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Anterior interosseous nerve syndrome diagnosis and intraoperative findings: A case report



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ABSTRACT

INTRODUCTION: Anterior Interosseous Nerve (AIN) is a motor branch from the Median nerve and runs deep in the forearm along with the anterior interosseous artery. It innervates three muscles in the forearm; an isolated palsy of these muscles is known as AIN Syndrome. There are several documented causes of AIN syndrome but its pathophysiology remains unclear.

PRESENTATION OF CASE: A 48-year old male that presented with right elbow pain and inability to flex his right interphalangeal joint of the thumb and the distal interphalangeal joint of the index finger. MR images denoted mild atrophy of the radial half of the flexor digitorum profundus and the pronator quadratus. Although there were no compressing lesions identifiable on MRI, Electrodiagnostic studies suggested compression neuropathy affecting the AIN. During surgical decompression of the median nerve in the proximal forearm, the operative findings were several tendinous fasciae and a tight fibrous arch of the flexor digitorum superficialis compressing the median nerve at the level of the AIN branch.

DISCUSSION: Different treatment schemes with reasonable outcome have been reported. Both nonsurgical and surgical intervention have been described in most of these schemes but differed in the timing of intervention with variable outcome.

CONCLUSION: Clinical suspicion should arise in the presence of isolated paralysis of the AIN-supplied muscles. MRI and electrodiagnostic studies will confirm the diagnosis and identify the etiology. The optimal treatment of AIN syndrome has not been established. We recommend surgical intervention in confirmed AIN syndrome from compression neuropathy, refractive to conservative therapy.

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1. Introduction

Anterior Interosseous nerve (AIN) syndrome is a rare syndrome that comprises less than 1% of all upper extremity nerve palsies, arising due to compression or inflammation of the AIN of the forearm [1]. The AIN is purely a motor branch of the median nerve that arises from its dorsomedial aspect, just inferior to the elbow. It is about 5–8 cm distal to the lateral epicondyle and 4 cm distal to the medial epicondyle. It passes distally, along the anterior interosseous membrane with the anterior interosseous artery. The AIN innervates three muscles in the forearm: flexor pollicis longus (FPL), pronator quadratus (PQ), and the radial half of flexor digitorum profundus (FDP) [2]. In the hand, the median nerve innervates 5 muscles: The 2 lateral lumbricals, opponens pollicis, abductor pollicis brevis, and flexor pollicis brevis [3].

2. Presentation of case

A 48-year old otherwise healthy male, presented to our orthopedic outpatient clinic complaining of a 1-week history pain in his right elbow associated with weakness in his right index finger and thumb. Physical examination showed weakness of the FLP and FDP to the index finger with a positive Pinch Grip test (Froment's sign). Examination of the interphalangeal (IP) joint of the thumb and distal interphalangeal (DIP) joints of the 2nd and 3rd digits all revealed powers (3/5), where the patient could overcome gravity, but not resistance. Full neurological and musculoskeletal examinations were otherwise normal. With the impression of AIN syndrome, the patient was initially treated conservatively with rest, analgesia with anti-inflammatory medications and physiotherapy for forearm flexor muscle stretching exercises and activity modification. Upon follow up 3-months later, the patient's symptoms progressed. Physical examination showed paralysis at the IP joint of the thumb and DIP joints at the 2nd and 3rd digits. Magnetic resonance imaging (MRI) scans of the forearm revealed abnormal high signal intensity of the both the PQ and the radial FDP muscles on proton density fat-saturated images (Fig. 1) and mild atrophy represented by some fatty streaks on T1 weighted images (T1WI)(Fig. 2).

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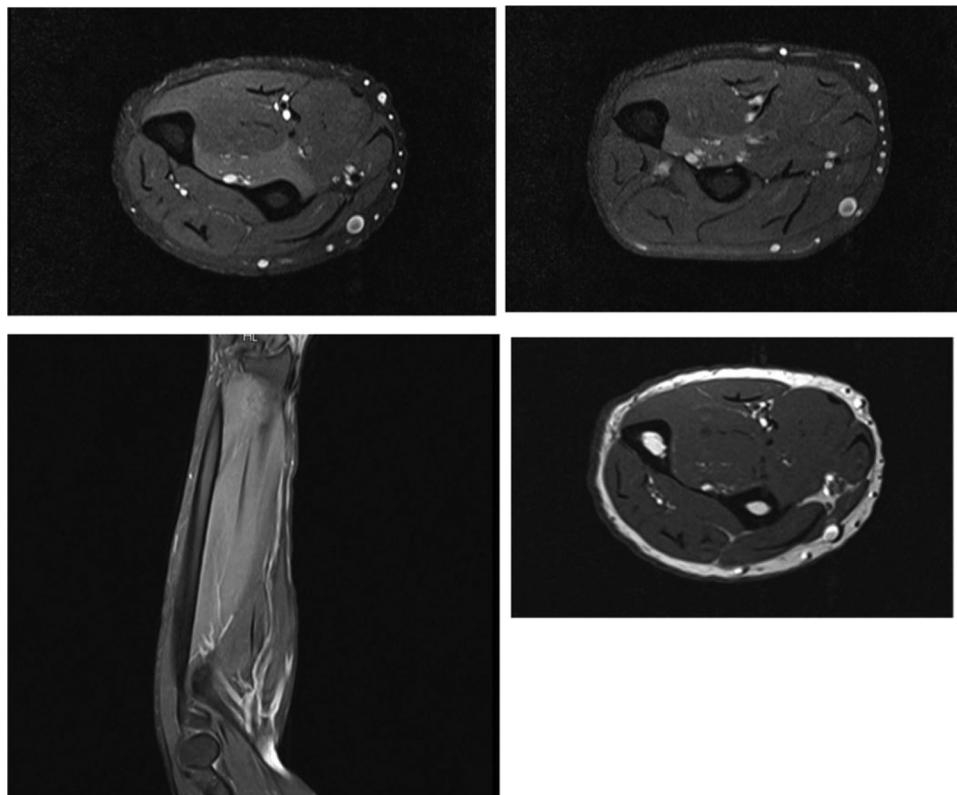


Fig. 1. Axial and sagittal fat-saturated proton density images demonstrating diffuse increased SI of the proximal portion of the flexor digitorum profundus muscle and axial T1WI demonstrates decreased muscle bulk and a few streaks of high SI within the flexor digitorum profundus muscle. Both images denote mild atrophy.

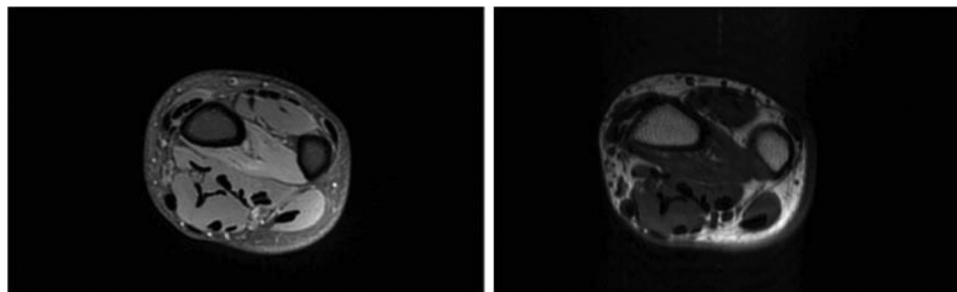


Fig. 2. Non-contrast MR images of the distal forearm: axial T1WI demonstrates few streaks of high SI seen within the pronator quadratus muscle and axial fat-saturated proton density image demonstrating diffuse increased SI of the pronator quadratus muscle. Both images denote mild atrophy.

Although there were no compressing lesions identifiable on MRI, electrodiagnostic studies by needle examination suggested compression neuropathy affecting the AIN as the cause of paralysis of the FPL, the radial FDP, and PQ muscles. After 3 months of failed conservative management, the patient underwent complete surgical decompression of the median nerve throughout its course in the proximal forearm through a lazy S-shaped incision over the volar forearm. With careful dissection from proximal to distal, the median nerve was exposed releasing the lacertus fibrosus, the deep head of the pronator teres muscle, the proximal fascial margin of the flexor digitorum superficialis arch and other possible fibrous bands or edges compressing the nerve. Several tendinous fasciae and a tight fibrous arch of the flexor digitorum superficialis were also found to compress the median nerve at the level of the AIN branch (Fig. 3), which were surgically released. Postoperatively, the patient was followed up for 6 months with slight improvements in his symptoms. His pain was well controlled with oral analgesia. His physical examination revealed power 2 at the IP joint of the thumb

and DIP joints at the 2nd and 3rd digits, where the patient was able to flex with gravity eliminated

3. Discussion

Anterior interosseous nerve syndrome is a pure motor neuropathy. Nevertheless, associated dull pain in the forearm had been reported [4]. Patients with AIN syndrome are typically unable to form an “O” by using the index finger and thumb due to paralysis of FPL and the radial FDP (impaired flexion of the interphalangeal joint of the thumb and the distal interphalangeal joint of the index finger). The patients will lose the ability to button their shirts or turn on their car keys to start it, for example. On physical examination, the Pinch Grip test is positive where patients will not be able to demonstrate the “OK” sign, instead clamping the sheet between an extended thumb and index finger [5]. The absence of sensory deficits in AIN syndrome differentiates it from carpal tunnel syndrome and other nerve palsies (e.g., Pronator Syndrome,

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