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Tumor Discovery

CASE REPORT

Compressive neuropathy of the branch of the posterior interosseous nerve with isolated paralysis of the extensor digitorum longus muscle: A case report

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Abstract

Compressive neuropathies occur when a nerve is compressed in a closed osteofibrous tunnel. Here, we report a case of isolated paralysis of the extensor digitorum longus muscle due to compression of a branch of the posterior interosseous nerve (PIN) in the proximal forearm in a 56-year-old man presented with progressive weakness of the left hand over 18 months. During the first time of clinical consultation, we found a swelling in the extensor aspect of the left proximal forearm, and a firm, non-tender, mobile swelling located deep in the extensor muscles, without other muscle involvement. The sensation was intact. An ultrasound scan and magnetic resonance imaging scan confirmed the diagnosis of an intramuscular lipoma, which was further confirmed with histopathologic examination. The patient was treated with an excision of the lipoma and decompression of the nerve. Post-operatively, the patient was given regular physiotherapy, through which he achieved improvement in his finger extension within a year. This is an extremely rare case of isolated paralysis of the extensor digitorum longus due to compression of the branch of the PIN by an intermuscular lipoma in the forearms.

Keywords: Posterior interosseous nerve palsy; Finger drop; Extensor digitorum longus paralysis; Intramuscular lipoma

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1. Background

Compressive neuropathies are caused by increased pressure in the nerves as the nerve pass through a closed osteofibrous tunnel, whose capacity is not commensurate with the content. In most cases, compressive neuropathies are idiopathic. The peripheral nerve is usually resistant to acute microvascular compressive changes due to low pressure. Prolonged compression of the nerve can cause increased intracellular permeability, leading to interfascicular edema and a delay in nerve conduction. Large-diameter nerve fibers are more susceptible to compression. Friction and traction can also cause nerve ischemia. Compressive neuropathies rarely occur in radial nerve[1].

Compressive neuropathies may occur as a result of neural sheath tumors and non-neural sheath tumors. Ganglioma, lymphangioma, hemangioma, myeloblastoma,

and lipoma are some of the non-neural sheath tumors that induce compressive neuropathy, with lipoma being regarded as the most common cause. Lipomas are benign soft-tissue tumors arising from adipose tissue. They are also called universal tumors because they can occur in any part of the body[2]. According to histopathological findings, lipomas are divided into lipoblastoma (immature fat cells), hibernomas (mature brown fat cells), and lipomas (mature white fat cells). Lipomas can cause neuropathy in four different ways: (i) Extrinsic compression by solitary lipoma, (ii) intrinsic compression by encapsulated lipoma, (iii) compression on the nerves by the fibrofatty masses of lipofibromatous hamartomas, and (iv) compression by macrodystrophia lipomatosa, causing localized gigantism of the extremities, especially toes and fingers. Solitary lipoma is the most common type of lipoma that produces nerve lesions. A solitary lipoma can compress a nerve located at superficial or deep locations[3]. On the other hand, intramuscular lipomas are very rare, and they are located deep within the muscle fibers[4].

The occurrence of nerve palsy caused by lipoma is rare. The majority of publications about lipoma causing compressive neuropathies are either case reports or small case series. There are few reports of lipoma causing posterior interosseous nerve (PIN) palsy[4]. Here, we report a case of isolated paralysis of the extensor digitorum longus due to compression of the PIN by an intermuscular lipoma in the proximal part of the left forearm.

2. Case presentation

A 56-year-old man presenting with progressive weakness in his left hand for 18 months approached us in December 2019. During the first time of clinical consultation, we found a 5 × 2.5 × 2 cm soft swelling over the proximal part of the left forearm. There was a drop in the middle and ring fingers (Figure 1). The extension of the wrist and metacarpophalangeal joints of the thumb and other fingers was unaffected. There was no sensory involvement. Radiograms of the neck and forearm showed normal results. Magnetic resonance imaging revealed a 2.2 × 2.4 × 5.2 cm lesion in the extensor compartment of the left forearm. It appeared hyperintense on T1-weighted and T2-weight images, suppressed on short tau inversion recovery images with no diffusion restrictions, and blooming on gradient echo sequences or post-contrast enhancement. The lesion extends to the flexor compartment over the superior interosseous membrane. The lesion closely abutted and compressed the PIN just after exiting from the supinator muscle. Given these findings, the lesion was diagnosed as an intermuscular lipoma (Figure 2A).

After obtaining his informed consent, the patient was treated with excision of the lipoma and decompression



Figure 1. The dropping of the middle and ring finger and normal extension of other fingers of the left hand.

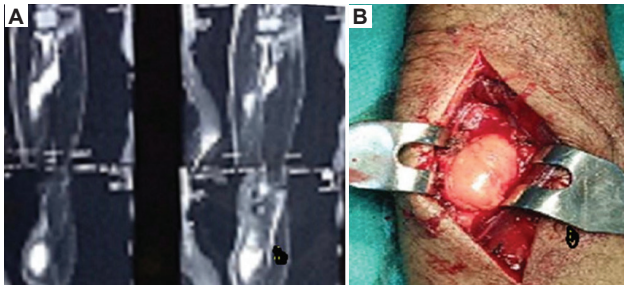


Figure 2. (A) Magnetic resonance imaging scan showed a 2.2 × 2.4 × 5.2 cm lesion in the extensor compartment of the left forearm. It appeared hyperintense on the T1-weighted and T2-weighted images. (B) Intraoperative photograph showed that the tumor was lying beneath the extensor carpi ulnaris muscle over the supinator.

of the PIN. The procedure was performed under a supraclavicular block. A 10 cm long curvilinear incision was made in the proximal forearm dorsally. The tumor was located beneath the extensor carpi ulnaris muscle over the supinator (Figure 2B). The lipoma was removed completely. Upon inspection, the PIN was found to be intact. A gross examination of the tumor demonstrated a well-circumscribed yellow mass consistent with lipoma. The patient was given a long arm slab until suture removal. The sutures were removed after 10 days. The diagnosis of lipoma was also corroborated by histopathological approaches (Figure 3A and B). Thereafter, he was prescribed regular physiotherapy and electrical stimulation from the physical medicine and rehabilitation center. His finger extension improved considerably after a year.

3. Discussion

The PIN originates as a continuation of the deep branch of the radial nerve. After piercing the lateral intermuscular

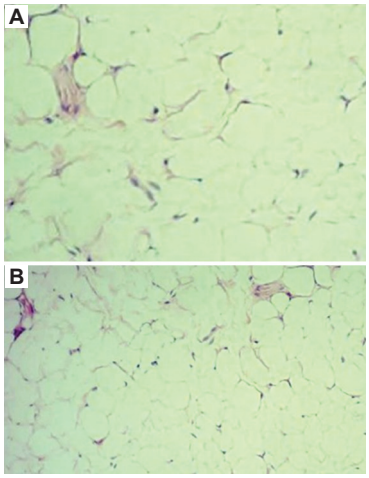


Figure 3. Hematoxylin-eosin-stained specimens showed mature adipocytes without atypia and a uniform distribution of vacuoles in the cytoplasm. (A) Low power ×10; (B) high power ×40.

septum at approximately 10 cm above the lateral epicondyle, the radial nerve traverses between the brachialis muscle medially and the extensor carpi radialis longus muscle laterally. The lateral epicondyle branches into superficial and deep branches, and the superficial branch continues as a sensory branch through the flexor compartment of the forearm. The deep branch of the radial nerve innervates the extensor carpi radialis brevis and supinator muscle before it enters the supinator between its two heads. Then, it winds around the neck of the radius to reach the posterior compartment of the forearm. From here onward, it is known as the PIN.

After exiting the supinator, the main trunk of the PIN gives three branches to extensor digitorum longus, extensor digiti minimi, and extensor carpi ulnaris. Then, it divides into a long branch which innervates extensor pollicic longus and extensor indicis and a short branch innervating abductor pollicic longus and extensor pollicis brevis. There are many variations in the origin of the branch to the extensor carpi radialis brevis. It can originate from the radial nerve, the superficial branch of the radial nerve, or the PIN[5]. The clinical manifestations of PIN palsy vary according to the site of involvement. The long radial extensors are usually spared in typical PIN palsy. Usually, the ulnar extensor and long extensor of fingers will be affected. When the patient is attempting to extend the wrist, there is a radial deviation due to the unopposed action of the extensor carpi radialis longus. There will not be any associated deep tendon reflex or sensory abnormalities in PIN palsy[6].

PIN syndrome may result in finger and thumb drops. This is due to the entrapment of the deep branch of the radial nerve between the two heads of the supinator. The common causes for this entrapment are fracture dislocation of the proximal radius and rheumatoid arthritis. The milder form of radial tunnel syndrome resembles the tennis elbow. The main structures causing entrapment of the deep branch of the radial nerve in the tunnel are the capsule-tendon-aponeurotic complex in the anterior aspect of the radiohumeral joint, the vascular arcade formed by the recurrent branch of the radial artery, and the arcade formed by the medial edge of the extensor carpi radialis brevis and the arcade of Frohse[7].

Compressive neuropathies of PIN may remain undiagnosed for long. Sometimes, it may mimic tennis elbow[8]. The first case of parosteal lipoma surrounding the neck of the radius causing weakness of finger extensors was reported by Richmond in 1953[9]. In an analysis of 31 cases of non-traumatic PIN palsies, 14 patients had entrapment of nerves within the supinator. The most common cause of compression in their series was the ganglion, followed by lipoma[10]. Another case showed that the excision of soft-tissue chondroma led to a complete resolution of symptoms of PIN palsy[11].

The anterior and posterior approaches to the proximal radius can injure the PIN. The anterior approach requires more muscle retraction but is relatively safer. Besides, Monteggia fracture can produce PIN palsy either at the time of injury or occur during treatment of neglected Monteggia fractures[12,13]. van den Bogaerde and Shin reported a case of PIN palsy due to nerve incarceration with EndoButton during the repair of distal biceps rupture[14]. Of note, inflammatory myofibroblastic pseudotumors, rheumatoid arthritis, false aneurysm, and psoriatic arthritis rarely cause compressive neuropathy of the PIN[15-18].

In our case, the patient developed isolated paralysis of the extensor digitorum longus of the left forearm and had difficulty extending the metacarpophalangeal joint of the middle and ring fingers. We believe that this is due to the peculiar anatomy of the PIN. After winding around the neck of the radius, the main trunk of the nerve splits into three independent branches innervating extensor digitorum longus, extensor digiti minimi, and extensor carpi ulnaris. Compression only occurred to the branch innervating extensor digitorum longus, sparing branches to the extensor indicis, and extensor digiti minimi.

4. Conclusion

Isolated muscle weakness due to compressive neuropathy of the PIN is extremely rare. This is a rare case of isolated paralysis of extensor digitorum longus due to

the compression of a branch of PIN by an intermuscular lipoma.

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Conflict of interest

The authors have no conflict of interest in publishing this report.

Author contributions

Conceptualization: Balaji Zacharia
Investigation: All authors
Methodology: Balaji Zacharia, Puneeth K. Pai
Formal analysis: All authors
Writing – original draft: All authors
Writing – review & editing: All authors

Ethics approval and consent to participate

According to the institutional policy, case reports are exempted from IRB clearance.

Consent for publication

We have obtained informed written consent from the patient for publication of this report.

Availability of data

Data can be obtained from the corresponding author upon reasonable request.

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