

Posterior Interosseous Nerve Syndrome: Diagnosis and Surgical Management: A Case Report

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Abstract

Radial nerve compression at the elbow is rare and has variable clinical presentations. Compression of the deep motor branch at the arcade of Frohse constitutes a rare syndrome and could have diverse etiologies. It leads to paralysis of finger and wrist extensors. We report the case of a 20 years old male who consulted for weakness in the extensor muscles of the right hand that had been evolving slowly over 8 years without sensory involvement. On electromyogram, compression of the radial nerve at the radial tunnel was suspected and the exact location was determined with echography to be at the arcade of Frohse. The patient was then operated upon and the recovery of motor functions post-op was satisfactory.

Keywords: Radial nerve compression; Arcade of frohse syndrome; Posterior interosseous nerve; Post traumatic

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Introduction

Radial nerve compression at the elbow is rare and has variable clinical presentations. It occurs in less than 0.7% of all entrapment neuropathies of the upper limbs [1]. Its origin could be anatomical, tumoral or post traumatic. The proximal arch of the superficial head of the supinator muscle, known as the arcade of Frohse [2] is one of the anatomical features of the lateral region of the elbow responsible for compressing the deep motor branch of the radial nerve [3] or Posterior Iterosseous Nerve (PIN). PIN compression is frequently associated with hypertrophy of Frohse's arcade [4]. This compression is rare [1] and typically occurs outside the radial tunnel. It was first described by Guillain and Courtellemont [5]. PIN compression is responsible for complete or partial paralysis of the finger extensors, thumb extensors and the extensor ulnar carpi [6]. We report the case of a 20 years old male student who consulted for weakness of the right hand extensors which had been progressing slowly over 8 years with no sensory involvement. An electromyogram was done from which radial nerve compression at the radial tunnel was suspected and the precise location was identified on echography at the arcade of Frohse. The patient underwent surgical decompression and the post op recovery of motor functions was satisfactory.

Case Study

History

This was a 20 years old right-handed male student with no

contributive past history who consulted for weakness in his right hand with difficulty writing, evolving progressively for about 8 years. On physical examination, he could not extend his fingers at the metacarpophalangeal joints and only weakly extended his wrist (**Figure 1**). The sensory exam was normal. An Electromyogram was done revealing the absence of motor potentials along the radial nerve (**Figure 2**). At rest, there were no active signs of denervation and with voluntary muscle contraction; there were no potentials in the motor units of the supinator longus (**Figure 3**) and the extensor indicis proprius (**Figure 4**). The amplitudes of the sensory potentials of the radial (**Figure 5**), median and ulnar nerves were normal and symmetrical. ENMG concluded on a compression of the radial nerve at the radial tunnel. An ultrasound scan was done which revealed thickening of the arcade of Frohse with a transverse diameter of the Posterior Interosseous Nerve (PIN) of 2.1mm (**Figure 6**). Surgical exploration showed a thickened fibrous arcade of Frohse (**Figure 7**) which was sectioned liberating the PIN. The evolution was marked 6 months later by a net improvement in the muscle strength and the patient has resumed writing.

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Figure 1: Physical examination.

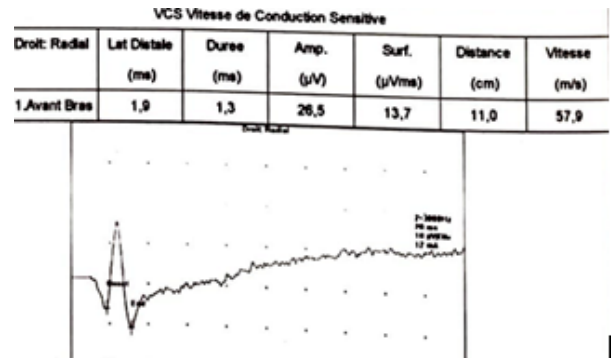


Figure 5: Normal amplitude of the sensory potentials of the radial.

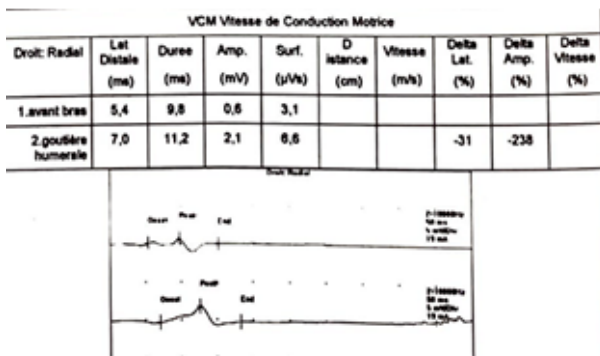


Figure 2: Absence of motor potentials along the radial nerve.

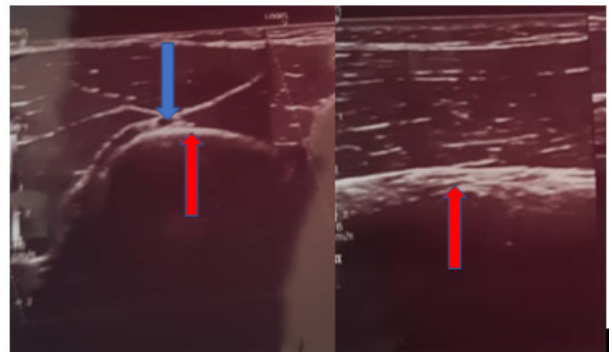


Figure 6: Left: Deep branch of the radial nerve (blue arrow), Arcade of Frohse (red arrow), Right: arcade of Frohse (red arrow).

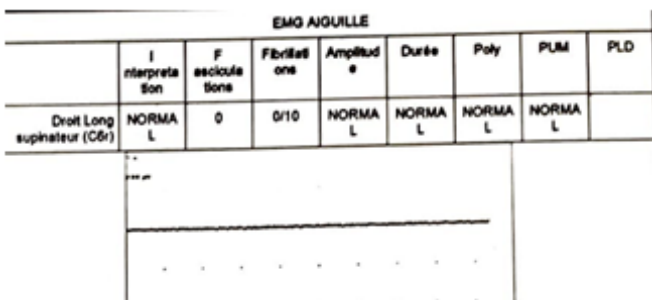


Figure 3: No potentials in the motor units of the supinator longus.

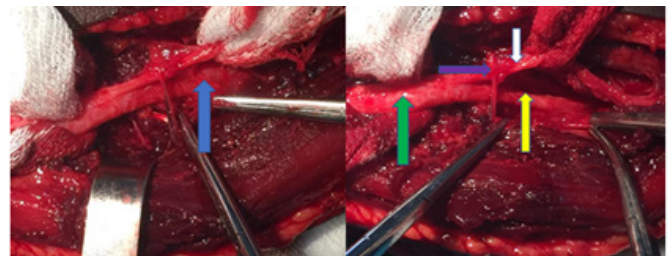


Figure 7: Left: arcade of Frohse (blue arrow), Right: radial nerve (green arrow), sensory branch (white arrow), deep branch (yellow arrow), and recurrent radial artery (indigo arrow).

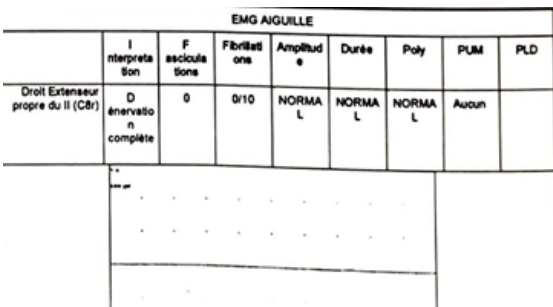


Figure 4: No potentials in the motor units of the extensor indicis proprius.

Discussion

Posterior Interosseous Nerve (PIN) compression at the arcade of Frohse is a very rare entity [1]. PIN compression syndrome was first described by Agnew in 1863 [7] and preferentially affects men on their dominant side [8]. Anatomically, the deep branch of the radial nerve or posterior interosseous nerve goes through the arcade of Frohse or the supinator arch at the elbow, passing between the two heads of the supinator muscle. There are four distinct anatomic types for the supinator arch [9]: tendinous, musculo-tendinous, muscular and membranous. A morphometric study of Frohse's arcade on 27 elbow joints of cadavers showed a predominance of the tendinous type [10] and concluded that the presence of thick tendinous forms could predispose to the

development of chronic PIN compressions. Clinically it presents as paralysis or paresis of the extensor muscles of the fingers and the abductor pollicis longus. Medical imaging is useful in identifying the causes of compression. The etiologies could be extrinsic or intrinsic. Standard radiographs could reveal bone lesions. MRI offers better and more precise visibility of soft tissues and may portray hypersignals on the nerve. Ultrasound is both useful for the measurement of the diameter of the PIN on a transverse section (mean value: 1.23+/- 0.23 mm) at the level of the supinator arch [11], and as a complement to EMG for more precise localization of the compression site [12,13]. An increase in the diameter of the PIN on ultrasound (transverse section) at the supinator arch and the presence of structural anomalies are arguments for compression at this level. Electroneuromyography has a contributory role in the diagnosis before surgical exploration [14]. Our patient was a right-handed student and presented with a pure motor deficit in his right hand. He did not participate in sports requiring a sustained alternation of pronation and supination movements, which is the most common etiology of Frohse's arcade syndrome [15]. Standard X-ray of the right elbow joint was normal and EMG concluded on PIN compression at the radial tunnel. However, the ultrasound showed thickening of the arcade of Frohse and a large diameter of the PIN on cross section. This multimodal approach to diagnosis is recommended [16] (clinical, EMG, sonography) and has allowed a reasonable surgical indication to be established with satisfactory result.

Conclusion

Frohse's arcade syndrome is a rare condition. The contribution of ultrasound coupled with EMG is very helpful in the diagnosis and allows for a reasonable surgical indication to be established with satisfactory results.

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