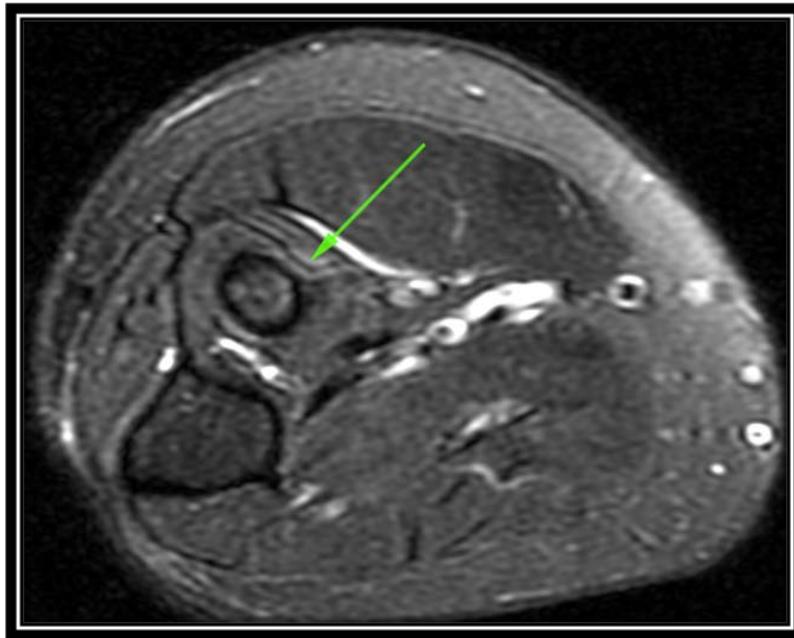
She sought medical assistance and an MRI exam and an ultrasound of the left elbow were obtained.

In the MRI, thickening of the common extensor tendon with internal heterogeneity were observed, more precisely at its insertion with the lateral epicondyle, combined with high signal intensity changes and abnormal thickening of

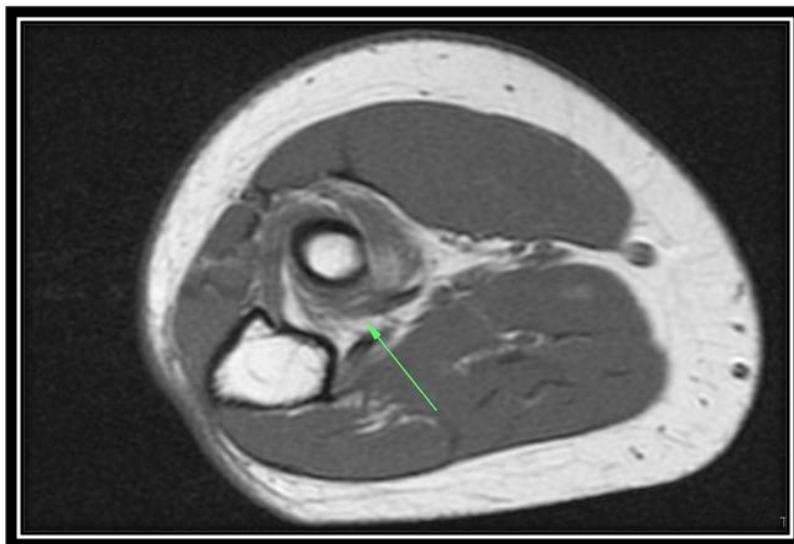
the posterior interosseous nerve (Figure 1 and Figure 2). There was also an apparent decrease in thickness and fatty infiltration of the supinator muscle, suggesting atrophy caused by subacute/chronic nerve compression (Figure 3).



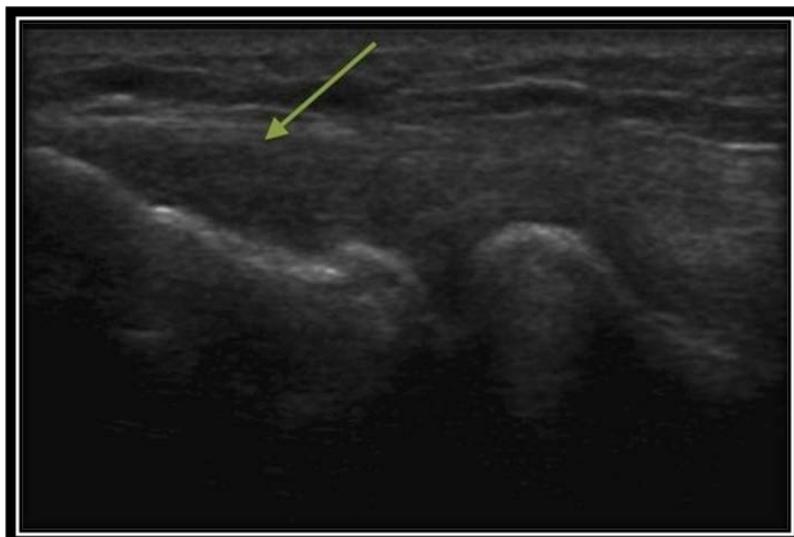
**Figure 1.** Coronal T2 fast spin-echo weighted fat-suppressed MRI of the elbow. Arrowhead demonstrates the lateral epicondylitis and the arrow demonstrates the high signal intensity changes within the posterior interosseous nerve



**Figure 2.** Axial T2 fast spin-echo weighted fat-suppressed MRI of the elbow demonstrates abnormal posterior interosseous nerve thickening combined with high signal intensity changes of this nerve between the superficial and deep heads of the supinator muscle (arrow)



**Figure 3.** Axial T1 spin-echo weighted non fat-suppressed MRI of the elbow demonstrates supinator muscle fat infiltration and mild atrophy (arrow)



**Figure 4.** Ultrasound image of the lateral compartment of the elbow that demonstrates thickening and hypoechogenicity of the conjoined tendon of the extensor muscles near the lateral epicondyle (arrow)



**Figure 5.** Ultrasound image of the elbow that demonstrates thickening and hypoechoogenicity of the posterior interosseous nerve in the region of the “Arcade of Fröhse” (arrow)

Ultrasound revealed thickening and hypoechoogenicity of the conjoined tendon of the extensor muscles near the lateral epicondyle (Figure 4), combined to thinning and heterogeneity with fatty replacement pattern of the muscle belly of the supinator muscle. The posterior interosseous nerve was also found thickened and hypoechoic in the region of the “Arcade of Fröhse” (Figure 5), making the PIN compressive syndrome the main differential diagnosis.

### 3. Discussion

The radial nerve originates from the posterior chord of the brachial plexus, proceeding along the radial sulcus in a spiral fashion and emerging close to the elbow, where it divides into a deep branch (the posterior interosseous nerve) and a superficial branch (the superficial radial nerve) [2].

The posterior interosseous nerve (PIN) passes beneath the supinator arch, continuing through the radial tunnel, dividing itself into a motor branch and a mixed branch. The motor branch innervates the extensor muscles of the fingers and thumb, the extensor carpi ulnaris and the abductor pollicis longus. The mixed branch, in turn, divides itself into a motor part innervating the deep forearm extensors, and a sensory part, which emerges in the radial aspect of the wrist [3].

Anatomically, there are five potential sites for the compression of the PIN in its course through the radial tunnel [4], represented by fibrous bands proximal to the radial head: the radial recurrent artery, which can compress the nerve against the radial head (“Leash of Henry”); the tendinous origin of the extensor carpi radialis brevis; the proximal portion of the supinator muscle, when in full pronation (“Arcade of Fröhse”); and the distal extremity of the supinator muscle.

Other causes of nerve compression, such as tumors (most commonly lipomas), cysts, inflammatory processes (rheumatoid arthritis, tuberculosis), trauma (hematoma, myositis ossificans) [5] and thickening of the connective tissue may produce similar signs and symptoms. It may also be related to stress activities and repetitive pronation, extension of the forearm and wrist flexion movements, as observed in tennis players and violinists [5]. The PIN

compressive syndrome is often confused with lateral epicondylitis, or tennis elbow, which may occur simultaneously.

Traditionally, patients complain about pain on the lateral aspect of the elbow, possibly leading to paresis or paralysis of the fingers and thumb. In the case discussed, the patient presented with pain on the lateral side of the left elbow with distal irradiation, combined with paresthesia of the hand, without loss of the wrist extension or finger abduction movements. In cases when there is complete denervation of the posterior interosseous nerve, the function of the extensor carpi radialis longus is usually preserved, maintaining movements of extension and radial deviation of the wrist. Partial lesions are observed when there is compression of isolated bundles of the PIN [2].

Electromyographic studies can reveal a definite slowing of conduction and low amplitude of the action potential of the nerve along the affected area, pointing to the severity and site of the lesion [1].

In imaging, various compressive neuropathies have been described in ultrasound and MRI exams. The ability of high frequency transducers to show neurological structures with exquisite details, combined with the dynamic feature of the study, makes ultrasound an attractive adjunct to clinical evaluation. Thus, the affected nerve is observed as thin hypoechoic fascicles, with more echogenic adjacent connective tissue. Its echogenicity is between the hypoechoogenicity of the muscles and the hyperechogenicity of the tendons [6].

The main signs found through this method are abnormal nerve thickening combined with abrupt change of caliber along the nerve axis at the site of compression [7]. In this particular patient, it was possible to visualize the thickening and hypoechoogenicity of the PIN along the “Arcade of Fröhse”.

More recently, due to fine spatial resolution and multiplanar capabilities, MRI has made it possible to evaluate the nerves. Normal peripheral nerves are seen, in anatomical locations well recognized by MRI, as low to intermediate signal intensity structures surrounded by fat.

Thereby, alterations in signal intensity, size or position of the nerve are suggestive of compression. Chronic advanced cases might present an increase in signal intensity of the corresponding muscle group due to muscle

atrophy with fatty infiltration [5]. In this patient, some alterations were observed which suggested atrophy of the supinator muscle due to chronic nerve compression. Through MRI, it is possible to determine the etiology of the nerve injury, its exact location and extent and rule out other conditions that may cause similar signs and symptoms (such as rupture of the rotator cuff) [5].

The nonsurgical treatment aims to reduce the peripheral nerve mechanosensitivity and to restore its neurodynamic function [8] by prescribing measures such as resting, change in daily activities, immobilization, as well as the use of anti-inflammatory medication. In refractory cases, a surgical attempt may be performed to decompress critical sites in the radial tunnel, specially at the arcade of Fröhse and the distal portion of the supinator muscle.

Therefore, early diagnosis and correct characterization of the signs of PIN compression syndrome are essential for the adequate management of these patients, which makes the knowledge of its different presentations in imaging methods, particularly MRI and Ultrasound, of great importance in the training of specialists in radiology and diagnostic imaging.

## Disclosures

Nothing to disclosure.

## References

- [1] Chien AJ, Jamadar DA, Jacobson JA, Hayes CW, Louis DS. Sonography and MR Imaging of Posterior Interosseous Nerve Syndrome with Surgical Correlation. *American Journal of Roentgenology*. 2003; 181: 219-221.
- [2] DANG AC, RODNER CM. Unusual compression neuropathies of the forearm, part I: radial nerve. *The Journal of hand surgery*, v. 34, n. 10, p. 1906-1914, 2009.
- [3] LOH YC et al. Neuroma of the distal posterior interosseous nerve A CAUSE OF IATROGENIC WRIST PAIN. *Journal of Bone & Joint Surgery, British Volume*, v. 80, n. 4, p. 629-630, 1998.
- [4] RAMOS R, Jesús R. Neuropatía compresiva del nervio interoseo posterior a nivel del codo (síndrome de la arcada de Fröhse): ¿debe incluirse en el listado de enfermedades profesionales?. *Medicina y Seguridad del Trabajo*, v. 56, n. 220, p. 248-256, 2010.
- [5] BELTRAN J, ROSENBERG ZS. Diagnosis of compressive and entrapment neuropathies of the upper extremity: value of MR imaging. *AJR. American journal of roentgenology*, v. 163, n. 3, p. 525-531, 1994.
- [6] Chiou HJ, Chou YH, Chiou SY, Liu JB, Chang CY. Peripheral Nerve Lesions: Role of High-Resolution US1. *Radiographics*, v. 23, n. 6, p. e15-e15, 2003.
- [7] DONG, Qian et al. Posterior Interosseous Nerve of the Elbow Normal Appearances Simulating Entrapment. *Journal of Ultrasound in Medicine*, v. 29, n. 5, p. 691-696, 2010.
- [8] ROBB, Andrew; SAJKO, Sandy. Conservative management of posterior interosseous neuropathy in an elite baseball pitcher's return to play: a case report and review of the literature. *The Journal of the Canadian Chiropractic Association*, v. 53, n. 4, p. 300, 2009.