










Posterior interosseous nerve syndrome: a case report and surgical treatment

Síndrome do nervo interósseo posterior: um relato de caso e abordagem cirúrgica



Emily de Carvalho Batista¹  Erlan Pércio Lopes Rufino² 
Higor Emmanuel Silva de Jesus³  Ana Leticia Lacerda Paiva¹ 
George Gláucio Carneiro Leão de Guimarães Filho¹  Fernando Augusto Pacífico¹ 
Emily Rodrigues Maia⁴ 

¹ Faculdade de Medicina de Olinda. Olinda, Pernambuco, Brazil.

² Real Hospital Português de Beneficência. Recife, Pernambuco, Brazil.

³ Afya Faculdade de Ciências Médicas. Jaboatão dos Guararapes, Pernambuco, Brazil.

⁴ Faculdade Pernambucana de Saúde. Recife, Pernambuco, Brazil

Abstract

The posterior interosseous nerve compression syndrome (PINCS) is one of many compression neuropathies of the upper body and affects the extensor compartment of the forearm. Although conservative treatment is efficient in most cases, persistent situations can demand surgery for decompression. This study aimed to report a case of posterior interosseous nerve compression syndrome treated with surgical decompression due to the persistence of symptoms after the failure of the conservative treatment. Furthermore, the study highlighted the importance of following post-surgical orientations to achieve full recovery and minimize possible sequelae.

Keywords: Radial nerve; Radial neuropathy; Nerve compression syndromes; Surgery.

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Corresponding author:

Emily de Carvalho Batista

E-mail: emilycarvalhob@outlook.com.br

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Resumo

A síndrome de compressão do nervo interósseo posterior (SCINP) é uma das muitas neuropatias compressivas da parte superior do corpo e afeta o compartimento extensor do antebraço. Embora o tratamento conservador seja eficiente na maioria dos casos, situações persistentes podem demandar cirurgia para descompressão. Este estudo teve como objetivo relatar um caso de síndrome de compressão do nervo interósseo posterior tratado com descompressão cirúrgica devido à persistência dos sintomas após a falha do tratamento conservador. Além disso, o estudo destacou a importância de seguir as orientações pós-cirúrgicas para obter recuperação completa e minimizar possíveis sequelas.

Palavras-chaves: Nervo radial; Neuropatia radial; Síndromes de compressão nervosa; Cirurgia.

INTRODUCTION

Several compression neuropathies affect upper body limbs, and the anatomical and functional knowledge of each nerve is paramount to performing a correct diagnosis of compression¹. The posterior interosseous nerve (PIN) is a branch of the profound radial nerve that originates in the brachial plexus².

The posterior interosseous nerve compression syndrome (PINCS) occurs when the nerve is compressed or irritated, causing pain, muscle weakness, and loss of function of the innervated muscles³. The radial nerve (RN) descends in the arm and divides into superficial and deep nerves in the proximal forearm. The deep branch of the posterior forearm emerges as the NIP, responsible mainly for the innervation of the extensor muscles of the forearm and the hand, providing motor innervation to the posterior forearm and extending up to the fourth dorsal compartment of the wrist².

The compression can occur in several points alongside the nerve trajectory: the arcade of Frohse (AF; i.e., a fibrous band in the supinator muscle where the nerve passes), the edge of the supinator, and fibrous bands surrounding the proximal radius⁴. Causes may include direct trauma or repetitive lesions (particularly of the forearm), tumors or ganglion cysts, and inflammation or cicatrization due to inflammatory or surgical conditions⁴.

PINCS is considered the most common compressive syndrome, being the third most common regarding the main branches of the brachial plexus (after carpal tunnel and cubital tunnel syndromes). The incidence of nerve compression of RN was estimated at 2.97 for men and 1.42 for women (100,000 people/year). The proportion of surgeries was 0.5 and 0.8, respectively. The incidence may increase until middle age, followed by a decrease. Still, these data vary among studies, reporting the existence of 3.53 cases per 100,000 people/year^{4,5}.

The symptoms develop gradually and include weakness in thumb and finger extension; however, the wrist extension is preserved due to the innervation of the extensor carpi radialis longus⁶. Prolonged compression can lead to nervous ischemia, impairing neural function⁴.

The treatment encompasses conservative and surgical treatments and requires direction and individualization. The first consists of reducing inflammation and swelling around the nervous structure using splints to reduce movements, non-steroidal anti-inflammatory medicaments, changes in lifestyle habits, local injections of corticosteroids, and physical therapy. Alternatively, surgery is an option when the conservative treatment shows no improvement after three to six months or when the patient presents pain after 12 weeks⁴. The type of procedure will depend on the site of injury and may include lesion resection, nerve release, supinator elongation, or synovectomy^{3,4}.

Thus, the present study aimed to report a case of PINCS treated by surgical decompression after symptoms persisted upon conservative treatment.

CASE REPORT

A female patient, 35 years old, works as a lawyer with an emphasis on typing activities, sedentary, previously healthy, and with no prior injuries, reported the onset of paresthesia in the extension of fingers of her right hand one year ago. The symptoms aggravated when the patient was pregnant, presenting loss of motor function and paresthesia of the supinator, fingers, and little finger common extensor upon physical examination. Furthermore, the movement of the abductor pollicis longus, the extensor pollicis brevis and longus of the thumb, and the extensor indicis proprius was reduced. The physical examination also identified a positive Tinel sign at the level of the supinator muscle close to the cubital fossa.

Considering the clinical findings, electroneuromyography and ultrasound of the right forearm were requested; the former showed signs of radial nerve injury in the posterior interosseous branch, and the latter revealed signs of compression at the level of the AF with thickening of the PIN.

Although the initial treatment for PINCS was conservative (i.e., pain relief medication and motor physical therapy), the patient did not present any improvement and underwent surgery for decompression of the PIN. The surgery is reserved only for refractory cases for at least three months of the conservative treatment^{3,4}.

In this context, the surgical decompression was performed in the proximal section of the anterior side of the forearm, close to the medial edge of the brachioradialis muscle. A layered dissection was conducted, releasing the compression areas, including the superficial fibrous bands over the radiocapitellar joint, the fibrous edge of the extensor carpi radialis brevis, the AF, and the distal edge of the supinator⁷.

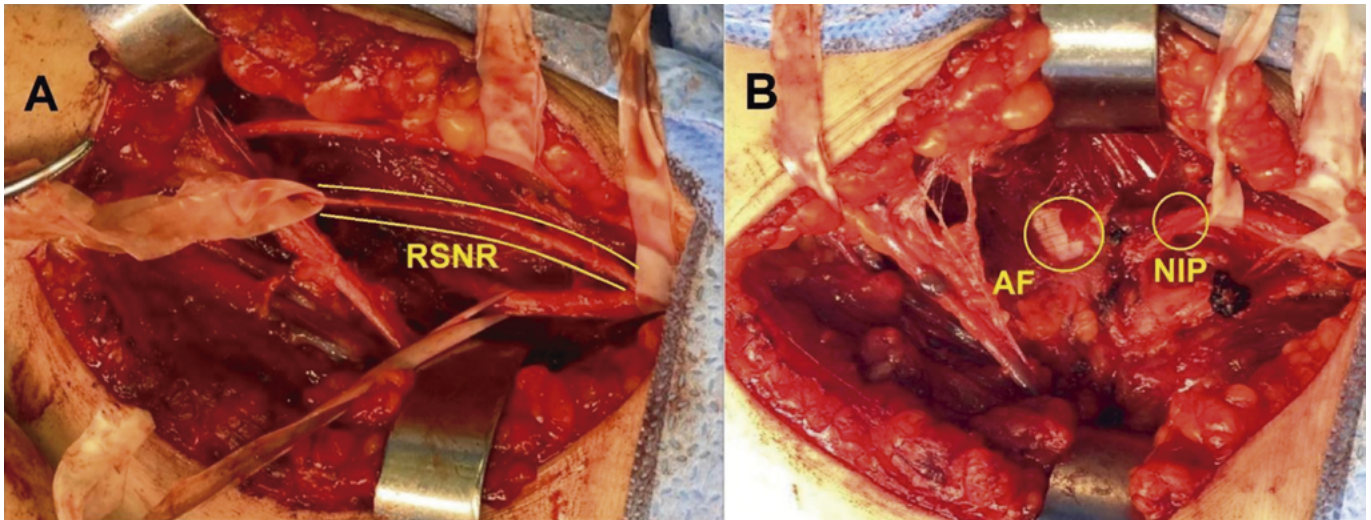


Figure 1. Proximal region of the anterior side of the forearms, close to the medial edge of the brachioradialis muscle. A: Superficial branch of the radial nerve (SBRN); B: arcade of Frohse (AF) and posterior interosseous nerve (PIN).

During the arcade opening, nerve thickening was observed, and the procedure provided complete decompression.

After two years and one month of the surgery, the patient did not present a satisfactory clinical improvement, with persistent pain and the inability to perform daily manual activities. The patient did not follow the recommended physical therapy rehabilitation protocol after surgery, which could have improved motor recovery.

DISCUSSION

The RN is the main nerve that arises from the posterior fascia of the brachial plexus, innervating all the muscles in the posterior compartment of the arm and the forearm. This nerve travels from the posterior to the anterior compartment, wrapping around the radial groove of the humerus and passing through the intermuscular septum between the brachialis (medially) and the brachioradialis (laterally). Then, the RN continues distally, emerging between the brachioradialis and the extensor carpi radialis longus and dividing into the superficial branch of the RN and the PIN (i.e., the deep branch of the RN). The radial tunnel is a musculotendinous structure that extends from the lateral epicondyle of the humerus to the distal edge of the supinator muscle. Therefore, the proximal edge of the superficial head of the supinator can form the AF, a fibrous arch of variable thickness that has been described as the most common site of PIN compression⁵.

The PIN compression can manifest as PINCS, leading to motor paralysis, or as radial tunnel syndrome, with impaired sensibility and pain in the lateral side of the elbow and forearm,

which can be confused with lateral epicondylitis. This condition worsens with repetitive pronation and supination of the forearm. On physical examination, the syndrome is marked by pain upon palpation of the PIN, especially in the AF, and may include discomfort with resisted middle finger or wrist extension (i.e., Milch and Maudsley signs), as well as increased pain during resisted pronation and supination^{7,8}.

The exact primary etiology is not fully understood, but it can occur by trauma or lesions that take space, such as rheumatoid arthritis, brachial neuritis, and spontaneous compression. Repetitive pronation and supination activities, such as typing (which is correlated to the case presented in this study), the frequent use of manual tools, and physical exercises that increase the stimulation of the forearm can also lead to PINCS. Some individuals present anatomical variations, including the narrowing of the channel where the nerve passes, that leave the posterior interosseous nerves more susceptible to compression. During pregnancy, hormonal alterations and increased liquid in the tissues may cause edema in the hand and wrists, increasing the risk of overload in the PIN, as observed in the presented case, since the patient reported worsened symptoms when pregnant and only sought the neurosurgical team after giving birth^{5,7}.

The diagnostic assessment involves a combination of medical history, physical examination, and complementary tests. A detailed medical history seeks to understand the symptoms and their duration, the triggering factors, and prior medical conditions to discard other causes. The physical examination focuses on the affected area, identifying pain, muscle weakness, and sensory changes. Specific tests may be conducted to evaluate nerve function, and complementary exams (e.g., nerve conduction study) are paramount to confirm the diagnosis by measuring the speed of electrical signals in the affected nerve. Electroneuromyography registers the electric activity on the muscle and the nerve response to electrical stimuli, identifying possible compressions or lesions. Image exams, such as ultrasound or magnetic resonance imaging, are requested to visualize anatomical structures of the forearm, including bones, muscles, and nerves, aiming to discover underlying causes of compression^{6,8,9,10}.

The PINCS treatment varies according to the intensity of the symptoms and the cause of the compression. Conservative treatments include rest, moderating physical activity, and ergonomic postures. The immobilization with wrist splints reduces the pressure on the nerve and helps to heal, especially in acute infections. Analgesic or non-steroidal anti-inflammatory drugs are used to treat pain and inflammation, and physical therapy is essential, including strengthening and flexibility exercises, as well as myofascial release techniques. Corticosteroid injections may be indicated to reduce inflammation in specific cases, usually guided by image exams. The surgery is considered in severe cases or cases unresponsive to conservative treatment, aiming at releasing nerve pressure, with the surgery being defined by the cause of the compression^{6,9,10}.

The surgery performs a lateral-anterior incision along the anterior side of the elbow joint,

five centimeters above the flexor crease, at the lateral edge of the biceps brachii muscle, and proceeds along this edge to the elbow joint, avoiding crossing the flexion crease at a 90° angle. Then, the incision curves medially following the medial edge of the brachioradialis muscle. During this stage, a careful dissection is performed between the brachioradialis and the extensor digitorum muscles, allowing visualization of the RN and its main branches: the PIN and the radial sensory nerve. The isolation of PIN is conducted with gentle dissection and the aid of a 2.5x magnifying surgical loupe, opening the AF to follow the nerve trajectory to its exit from the supinator muscle. This phase includes a compression test during the carpal flexion and forced pronation of the forearm, providing adequate nerve evaluation. The closing is performed in two plans with different sutures to close subcutaneous tissue and the skin^{6,9,11}.

PINCS prognosis depends on the cause of the compression, the severity of the nerve lesion, and the quality of the treatment. An early diagnosis and proper therapeutic resources generally ensure significant improvement and full recovery in most cases. An accurate diagnosis obtained through detailed clinical examination is paramount^{6,11}. Although several patients experience a decrease in symptoms and the recovery of nerve function with time, severe cases or insufficient treatment may lead to permanent lesions, causing persistent symptoms or loss of function. The prognosis varies with the cause, the severity of the compression, the general health of the patient, and the adherence to treatment^{4,6}.

In summary, the prompt identification of PINCS and the proper intervention are fundamental to achieve positive results. An early diagnosis reduces symptoms, prevents complications, and facilitates nerve function recovery. Adherence to rigorous post-operative orientations is crucial to treatment success, favoring full recovery and minimizing sequela. This study also highlights the importance of multidisciplinary collaboration to achieve a better quality of life for individuals^{4,6}.

CONFLICT OF INTEREST

Nothing to declare.

AUTHOR CONTRIBUTIONS

ECB - Conceptualization, Writing – original manuscript and Writing – review and editing; **EPLR** - Conceptualization, Supervision, and Writing –review and editing; **HESJ** - Writing – original manuscript and Writing – review and editing; **ERM** - Writing – original manuscript and Writing – review and editing; **ALLP** - Writing – original manuscript and Writing – review and editing; **GG-CLGF** - Conceptualization, Writing – original manuscript and Writing – review and editing; **FAP** - Conceptualization, Data curation, investigation, Methods, Project management, Resources, Supervision, Writing – original manuscript and Writing – review and editing. All authors approved the final version.

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