

Median nerve entrapments in the forearm – a case report of rare anterior interosseous nerve syndrome

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Summary

Nowadays, median nerve entrapment is a frequent issue. Many physicians are familiar with the most common median entrapment, which is the carpal tunnel syndrome (CTS). By contrast, less frequent entrapments, historically called “pronator syndrome” are still misdiagnosed as overuse syndrome, flexor tendinitis or other conditions. This article is meant to introduce proximal median nerve entrapments, followed by a case report of the rarest example – anterior interosseous nerve syndrome (AIN syndrome).

Key words

nerve entrapment – nerve compression syndromes – median nerve – median neuropathy – neurosurgery

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Introduction

The most common median nerve entrapment syndrome is the carpal tunnel syndrome [1], while proximal forearm median entrapment syndromes have been considered rare [2]. In recent years, it has been shown that proximal forearm median entrapment syndromes are more frequent than it was previously thought and they are rather underdiagnosed. Moreover, their diagnosis is problematic [2].

Two or three separate units may be hidden under what is historically known as “pronator syndrome”. These are: 1. lacertus syndrome; 2. superficialis syndrome; 3. anterior interosseous nerve syndrome (AIN syndrome), which could be considered a subgroup of the superficialis syndrome (and therefore might also be called superficialis–AIN syndrome) [3].

Lacertus syndrome is caused by the compression of the median nerve by the aponeurosis of the biceps brachii muscle (called lacertus fibrosus), as the median

nerve runs directly under this structure [4,5]. Lacertus syndrome mainly affects people working with their forearm in pronation, for example typing on a computer or a similar kind of job [6,7]. There is no predominance with regard to dexterity [4]. In correspondence with the topography of the median nerve, the pressure of the lacertus primarily affects the motor fibers of the nerve rather than the sensitive ones [7]. Flexor carpi radialis muscle (FCR), flexor digitorum profundus muscle for second digit (FDP II) and flexor pollicis longus muscle (FPL) are predominantly affected, which is clinically manifested by weakening of these muscles. Sensitive neuropathy occurs in later stages with more severe damage. The diagnosis is established mainly clinically. In their medical history, the patient complains about a weakened pinch grip, clumsiness of the hand or dropping objects. The patient will not complain about nocturnal pain, which is the difference from CTS [8]. The clinical examination consists of examining the muscle

strength of the FCR, FDP II and FPL. On top of that, pressing at the lacertus site is painful. Another exam is the scratch collapse test. In this test the patient is asked to perform external rotation of the shoulders with elbows flexed to 90°, while the skin over the area of suspected nerve compression is scratched. This should cause temporary loss of muscle resistance. The healthy side is compared to the contralateral side where the entrapment syndrome is present [4]. Non-surgical treatment consists of physiotherapy, load restriction and application of corticosteroids. However, non-surgical treatment tends to have only a temporary effect during the period of skipping exercise or work [6]. Surgical treatment is represented by the release of the lacertus under general or regional anesthesia. The patient should feel an almost immediate improvement in muscle strength by breaking the conduction block after the release [4].

Superficialis–AIN syndrome occurs when the arcade of the flexor digito-



Fig. 1. Flexor digitorum superficialis arcade in dissector forceps.

rum superficialis muscle (FDS) causes compression. The clinical difference between this unit and lacertus syndrome lies in the presence of sensitive symptoms, especially pain in the volar forearm. A weakening of pinch grip may be present, caused by the affection of the FPL and FDP II–III muscles, although weakening of the FDP may not be well expressed. Isolated AIN syndrome is the

rarest of the described conditions. Since it is a motor nerve, there are no sensitive symptoms, and it manifests as a weakening or loss of FPL function, i.e. flexion of the thumb interphalangeal (IP) joint. Non-surgical treatment consists of physiotherapy, load restriction and corticosteroid injection. Surgical treatment consists of cutting the fibrous part of the FDS arcade, which is located between

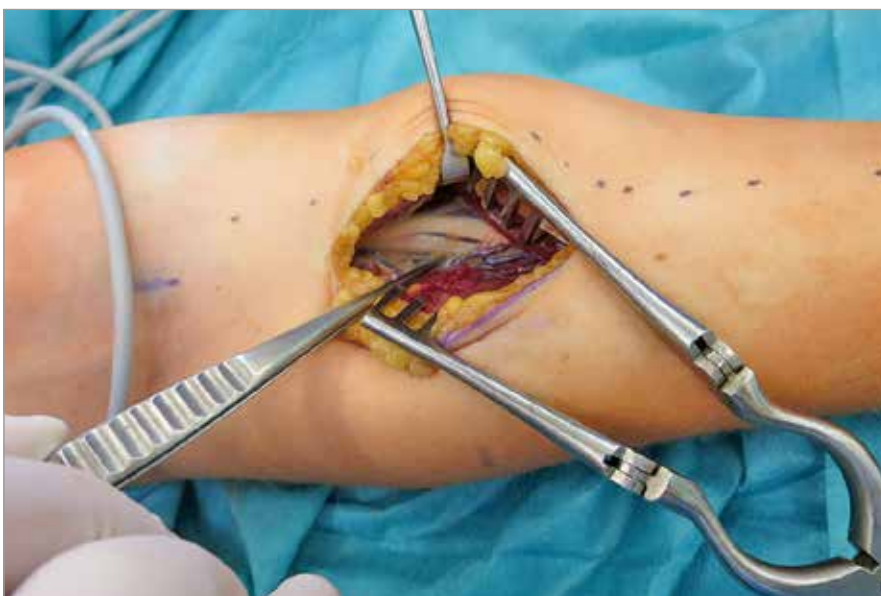


Fig. 2. Median nerve and anterior interosseous nerve. Hourglass site of compression is showed by the tweezer. After the cutting of the flexor digitorum superficialis arcade, the branching of the median nerve with the anterior interosseous nerve is clearly visible.

the pronator teres and FDS muscles. If only isolated AIN syndrome is present, additional fibrous or vascular strangulations may be present directly above the nerve. The procedure is performed under general or regional anaesthesia, using a tourniquet. Similarly to lacertus syndrome, the patient should feel an immediate muscle strength improvement. AIN syndrome can be confused with the so-called Parsonage-Turner syndrome [9,10], which is a brachial neuritis with a potential to spontaneously heal within 6 months.

In recent years, the wide-awake local anesthesia no tourniquet technique (WALANT) has gained importance in the surgery of nerve entrapment syndromes. In WALANT, a mixture of 1% lidocaine with adrenaline and bicarbonate is applied approx. 30 minutes before the surgery. This approach is considered most comfortable for the patient and enables testing of muscle strength during the surgery. The method has been promoted by Dr. Elizabeth Hagert from Sweden (currently working in Qatar), albeit originally introduced by Dr. Donald H. Lalonde from Canada.

Below we shall be presenting a recent case from our Institute.

Description of the case

The presented case involves a 37-year-old woman, who came to our tertiary care unit complaining of an inability to flex the thumb of her right hand in the IP joint. The condition has been present for 6 months without any progress. Medical history revealed a short episode of forearm pain without the history of any injury, followed by the inability to flex the right thumb in the IP joint. She was referred by a neurologist under the diagnose Kiloh-Nevin syndrome, which is a synonym for AIN syndrome. This diagnosis was supported by MRI scan. The later conducted electromyography confirmed AIN syndrome. The clinical examination revealed a lack of power in the FPL muscle with no active flexion in the

IP joint of the right thumb. However, the tenodesis effect was normal, which indicated that FPL tendon should be intact. Other fingers had a normal active range of motion. An ultrasound was performed, which showed the FPL tendon in continuity and without adhesions during passive range of motion. However, FPL muscle belly had no voluntary contractility. The diagnosis was very clear and thus surgery was scheduled as soon as possible.

The surgery was performed under infraclavicular brachial plexus block. During the surgery, tenotomy of the musculotendinous junction of the humeral head of the pronator teres muscle was executed, but we left muscle fibers in continuity in the fashion of fractional lengthening. A dissection of the arcade of the flexor digitorum superficialis muscle followed (Fig. 1), revealing the site of the compression of the anterior interosseus nerve (Fig. 2). At the end of the procedure, we placed a Redon drain and finished with intradermal suture, resulting in a scar that was only 6 cm long (Fig. 3).

Two days after the surgery, the patient was able to move the thumb in full range of motion, including the IP joint. Only a small degree of weakness was apparent in comparison to the opposite side (Fig. 4, 5). At the follow up of 4 weeks after the surgery, the patient showed only minimal signs of FPL weakness, full thumb IP joint range of motion and was completely happy with the result.

Conclusion

Proximal median nerve entrapments are less frequent compared to CTS, but their incidence is probably higher than it has been traditionally stated in last decades [2]. Yet it remains rare constituting less than 1% of median nerve neuropathies. Physicians should actively seek and investigate patients with forearm affections who complain of grip weakness. Also, muscle strength tests should be an integral part of the clinical exam-



Fig. 3. Scar.

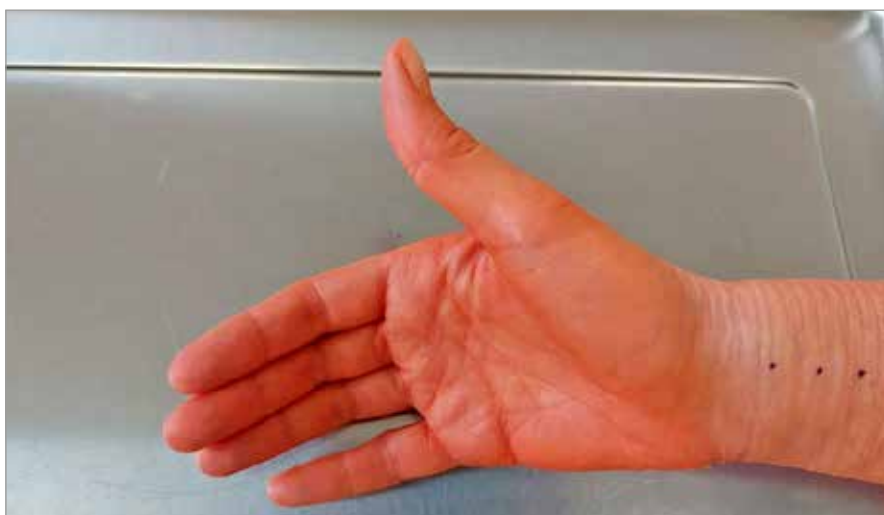


Fig. 4. Post-operative thumb extension.



Fig. 5. Post-operative thumb flexion.

ination, when nerve entrapment syndrome is suspected. The use of ultrasound in nerve entrapment syndromes of the forearm brings a great benefit and should be added to clinical practice, as it shows the muscle contractility and tendon continuity, and may therefore prevent misdiagnosis and even tendon revisions, which apparently happen in some cases.

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