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Original article

Ultrasonography as a tool in diagnosis of carpal tunnel syndrome[☆]



Adham do Amaral e Castro^{a,*}, Thelma Larocca Skare^b, Alexandre Kaue Sakuma^b,
Wagner Haese Barros^a

^a Department of Radiology, Hospital Universitário Evangélico de Curitiba, Curitiba, PR, Brazil

^b Department of Rheumatology, Hospital Universitário Evangélico de Curitiba, Curitiba, PR, Brazil

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ABSTRACT

Objective: We aimed to determine the value of ultrasonography (US) in the diagnosis of carpal tunnel syndrome (CTS).

Methods: Two hundred patients (400 hands) were submitted to wrist US to measure median nerve area (MNA), questioning on paresthesia and pain in the median nerve territory, Tinel and Phalen maneuvers. An MNA $>9\text{ mm}^2$ was considered diagnostic of CTS.

Results: Measurement of MNA by US was $>9\text{ mm}^2$ in 27% of the hands. A good association with pain ($p < 0.0001$), paresthesia ($p < 0.0001$), Tinel test ($p < 0.0001$) and Phalen test ($p < 0.0001$) was found. According to the clinical criteria for classification of CTS from American Academy of Neurology the MNA by US had 64.8% of sensibility and 77.0% of specificity in this sample.

Conclusion: Measurement of MNA by US performs well and can be used as first option for the investigation of patients with CTS.

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Ultrassonografia no diagnóstico da síndrome do túnel do carpo

RESUMO

Objetivo: Determinar a importância da ultrassonografia (US) no diagnóstico da síndrome do túnel do carpo (STC).

Métodos: Duzentos pacientes (400 mãos) foram submetidos a uma US do punho para medir a área do nervo mediano (ANM). Foram perguntados quanto à presença de parestesia e dor no território do nervo mediano e submetidos aos testes de Tinel e Phalen. Uma ANM $>9\text{ mm}^2$ foi considerada diagnóstica de STC.

Palavras-chave:

Síndrome do túnel do carpo
Ultrassonografia
Dor na mão
Parestesia na mão

[☆] This study was originated in the Rheumatology and Radiology departments of Hospital Universitário Evangélico de Curitiba, Curitiba, PR, Brazil.

* Corresponding author.

E-mail: adham.castro@gmail.com (A. do Amaral e Castro).

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Resultados: O valor da ANM medida pela US foi $>9\text{mm}^2$ em 27% das mãos. Foram encontrados uma boa associação com a dor ($p < 0,0001$), parestesia ($p < 0,0001$), teste de Tinel ($p < 0,0001$) e teste de Phalen ($p < 0,0001$). De acordo com os critérios clínicos para a classificação da STC da American Academy of Neurology, a ANM medida pela US teve 64,8% de sensibilidade e 77% de especificidade nessa amostra.

Conclusão: A mensuração da ANM pela US é adequada e pode ser usada como primeira opção para a investigação de pacientes com STC.

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Introduction

Carpal tunnel syndrome (CTS) is the most frequent entrapment neuropathy, it is due to the compression of the median nerve at the wrist.¹ The history and physical examination, including provocative signs such as Tinel and Phalen maneuvers, have been considered highly suggestive of the diagnosis.² Electroneuromyography (EMG) studies are usually considered to prove it,³ but this is a test that is not readily accessible and not well tolerated by all the patients that preclude its repetition for patient's follow up.

Recently wrist ultrasonography (US) with measurement of the median nerve area (MNA) has been considered an alternative to EMG.⁴ An MNA of 9mm^2 in the distal carpal tunnel, at levels of pisiform bone is considered diagnostic of CTS.^{5,6} According to some researchers this is an exam with high sensitivity and specificity in CTS diagnosis⁴⁻⁶; others are not so enthusiastic. Mondelli et al.¹ found that almost 1/4 of patients with diagnosis of mild cases of CTS diagnosed clinically could not have been detected by US. Carvalho et al.,⁵ in a review, found that MNA US measurement has 82 to 86% of sensibility and 48 to 87% of specificity.

One of the problems of studying CTS is the lack of consensus to establish the definitive diagnosis.⁷ Neurologists traditionally establish it based more on the outcome of nerve conduction studies than on the patients' signs and symptoms.⁷ In contrast, hand surgeons appear to give considerably more importance to the patients' signs and symptoms.⁷ The lack of universally accepted classification criteria may be responsible for the diversity of results seen in the literature.

To look further into the usefulness of US to diagnose CTS, we measured the MNA of 200 individuals to analyze if this measure could predict which patient had or not clinical symptoms of CTS.

Patients and methods

Two hundred hospital workers (35 men and 165 women) were invited to participate in the study. After approval of local Committee of Ethics in Research and patient's signature of consent term, all participants filled the Katz diagram for pain and numbness in the median nerve area.⁸ Physical examination included Phalen¹ and Tinel test.¹ Tinel's test¹ was performed by tapping the median nerve at the wrist, and this was repeated four to six times. The presence or absence of radiating pain or paraesthesia in the median nerve distribution

was recorded. Phalen's test¹ was executed by asking each subject to hold hand with the wrist in complete palmar flexion with elbow extended and forearm pronated. The Phalen's test was considered positive if symptoms were reproduced in 1 min.

The MNA was measured by US equipment (Toshiba XARIO XG, Tokyo, Japan), with a multifrequential linear transducer of 12 MHz at volar distal surface of the wrist (at the level of pisiform and tuberosity of scaphoid) by a blind technician. For the examination, patients should be seating in a chair with arms extended and hands with finger semiextended. A MNA with more than 9mm^2 was considered diagnostic of CTS.⁵

Data were collected in frequency and contingency table. The sample distribution was tested by Kolmogorov-Smirnov test. Central tendency was expressed in median and interquartile range (IQR) as the sample distribution was non-parametric. Association studies were done by chi-squared (χ^2) test. Adopted significance was of 5%. Calculation was done with specific software (Graph Pad Prism version 5.0, San Diego, USA).

Results

The studied sample was formed by 35 men and 165 women with median age of 40.0 years (ranging from 18.0 to 74.0 years; IQR of 27.0-49.0 years). In this sample 39/200 (19.5%) were afrodescendant; 156/200 (78%) caucasians, and 5/200 (2.5%) orientals. According to labor activities, 142/200 (71%) had manual work and 58/200 (29%) had white collar work.

In the 400 examined hands, paresthesia was found in 108/400 (27.5%), pain in 106/400 (26.5%), positive Tinel test in 99/400 (24.7%) and positive Phalen's test in 97/400 (24.2%). Both symptoms (pain and paresthesia) were found simultaneously in 74/400 (18.5%) and both signs (Tinel and Phalen's) in 60/400 (15%).

MNA at US had a median value of 8mm^2 (ranging from 4 to 21mm^2 ; IQR of 6.0-10.0 mm^2). In 108/400 (27%) hands the value of MNA was $>9\text{mm}^2$ characterizing presence of CTS by the US.

Comparing the presence of signs and symptoms in those with MNA $>9\text{mm}^2$ with those with $\leq 9\text{mm}^2$ by US, it was found the results shown in Table 1.

If the CTS diagnosis were made according to American Academy of Neurology criteria⁹ that considers classic/probable cases those with paresthesia or pain in at least 2 of the first 3 fingers, the MNA by US had 64.8% of sensibility and 77.0% specificity in this sample.

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