

CLINICAL CASE

CARPAL TUNEL SYNDROME IN TWO PATIENTS WITH BIFID MEDIAN NERVE**Diana-Andreea Bonto¹, Andra-Elena Martin², E. M. Popescu¹, D. Zamfirescu^{1,2}**¹The University of Medicine and Pharmacy „Carol Davila”, Bucharest, Romania²Plastic Surgery and Reconstructive Microsurgery Clinic, Bucharest, Romania

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Abstract

The most frequent type of entrapment neuropathy is the carpal tunnel syndrome, represented by a constellation of signs and symptoms in which no test absolutely confirms the diagnosis. The bifid median nerve is an anatomic variation that can be associated with this syndrome and the surgeon must be aware of this condition preoperatively in order to plan correctly the surgical approach. Ultrasonography and magnetic resonance imaging can be successfully used for the detection of the anatomic variation of the median nerve, for the complete evaluation of the carpal tunnel soft tissue and its anatomic structures in order to obtain better results. We present two cases of unilateral carpal tunnel syndrome with bifid median nerve diagnosed preoperatively by means of ultrasonography and the good outcome after the open decompression procedure. The existence of anatomic variation of the median nerve along with other possible pathologies in the carpal tunnel determine us to select the open procedure despite the existence of the endoscopic approach in order to provide better visualization in the surgical field and correct identification of the anatomic structures.

Keywords: *carpal tunnel syndrome, bifid median nerve, decompression*

Introduction

The carpal tunnel syndrome was first described by Sir James Paget in 1854 when he published his „Lectures on Surgical Pathology”. It represents a compression neuropathy of the median nerve at the level of the carpal tunnel by an adjacent anatomic structure. Systemic conditions such as diabetes, hypothyroidism, hyperthyroidism, alcoholism or toxic exposure may all contribute to the increasing susceptibility of peripheral nerves to injury secondary to compression [1]. Lanz had realized an anatomical classification in four groups of the median nerve variations: variations of the

thenar branch, accessory branches of the median nerve at the distal carpal tunnel, high division of the median nerve (bifid median nerve) and accessory branches proximal to the carpal tunnel [2]. There have been reports that inform about the possibility of accompanying anomalies with median nerve that include double compartment in the carpal tunnel, agenesis of the thenar eminence, bony malformation of the radial column at the wrist, as well as vascular malformations, especially persistent median artery [2]. Although the diagnosis of carpal tunnel syndrome is based on patient history, physical examination and electrophysiologic studies, ultrasonography at

high frequencies is a useful diagnostic tool that can effectively show median nerve abnormalities and variation in case of atypical presentation or electrophysiologic abnormalities [6].

Materials and Method

We present two cases of carpal tunnel syndrome with bifid median nerve with the purpose of describing the clinical manifestation along with objective information obtained by means of ultrasonography and electromyography.

Case 1 - Forty-six-year-old male presented with one year history of paresthesia in the right hand affecting the index, middle and ring fingers, numbness and weakness. Tinel test was positive while Phalen test was negative. Electromyography confirmed the compression of the median nerve in the carpal tunnel, and ultrasonography revealed two nerve trunks in the carpal tunnel; color Doppler did not identify the median artery travelling between the two nerve trunks. Contralateral median nerve did not present any anomalies.



Figure 1 - Dissection of the anatomical structures at the location of carpal tunnel

Case 2 - Fifty-three-year old woman presented with a two and a half year history of right-sided brachialgia associated with paresthesias, especially in the thumb and index finger, symptoms that increased during the night and in hand repetitive movements. Tinel and Phalen tests were clearly positive. The electromyographic study confirmed the diagnosis of carpal tunnel syndrome.

Ultrasonography revealed the presence of a bifid median nerve and echo-Doppler investigation did not identify the presence of a median artery between the two nerve trunks. Sonographically the contralateral median nerve did not reveal any abnormalities.



Figure 2 - Surgical image of an exposed bifid median nerve at the location of carpal tunnel

For the treatment of carpal tunnel syndrome there is a nonsurgical approach that includes splinting the wrist in neutral position, steroid injections, and management of any underlying systemic disease [1].

Failure of nonsurgical treatment indicates for surgical release of the carpal tunnel, open median nerve decompression leading to symptomatic relief in the majority of patients [1]. Several endoscopic procedures have been described and introduced with the advantages of a smaller scar and an earlier rehabilitation, but associating the risk of a poor or absent visualization with the inability to identify anatomic variants involved and the attendant risk of iatrogenic injury [1]. Endoscopic approach provides a faster recovery with a faster relief of pain and improvement in functional abilities, although paresthesia and numbness subside in an identical manner with the open procedure [3].

Simple decompression had proven extremely effective and associated internal neurolysis of the median nerve or longitudinal epineurotomy conferred no benefit regarding the nerve volume or clinical outcomes [3].

Our two patients underwent simple carpal tunnel release (Figure 1 and 2) with the immediate symptomatic relief. Postoperative management included splinting for 3 days that

maintained the elbow at 90° of flexion, the forearm in 45° of pronation and the wrist in slight flexion, and then replacement of the bulky dressing with a simple adhesive strip. The 5-0 nylon simple sutures used to close the skin were removed at 7 to 10 days and Steri-strips were applied.

Discussions

The carpal tunnel is an open-ended proximally and distally, but behaves similar to a closed compartment physiologically and maintains its own distinct tissue fluid pressure levels. It is a fibroosseous canal that is bounded dorsally by the concave arch of the carpal bones and by the flexor retinaculum volarly [1].

The median nerve does not usually give off any branches during its course in the lower third of the forearm and wrist, with the exception of an inconstant palmar cutaneous branch. After its course below the anterior carpal ligament, the nerve enters the palm of the hand. The recurrent motor branch passes through or around the distal edge of the transverse carpal ligament in one of three patterns: extraligamentous, subligamentous and transligamentous courses [1].

Anatomically, two areas of the carpal ligament may cause median nerve compression. The first is at the proximal edge of the transverse carpal ligament, where the compression may be produced by acute wrist flexion and the second is adjacent to the hook of the hamate [1]. Compression within the carpal tunnel may also result from any space-occupying lesion that increase pressure in this noncompliant compartment, thus compressing the median nerve [1]. In some cases a persistent, normally asymptomatic median artery is present, artery that can represent the location of thrombi development that can cause a carpal tunnel syndrome [7].

This paper presents two cases of group III in the Lanz classification: cases with a high division of the median nerve [2]. According to Gabarda et al. 10-30% of the wrists present with a persistent median artery, and in some populations such arteries may appear in up to 50% of individuals [7]. None of the two cases

presented in this paper presented a persistent median artery.

The clinical picture of pain and paresthesias in the palmar radial aspect of the hand, often worse at night and/or exacerbated by repetitive use of the hand represent a constellation of symptoms and signs readily recognized according to Szabo et al [1]. The gold standard diagnosis of the carpal tunnel syndrome is represented by electrodiagnosis. Nerve conduction studies can provide objective evidence of impaired conduction, and in general, distal motor latencies of more than 4.5 ms and distal sensory latencies of more than 3.5 ms are considered abnormal [1]. However, a negative nerve conduction study does not mean a patient does not have carpal tunnel syndrome that will respond to surgery [3].

Imaging is helpful in defining the anatomic structures within the carpal tunnel. In particular, high frequency probe enables the operator to obtain a detailed evaluation of the carpal tunnel soft tissue and the median nerve is well observed in its fascicular hypoechoic structure along with any of its typical anatomic changes in patients with carpal tunnel syndrome [4]. Radiologic criteria for diagnosing carpal tunnel syndrome on MRI or sonography include swelling of the median nerve proximal to the carpal tunnel and bowing of the flexor retinaculum according to H. Turker et al. [6]. Sonographically, a median nerve cross sectional area larger than 0.09 or 0.10 cm², measured at the level of pisiform bone is considered diagnostic for carpal tunnel syndrome, although patients with bifid median nerve diagnosed clinically and electromyographically with carpal tunnel syndrome have also shown normal cross sectional areas for each branch [7].

Conclusions

Carpal tunnel release remains the most commonly performed hand operation. The use of endoscopic approach could lead to unnecessary complications or increase in percentages of relapses [7]. Instead, the open procedure provides better visualization in the surgical field and eases the recognition of the important anatomic structures along with associated pathologic elements. In the case of

carpal tunnel syndrome associated with bifid median nerve, open procedure is recommended in order to visualize directly the anatomical variation and allow proper technique usage to assure the correct carpal tunnel release without iatrogenic neurovascular injury associated. Also, considering the probability that the bifid median nerve could be accompanied by a median artery positioned between the two nerve trunks, the open procedure is the proper choice.

References

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