Case report

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Bifid median nerve: case report

Irakli B. Goginava [1], Giorgi Murvelashvili [2], Mikheil A. Shavgulidze [3], Mariia V. Riezunenko [4], Giorgi L. Giorgidze [5]

[1] Department of Pelvic Fractures Surgery, West Georgia Medical Center, Kutaisi, Georgia
[2] Orthopedics and Traumatology Department, Medical Center Medina, Batumi, Georgia
[3] High Franconia Clinics, Münchberg, Germany
[4] Department of Traumatology and Orthopedics, West Georgia Medical Center, Kutaisi, Georgia
[5] Department of Neurology, West Georgia Medical Center, Kutaisi, Georgia

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Address for correspondence:
Irakli Borisovich Goginava, Department of Pelvic Fractures Surgery, West Georgia Medical Center, Javakhishvili str., 83a, Kutaisi, 4600, Georgia, e-mail: igoginava@evex.ge

In the article a rare case of abnormal anatomical structure of the median nerve in a patient with carpal tunnel syndrome is described: a high bifurcation of the median nerve.

A 67-year-old woman complained of periodic intense nocturnal pain and numbness of 1-3 fingers of her left hand. During clinical examination Phalen's wrist flexion and wrist extension tests, Hoffmann-Tinel, postural provocation, median nerve compression, and the "tourniquet" tests were positive. Allen's test was negative. There was no atrophy of the thenar muscles, the strength of palmar abduction of the thumb was comparable to that of the right hand. Sensitivity of the fingers was unchanged. Based on the history and clinical examination, a diagnosis of idiopathic carpal tunnel syndrome of the left hand was made. Open carpal tunnel release, mesoepineurolysis of the median nerve, and tenosynovectomy were performed. Intraoperatively, it was found that from the proximal edge of the wound, the trunk of the median nerve was split into two parts, which were reconnected in the area of the exit from the carpal tunnel, forming a "loop" like structure. An hourglass deformity was also noted on both branches of the median nerve. The radial branch of the split nerve was visually thicker than the ulnar branch. Postoperatively, pain and numbness of 1-3 fingers resolved completely.

The median nerve bifurcation is extremely difficult to detect preoperatively. In the case of a traumatic complete anatomical injury to the median nerve, one should make sure that this structural anomaly is absent, and if there is a bifurcation of the nerve, an extended revision should be performed and a suture should be placed on both damaged branches.

During surgical treatment of carpal tunnel syndrome, it is advisable to check whether the bifurcated nerve runs through a single canal rather than two separate canals. In the latter case, it is necessary to influence both canals during operative or conservative treatment.

Keywords: *abnormal anatomical structure; high bifid median nerve; carpal tunnel syndrome*

Introduction

The anatomical structure of the median nerve in the forearm and hand has been extensively described in numerous studies. However, various anomalies in the structure of the nerve are of particular theoretical and practical interest. One such anomaly is high bifurcation—the splitting of the median nerve at the level of the forearm and carpal tunnel. In foreign literature, descriptions of this anomaly, especially clinical cases, are quite rare [1]. Only one publication has been found in the available Ukrainian-language scientific literature [2], and none have been found in national medical publications.

The aim of this study is to familiarize readers of the journal with a rare anomaly in the anatomical structure of the median nerve and to describe the features of diagnosis and treatment of carpal tunnel syndrome in combination with median nerve bifurcation.

Case presentation

A 67-year-old woman was admitted with complaints of periodic, predominantly nocturnal, intense pain and numbness in 1-3 fingers of her left hand. At night, her condition improved only by lowering the hand, rubbing it, and shaking it (the "flick" sign). These complaints began 4 years ago, and her condition gradually worsened. She did not seek treatment. During the clinical examination, Phalen's wrist flexion and wrist extension tests, Hoffmann-Tinel test from the median nerve projection site on the forearm, the postural provocation test, median nerve compression, and the "tourniquet" tests were positive. Allen's test was negative. There was no atrophy of the thenar muscles, and the strength of the palmar abduction of the thumb was comparable to that of the right hand. Sensitivity in the fingers was unchanged. Based on the medical history and clinical examination, a diagnosis of idiopathic carpal tunnel

syndrome of the left hand was made and surgical treatment was indicated.

Surgery was performed under local anesthesia using the WALANT technique with a 1% lidocaine solution [3]. A C-shaped skin incision was made, extending to the lower third of the forearm. The flexor retinaculum was completely dissected longitudinally over the grooved probe inserted into the carpal tunnel. Mesoepineurolysis of the median nerve was subsequently performed. It was found that, starting from the proximal edge of the wound, the trunk of the median nerve was split into two parts, which rejoined in the area of the exit from the carpal tunnel, forming a so-called "loop" (***Fig. 1***).

An hourglass deformity was also noted on both branches of the median nerve. The radial branch of the split nerve was visually thicker than the ulnar branch. Due to severe finger flexor tenosynovitis, a tenosynovectomy was performed. The edges of the flexor retinaculum were excised. Sutures were applied to the skin. The postoperative period proceeded without complications.

Three months after the operation, the patient reported complete resolution of pain and numbness in the fingers of the operated hand.

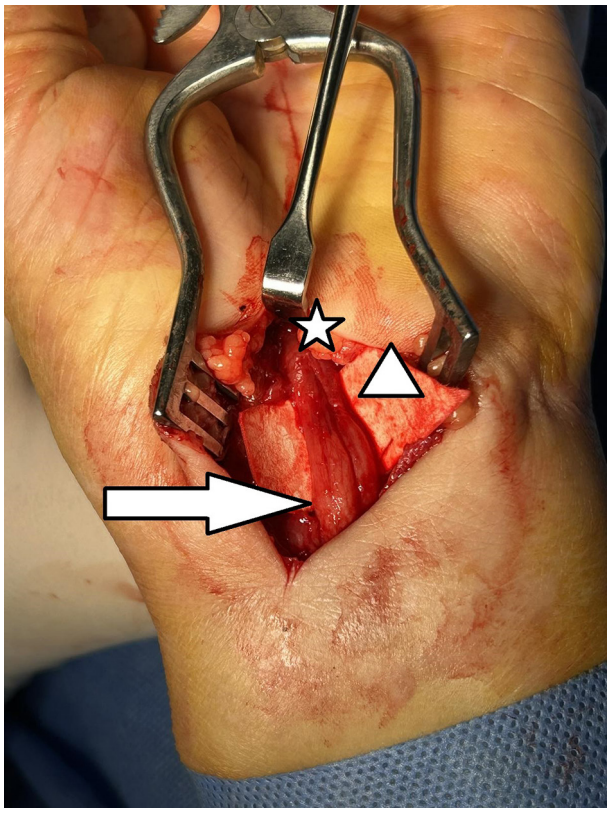

Fig. 1. High bifurcation of the median nerve (arrow – bifurcated median nerve; triangle – hourglass deformity of the median nerve; asterisk – "loop" of the median nerve)

Discussion

According to normal anatomy, the median nerve in the lower third of the forearm looks like a single trunk. In this form, it enters the carpal tunnel distally together with the flexor tendons of I-V fingers and, in the area of the distal edge of the flexor retinaculum, splits into six motor branches to the thenar muscles, two radial lumbrical muscles, and sensory branches to I-III fingers and the radial surface of the ring finger [4]. Most practicing surgeons are guided precisely by this normal anatomy of the median nerve during operations on the forearm and hand**.** However, upon closer examination of the anatomy of the nerve, many features can be noted that quite often affect the outcomes of surgical interventions. The scientific literature describes variants of the unusual structure and location of the branches of the median nerve in the area immediately adjacent to the carpal tunnel and in the area where it exits, including extraligamentous location of the recurrent motor branch (standard location), transligamentous, supraligamentous, and subligamentous locations; accessory recurrent motor branches; and the origin of the recurrent motor branch from the volar or volar-medial surface of the median nerve trunk, etc. [4, 5, 6]. Variants of bifurcation or even trifurcation of the median nerve at the level of the lower third of the forearm are also presented [7].

During surgery for carpal tunnel syndrome, we incidentally encountered a bifurcation of the median nerve in the lower third of the forearm and hand corresponding to a high bifurcation of the median nerve of group 3A according to the Lanz classification. This variant is characterized by bifurcation of the median nerve trunk proximal to the carpal tunnel, with or without a connecting branch, in the absence of a persistent median artery and lumbrical muscles originating in the carpal tunnel region [8]. High bifurcation of the median nerve was first described in scientific medical literature by I. Kessler [9].

The clinical picture in the patient described above did not differ from that observed in many other patients we operated on with carpal tunnel syndrome. Therefore, it is practically impossible to suspect the presence of high bifurcation of the median nerve in advance. In rare cases of persistent median artery thrombosis, which sometimes occurs with bifurcation of the median nerve, the clinical picture of carpal tunnel syndrome may be altered and include sudden numbness and paresthesia in the fingers innervated by the median nerve, as well as pain and swelling in the volar surface of the wrist joint [10, 11].

Another important feature of the abnormal anatomical structure of the median nerve is that the two branches of the nerve can run in separate cylindrical canals formed by the fibers of the flexor retinaculum [1]. Therefore, during operative or conservative treatment it is necessary to influence both canals.

Conclusion

We describe a case of unusual anatomical structure of the median nerve in the lower third of the forearm and carpal tunnel, specifically a high bifurcation of the median nerve. It is necessary to

be aware of the existence of such an anomaly in order to avoid negative treatment outcomes. In the case of traumatic complete anatomical injury to the median nerve, one should make sure that this structural anomaly is absent, and if there is a bifurcation of the nerve, an extended revision should be performed and a suture should be placed on both damaged branches.

During surgical treatment of carpal tunnel syndrome, it is advisable to check that the bifurcated nerve runs through a single canal**,** rather than two separate canals. In the latter case, it is necessary to influence both canals during operative or conservative treatment.

Disclosure

Conflict of interest statement

The authors declare that there is no conflict of interest.

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Informed consent

The patient gave written consent for this report to be published and for information about the nature of her illness to be posted online.

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