



To Assess The Usefulness And Efficacy of High Resolution Ultrasound In Nerve Entrapment Pathologies.

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Abstract

The essentiality of high resolution US over MRI for imaging and detecting the peripheral nerve pathology because it is inexpensive and widely available with no contraindications and allows rapid, detailed real time imaging of the entire length of major peripheral nerves of both limbs

Keywords: High Resolution US, Nerve Entrapment, Carpel Tunnel Syndrome, Nerve Root Pathologies, MRI Nerve Root.

Introduction

Sonography should be the primary technique for imaging peripheral nerve pathology because it is inexpensive and widely available with no contraindications and allows rapid, detailed real time imaging of the entire length of major peripheral nerves of both limbs.

Current ultrasonography (US) systems equipped with linear -array transducer in the range of 5 -15 MHz with

smaller foot -prints have enabled visualization of most nerves with high conspicuity, demonstrate their proper fascicular structures, recognise specific abnormalities, differentiate endoneural from extraneural lesions and evaluate the extent of the lesions .

Magnetic resonance (MR) imaging continues to be the standard for evaluation of the peripheral nervous system because image acquisition is not operator dependent as it is in US and interpretation is intuitively Easier.

Advantages of high resolution US over MRI are high resolution, low cost, non invasive, real -time, dynamic imaging which can be performed relatively quickly with ability to explore different segments of nerve trunks in a single study.

Ultrasound provides very high resolution for superficial structures.

Materials and Methods

Materials - Machine Name

- GE VOLUSON 650
- Logiq E portable

Hockey stick probe (High frequency transducer (5 - 15mhz)with near field resolution) which is seen in figure 1

Color and power doppler scans performed in transverse and longitudinal planes .

Methodology

This study was conducted in those patients with clinically suspected nerve entrapments who were referred to the radiology department for High resolution US scanning.

Written informed consent was obtained from these patients and instructions were given.

The clinical data, previous investigations reports were obtained and analysed.



Figure 2: Hockey stick probe

Ultrasound was performed at three levels as shown in the figure 1

Proximal at the radicular articulation, at the level of pisiform in the middle - and distally at the level of hook of hamate

Clinical features

The hallmark of classic Carpel tunnel syndrome (CTS) is pain or paresthesia (numbness and tingling) in a distribution that includes the median nerve territory, with involvement of the first three digits and the radial half of the fourth digit.

Results

Total of twenty three cases of nerve entrapment syndromes were included in the study. The study population predominantly consisted of Females in the study with 69.57% and males with 30.43%. The mean age was 44, minimum age was 17 years and maximum age was 62 years in the study population. Among the study population, 14 (60.87 %) had median nerve compression unilaterally, two (8.70%) had median nerve compression bilaterally, 4 (17.39%) had



Figure 1: Axial images of carpal tunnel – at three levels

flattening of median nerve, and three(13.04%) had normal median nerve.

USG Findings	No. of cases	Percentage (%)
Median nerve compression	14	60.87%
Flattening of median nerve	4	17.39%
Median nerve is normal	3	13.04%
Bilateral median nerve compression	2	8.70%

Among the study population, 10 (43.48%) were diagnosed with right carpal tunnel syndrome, 9 (39.13%) were diagnosed with left carpal tunnel syndrome, 3 (13.04%) were diagnosed with bilateral carpal tunnel syndrome and 1 (4.35%) was not having evidence of carpal tunnel syndrome.

The median age was 45.5 (32.0, 57) in median nerve compression, it was 51.50 (25, 56.25) in flattening of median nerve, it was 42 (30, 56) in median nerve is normal and it was 41(22.50, 49.50) in median nerve compression on both sides. The difference in the age between USG findings was statistically not significant (P value 0.952).

Among people with median nerve compression 6 (42.86%) were males, 8 (57.14%) were females. Among people with flattening of median nerve all 4 (100%) were females. Among people with normal median nerve 1 (33.33%) was male, 4 (66.7%) were females.

Among people with median nerve compression on both sides all 2 (100%) were females.

Among the median nerve compression, 8 (57.14%) were diagnosed right carpal tunnel syndrome, 4 (28.57%) were diagnosed left carpal tunnel syndrome and 2 (14.29%) were diagnosed bilateral carpal tunnel syndrome. Among the flattening of median nerve, 2 (50%) were diagnosed right carpal tunnel syndrome and 2 (50%) were diagnosed left carpal tunnel syndrome. Among the normal median nerve, 2 (66.67%) were diagnosed left carpal tunnel syndrome and 1 (33.33%) was not having evidence of carpal tunnel syndrome. Among the median nerve compression on both sides, 1 (50%) was diagnosed left carpal tunnel syndrome and 1 (50%) was diagnosed bilateral carpal tunnel syndrome.

Representative Cases

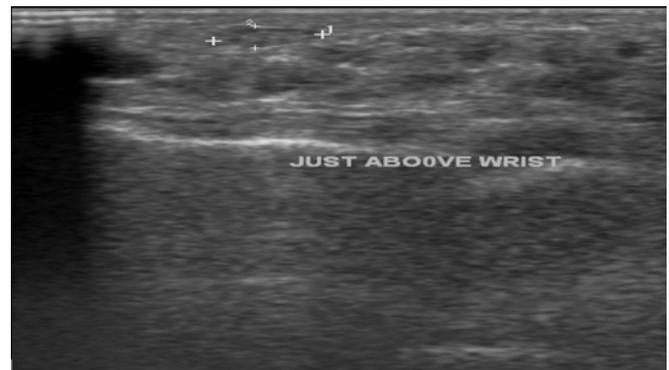


Figure 3: US image showing nerve compression just above wrist



Figure 4: Longitudinal section of median nerve

Discussion

The diagnosis of CTS usually is based on typical clinical signs and symptoms and can be confirmed with electrodiagnostic examinations in most cases

All patients underwent musculoskeletal ultrasonographic studies (MSUS) in radiology department using GE VOLUSON 650, Logiq E portable and Hockey stick probe (High frequency transducer(5 -15mhz) with near field resolution) was used to visualise nerve pathologies that occur in motion.

In our study twenty three (23) hand ultrasound, out of which ten were diagnosed with right carpal tunnel syndrome, nine were diagnosed with left carpal tunnel syndrome and three were diagnosed with bilateral carpal tunnel syndrome and one was not having evidence of carpal tunnel syndrome

Zaidman et al ¹, says that ultrasound has higher high sensitivity and specificity when compared to MRI .They say that high resolution USG is the first modality of choice in evaluation of the peripheral nerve lesions similar to this study.

In Moran' sl et al study ², a cross -sectional area greater than 13 mm was considered diagnosis with CTS . In this study , a cross sectional area greater than 10 mm was considered diagnostic for CTS.

Ibrahim et al ³,say that dominant hand is more frequently effected due to over use .This sstudy coincided with *this findings*

Dessy R. Emril et all ⁴ say that women were effected more than men. In 46 people there are 37 (80.4%) women and 9 men (19.6%). In our study out of 23 patients (16 females were and 7 were male) indicating that women are more frequently effected.

In our study the age was an important risk factor for the occurrence of CTS as the highest number of the

patients in this study were between the age groups of 17 and 62 years.

Ultrasound provides a safe cost effective and rapid means of assesing nerve pathologies . This study has emphasied the role of ultrasound examination as a primary imaging investigation in nerve pathologies.

US is comparible to or even better than the expensive imaging techniques like MRI .The combination of hockey stick probe provides a great opportunity to study imaging aspects of nerve lesions.

Consequently high resolution ultrasound in nerve studies is fast becoming an essential tool in routine clinical practice .There is an accumulating evidence that nerve entrapment studies depend upon clinical diagnosis.

The following studies confirmed that median nerve cross -sectional measurements with the help of ultrasound correlates well with the presence of carpal tunnel syndrome and is both sensitive and specific for the diagnosis .Sonography in the diagnosis by Iain Duncan et al American journal of radiology 1999.⁵

The combination of improved Color ,power doppler technology and high frequency probe provides a great opportunity to study image aspects of the nerve in transverse and longitudinal planes .

Axial and longitudinal views of the median nerve using power and spectral doppler show arterial flow within the nerve and also help to differentiate nerves from vessels.

Movement of limb helps to differentiate nerves from tendons.

The use of over nerve conduction study (NCS) is the detailed anatomy of that particular region was viewed, whereas in NCS, which measures the speed of transmission of electrical impulses through the nerve.

In nerve conduction measures the speed of transmission of electrical impulses through the nerve identify the pathology situated anywhere along the course of the nerve, where as high -frequency linear /hockey stick transducer gives detail anatomy of the only the particular region viewed.

The only disadvantage is the long learning process which remains an important limiting factor in the widespread use of ultrasound in routine clinical practice.

Conclusion

High-resolution ultrasound examination has shown promising results as a supplementary tool in the diagnosis of peripheral nerve entrapment.

Carpel tunnel syndrome is the common cause of nerve entrapment in this study.

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