Global Health: Journal of Health Sciences, Public Health and Pharmacy

E-ISSN: 3062-8687
P-ISSN: 3063-7465

Research/Review

Role of Median Nerve Cross-Sectional Area in the Diagnosis of Carpal Tunnel Syndrome

Zainab Hazim Abd-alhussein[1]*, Ali F. AL-Hashimi[2], Ihsan S. Nema[3]

[1]MBCHB, Medical Doctor at Al-Imamain Al-Kadhimain Medical City, Department of Physiology, Baghdad, Iraq: zainab.h.abdalhussrin.med24@ced.nahrainuniv.edu.iq
[2] MBChB, PhD Department of Physiology and Medical Physics, College of Medicine, Al-Nahrain University, Baghdad, Iraq: ali-nahrain71@nahrainuniv.edu.iq
[3] FICMS, Section of Neurosurgery, Department of Surgery, Medical College, Al-Nahrain University, Baghdad, Iraq: ihssansbhe2006@gmail.com

Abstract. Carpal tunnel syndrome (CTS) is the most common chronic neuropathy of the upper limb, characterized by compression of the median nerve within the carpal tunnel. It typically results from repetitive hand movements or trauma and leads to pain, numbness, and weakness, making it a significant occupational health concern. Increased intracarpal pressure causes venous stasis, edema, and ischemic damage, which slow nerve conduction and are detectable through electrodiagnostic (EDX) studies. Recently, ultrasonographic measurement of the median nerve cross-sectional area (CSA) has been proposed as a noninvasive diagnostic option. This study aimed to evaluate the diagnostic accuracy of ultrasound-based CSA measurement compared with EDX findings in CTS patients. The research was conducted at Al-Imamain Al-Kadhimain Medical City in Baghdad from November 2024 to March 2025 and included 100 patients (200 hands). All individuals underwent both EDX and high-resolution ultrasonography using a 5–13 MHz linear probe, with CSA calculated by the direct tracing method. CTS was confirmed in 102 hands (51%). Affected hands demonstrated significantly prolonged distal motor and sensory latencies, reduced amplitudes, and lower conduction velocities ($p < 0.001$). Mean CSA was significantly larger in CTS hands (13.75 ± 3.95 mm²) than in non-CTS hands (10.15 ± 3.33 mm², $p < 0.001$). ROC analysis produced an AUC of 0.776 and an optimal cutoff of 11.5 mm² (72% sensitivity, 76% specificity). CSA also increased with CTS severity. Moderate accuracy was observed when differentiating mild from moderate CTS at a 12.5 mm² cutoff, and moderate from severe CTS. In conclusion, median nerve CSA measurement by ultrasound is a reliable, noninvasive, and rapid tool for diagnosing and grading CTS, complementing EDX assessment.

Keywords: Cross-Sectional Area; Electrodiagnostic Studies; Electrodiagnostic Study; Nerve Conduction Study; Neuromuscular Ultrasound.

Received: July 17, 2025;
Revised: September 28, 2025;
Accepted: December 07, 2025;
Published: December 10, 2025;
Curr. Ver.: December 10, 2025.

1. Introduction

CTS is a widely prevalent upper extremity compression of nerves syndrome, often caused by median nerve pressure in the tunnel of the carpals. The carpal tunnel lies on the palm base, near the distal wrist crease. The transverse carpal ligament edges the tunnel, bordered laterally and inferiorly by carpal bones, fibrous sheaths, and attachment connective tissue. The median nerve within the tunnel is susceptible to compression injuries due to localized trauma, repetitive strain on the hand and wrist, improper hand positioning, and localized constriction, all of which are acknowledged factors leading to work-related dysfunction.

CTS cases are reported at a rate of 276 per 100,000 years, with incidence rates of 9.2% in women and 6% in males. While CTS occurrences are ubiquitous within all age demographics, they are most common among persons aged 40 to 60. The beginning of CTS is linked to prolonged pressure on the median nerve, resulting from heightened pressure within the confines of the carpal tunnel. The heightened pressure within the carpal tunnel obstructs venous drainage, leading to stasis, hypoxic injury to the capillary endothelium, and heightened permeability and swelling in the carpal tunnel. This ultimately culminates in a gradual thickening of the synovial sheaths surrounding the flexor tendons. The heightened

interstitial pressure, swelling, and thickening of the sheaths within the carpal tunnel play a role in nerve compression observed in both idiopathic and certain secondary types of CTS.

The modification of the little blood vessels within the nerve results in venous stasis, fluid retention, and ischemic damage, primarily impacting the epineurium. These conditions interfere with axonal transport in the nerve bundles, ultimately causing a decrease in conduction velocity in structurally intact nerve fibers. Paresthesia (primarily numbness and tingling), wrist and hand pain, and, in extreme instances, hand muscular weakness or atrophy are used to diagnose CTS. Clinically used CTS examinations include Phalen's wrist flexion diagnosis, Tinel's median nerve percussion examination, and Durkan's carpal compression assessment. Electrodiagnostic investigations (EDX) provide a crucial objective evaluation for diagnosing CTS. EDX examinations encompass assessments of nerve conduction activities (NCSs). NCSs confirm CTS by detecting impaired median nerve conduction within the carpal tunnel, while conduction in other regions remains unaffected.

CTS is typically categorized into three levels: mild, moderate, and severe, determined by the outcomes of nerve conduction studies. Individuals experiencing mild CTS exhibit sensory irregularities solely on electrophysiological assessments, characterized by extended distal sensory latency (DSL). Conversely, the distal motor latency (DML) tends to stay consistent or experiences only slight prolongation. The amplitudes of all recorded responses fall within the expected range, whereas individuals with moderate CTS exhibit an extension of both distal sensory latency and distal motor latency. The recorded sensory and motor responses may exhibit diminished amplitudes, generally accompanied by only minor alterations. Individuals experiencing severe carpal tunnel syndrome are characterized by the failure to elicit median sensory nerve action potentials or by significantly diminished amplitude and notably extended distal sensory latency. The amplitude of the compound muscle action potential (CMAP) is either low or not measurable, and when it is detectable, the distal motor latency (DML) shows a notable prolongation.

The use of ultrasound has been implicated in the diagnosis of CTS because thickening of the median nerve, flattening of the nerve within the tunnel and bowing of the flexor retinaculum are all features diagnostic of CTS. Ultrasound may reveal an increased CSA of the nerve, measured at the level of the pisiform, just before it is flattened at the site of compression. CSA of the median nerve is a highly reproducible parameter and has demonstrated acceptable reliability indicative of CTS.

The purpose of this study is to evaluate the role of median nerve cross-sectional area in the diagnosis of carpal tunnel syndrome compared to the electrophysiological study.

2. Material And Method

The research was a cross-sectional investigation conducted at the Department of Physiology at Al-Imamain Al-Kadhimain Medical City in Baghdad, Iraq, from November 2024 to March 2025. The ethical informed consent was obtained from the patients to join up with the research, explained in simple words. Nerve conduction studies were assessed by using an electromyography machine (NIHON KOHDEN). At the same time, the ultrasonic examinations were done using a high-resolution sonography of a 5-13 MHz portable double-head ultrasound probe, consisting of a convex side (for deep organ examination) and a linear side (for superficial structure examination).

Median Antidromic Sensory Study

The procedure involved capturing data from an active electrode positioned on the metacarpophalangeal (MCP) joint of the fingertips, alongside a reference electrode situated on the distal interphalangeal joint, approximately 3 to 4 centimeters away from the active electrode. The stimulation at the wrist takes place between the tendons of the flexor carpi radialis and palmaris longus muscles, located 13 cm proximal to the active electrode.

Ulnar Antidromic Sensory Study

The ulnar nerve stimulation is at the wrist near the flexor carpi ulnaris tendon, and surface sensory electrodes were used for the recording on the little finger. The patient was advised to separate his fingers from each other in order to reduce volume-conducted motor potential.

Median Motor Nerve Conduction Study

Stimulation is applied distally at the wrist, situated between the flexor carpi ulnaris and palmaris longus tendons, as well as at the upper elbow, positioned medially to the biceps tendon. Utilizing an active electrode positioned at the abdominal muscle of the abductor pollicis brevis and a reference electrode placed at the first metacarpophalangeal joint, excess stimulus intensity was avoided to prevent ulnar co-stimulation.

Ulnar nerve motor conduction study

Distal stimulation at the wrist near the flexor carpi ulnaris tendon, while proximal stimulation is 3 cm proximal from the medial epicondyle, recording from the active electrode at the belly of the abductor digiti minimi (ADM) muscle at the hypothenar eminence, reference electrode at 5th MCP joint.

Median Nerve CSA:

Patients remained in chairs with arms raised, hands supine on an examination couch, and fingers semi-extended. The median nerve and flexor carpi radialis tendon are often similar in size and shape, so ultrasound is used to image them in the short axis at the distal wrist crease between the carpal tunnel inlet and outlet using direct tracing and the nerve's hyperechoic sheath as the margin, as shown in Figure 1. Nerves seem honeycomb-like, whereas tendons are compact fibrillar. The carpal tunnel inlet and exit are the proximal and distal margins of the flexor retinaculum, respectively, between the scaphoid tubercle and the pisiform bone, and the trapezium bone and the hook of the hamate. The most significant and verified metric is CSA, determined by tracing within the hyperechoic epineurium. CSA at the wrist is usually up to 10 mm^2, with 11 or 12 mm^2, as shown in Figure 1.

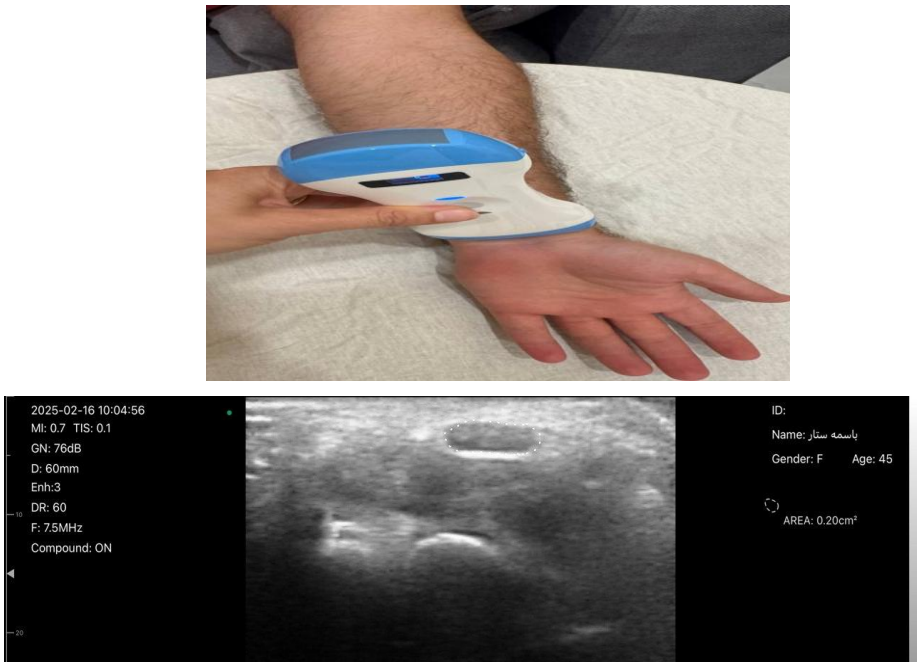

Figure 1. Assessment of the median nerve and characterizing its visualization through ultrasound scans.

Statistical Analyses

Statistical analyses were calculated employing SPSS 25.0 (SPSS, Chicago). Category parameters were number and frequency. The student's t-test, mean, and standard deviation were used to analyze continuous data. The receiver operating characteristic (ROC) curve was used to assess the diagnostic effectiveness of CSA, sensory, and motor conduction in distinguishing individuals with and without CTS. Statistically significant difference was $p < 0.05$.

3. Results

Demographic Characteristics of the Patients

This research examined 100 individuals (200 hands) with hand discomfort and parasthesia, aged 19-81, with an average age of 46.23 ± 12.1 years. Most patients were between 41 and 60 years old (58%). Females constituted the majority of the study population (78%),

while males accounted for 22%. Neurophysiologic diagnoses revealed that 49% had normal findings and 51% had CTS alone, as shown in Table 1.

Table 1. Characteristics and medical information of the research population.

Characteristic	Mean ± SD (n = 100)
Age	46.23±12.1
	19-81
Sex	22 (22%)
Males	78 (78%)
Females	
Presence of DM	9 (9%)
Yes	91 (91%)
No	
Final Neurophysiologic Diagnosis	49 (49%)
Normal	51 (51%)
CTS	

SD = standard deviation, DM = diabetic mellitus.

Carpal Tunnel Syndrome

In the research, which included 200 hands, CTS was identified in 102 hands (51%) based on nerve conduction studies NCS, as shown in Table 1. Table 2 compares median nerve sensory and motor parameters between CTS and non-CTS patients. Patients with CTS demonstrated significantly prolonged median distal motor latency (4.31 ± 1.26 msec vs. 3.14 ± 0.64 msec, $p < 0.001$) and sensory latency (3.5 ± 0.9 msec vs. 2.62 ± 0.54 msec, $p < 0.001$) compared to those without CTS. Additionally, median distal and proximal amplitudes were significantly lower in the CTS group (11.11 ± 4.15 mV vs. 12.38 ± 4.6 mV, $p = 0.042$; 9.53 ± 4.1 mV vs. 10.85 ± 4.35 mV, $p = 0.029$, respectively). Median motor conduction velocity was also reduced in CTS patients (57.25 ± 6.57 m/sec vs. 60.39 ± 6.65 m/sec, $p < 0.001$), while F-wave latency showed no significant difference between groups (25.79 ± 2.34 msec vs. 26.16 ± 2.0 msec, $p = 0.237$). Patients with carpal tunnel syndrome had substantially lower sensory nerve action potential amplitude (27.6 ± 17.57 μV vs. 36.27 ± 14.0 μV, $p < 0.001$) and conduction velocity (40.58 ± 10.48 m/sec vs. 54.1 ± 7.87 m/sec, $p < 0.001$).

Table 2. Median nerve sensory and motor parameters in the patient.

Median nerve parameters	**Yes (n=102 hands)**	**No (n=98 hands)**	**p-value**
	Mean ± SD Range		
Median distal motor latency(msec)	4.31±1.26 2.4-10.7	3.14±0.64 1.56-6.2	<0.001
Median distal amplitude (mV)	11.11±4.15 0.3-21.07	12.38±4.6 4.3-26.1	0.042
Median proximal amplitude (mV)	9.53±4.1 0.4-20.7	10.85±4.35 3.2-24.5	0.029
Median motor conduction velocity (m/sec)	57.25±6.57 33.8-86.2	60.39±6.65 49.1-79.3	<0.001
Median F-wave minimal latency (msec)	25.79±2.34 17-32.7	26.16±2.0 23-30.56	0.237
Median sensory latency(msec)	3.5±0.9 1.3-6.4	2.62±0.54 1.8-6.2	<0.001
Median sensory amplitude (μV)	27.6±17.57 0.5-74	36.27±14.0 3.2-65	<0.001
Median sensory conduction velocity(m/sec)	40.58±10.48 12.0-59.1	54.1±7.87 15.0-69.9	<0.001

In Table 3, Median distal motor latency progressively increased from mild (3.53 ± 0.53 msec) to moderate (4.44 ± 1.1 msec) and severe CTS (5.64 ± 1.66 msec) with a highly significant p-value (<0.001) according to the ANOVA (analysis of variance) test. The post hoc assessment conducted on the same table indicated significant variations alone between

the Mild and Severe CTS groups. Similarly, median distal amplitude decreased significantly across severity levels, from 12.41 ± 4.52 mV in mild cases to 9.23 ± 1.82 mV in severe cases ($p = 0.027$). The Post HOC test reveals notable differences solely across minor and alternate cases, as well as between Mild and Severe cases. The median proximal amplitude exhibited a diminishing trend, with results approaching significance ($p = 0.060$). Nonetheless, the Post HOC test indicated substantial differences between mild and severe, as well as between intermediate and powerful. Changes in median motor conduction velocity in the studied CTS groups were not significant, nor in between the groups according to the post HOC test. On the other hand, changes in F-wave minimal latency were near-significant, with substantial differences between mild and severe cases of CTS and between moderate and severe cases.

A slight increase in median nerve sensory delay was seen with increasing CTS severity, reaching statistical significance ($p < 0.001$). Only moderate and severe patients differed in the Post HOC study. On the severity scale, median SNAP and SCV decreased significantly, with SNAP amplitude reducing from 32.0 ± 16.79 μV to 12.26 ± 12.22 μV and SCV lowering from 45.87 ± 7.86 m/sec to 28.0 ± 12.75 m/sec ($p < 0.001$). The Post HOC test shows substantial variations between mild, moderate, and severe cases.

Table 3. Median nerve sensory and motor parameters according to the severity.

Median nerve parameters	severity			p-value
	Mild (n=36)	Moderate (n=50)	Severe (n=16)	
		Mean ± SD Range		
Median distal motor latency(msec)	3.53±0.53[a] 2.4-4.6	4.44±1.1[ab] 2.5-8.7	5.64±1.66[b] 3.5-10.7	<0.001
Median distal amplitude (mV)	12.41±4.52[a] 4.1-21.07	10.78±3.61[b] 2.9-20.8	9.23±1.82[b] 0.3-19.91	0.027
Median proximal amplitude (mV)	10.61±4.26[a] 3.7-20.32	9.32±3.87[a] 2.5-20.7	7.77±4.0[b] 0.4-12.9	0.060
Median motor conduction velocity (m/sec)	58.1±6.21 44.4-76	57.05±7.33 33.8-86.2	55.89±4.56 49.0-65.0	0.519
Median F-wave (msec)	25.17±1.81[a] 23.0-29.0	25.92±2.07[a] 23.0-32.69	26.81±3.6[b] 17.0-32.0	0.054
Median sensory latency(msec)	3.05±0.6[a] 1.9-5.0	3.52±0.86[ab] 1.3-6.4	4.44±0.84[b] 3.1-6.2	<0.001
Median sensory amplitude (μV)	32.0±16.79[a] 0.5-57	29.37±17.19[a] 1.4-74.0	12.26±12.22[b] 1.2-32.55	<0.001
Median sensory conduction velocity(m/sec)	45.87±7.86[a] 18.0-59.1	41.21±8.0[a] 20.8-56.0	28.0±12.75[b] 12.0-48.0	<0.001

Ultrasonography (US) of the median nerve in CTS and non-CTS patients is shown in Table 4. Among 102 hands with carpal tunnel syndrome, the median nerve cross-sectional area was significantly higher at 13.75 ± 3.95 mm^2, compared with 10.15 ± 3.33 mm^2 in the 98 hands without the condition ($p < 0.001$).

Table 4. Ultrasonographic data according to the presence or absence of CTS (n = 200 hands).

nerve/Cross-sectional area	Yes (n=102 hands)	No (n=98 hands)	p-value
	Mean ± SD Range		
Median CSA, mm^2	13.75±3.95 3-24	10.15±3.33 5-22	<0.001

CSA = cross-sectional area.

The ROC curve assessed median CSA's ability to distinguish CTS patients from non-CTS patients. The median cross-sectional area had an AUC of 0.776 with a 95% confidence range of 0.711 to 0.840. The test had 72% accuracy and 76% distinctiveness at a median CSA value of 11.5 mm^2, as shown in Figure 2.

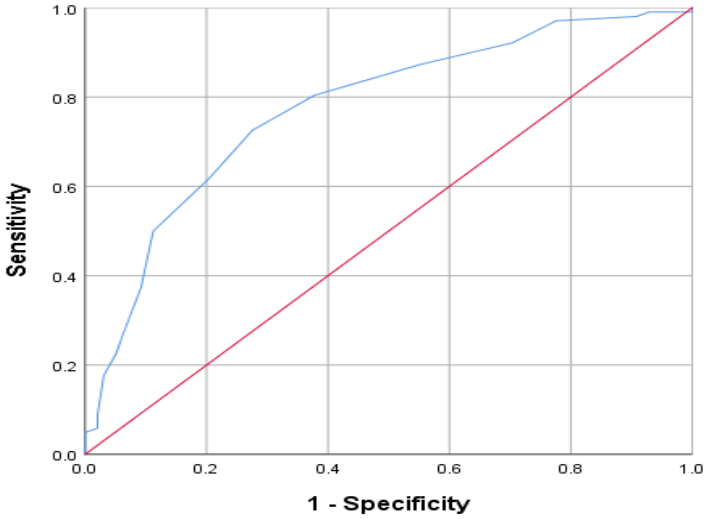

Figure 2. ROC curve for median CSA in the context of discrimination between patients with and without CTS.

Predictive value of US for CTS

Interestingly, 34 hands (17%) showed positive results for CTS during US, while these hands were negative for CTS through nerve conduction study. Accordingly, the predictive values of US in the detection of CTS could be calculated as illustrated in Table 5.

Table 5. Predictive value of US in the detection of CTS.

		NCS		Total
		Positive	Negative	
US	Positive	74	34	108
	Negative	28	64	92
	Total	102	98	200

Positive predictive value of US= 74/(74+34)×100= 68.52%.

Negative predictive value of US= 64/(64+28)×100= 69.57%.

The role of the US in CTS severity

According to NCS, 36 hands (35.29%) had mild CTS, 50 hands (49%) had moderate CTS, and 16 hands (15.69%) had severe CTS. Table 3-6 shows the CSA measured by the median nerve US based on CTS severity, in contrast median nerve CSA demonstrated an apparent increase with CTS severity, measuring 11.47 ± 2.54 mm² in mild, 14.0 ± 3.73 mm² in moderate, and 18.06 ± 3.45 mm² in severe cases, and these changes were statistically significant according to ANOVA analysis ($p < 0.001$). Finally, Post HOC test revealed which increment was statistically significant between mild and moderate, moderate and severe, and between mild and severe CTS.

Table 6. Ultra-sonographic data according to the CTS severity (n = 200 hand).

Nerve/Cross-sectional area	**CTS severity**			**p-value**
	Mild (n=36 hands)	**Moderate (n=50 hands)**	**Severe (n=16 hands)**	
	Mean ± SD			
	Range			
Median CSA, mm				
	11.47±2.54[a]	14.0±3.73[b]	18.06±3.45[c]	<0.001
	6.0-18	3.0-24	12-23	

Variations in minor letters are important.

Median CSA was tested for its ability to distinguish mild from moderate CTS using the ROC curve. The AUC was 0.732, 95% CI= 0.626-0.839. As demonstrated in Figure 3, the test's sensitivity and specificity at the cut-off value of median CSA= 12.5 were 72% and 76%, respectively.

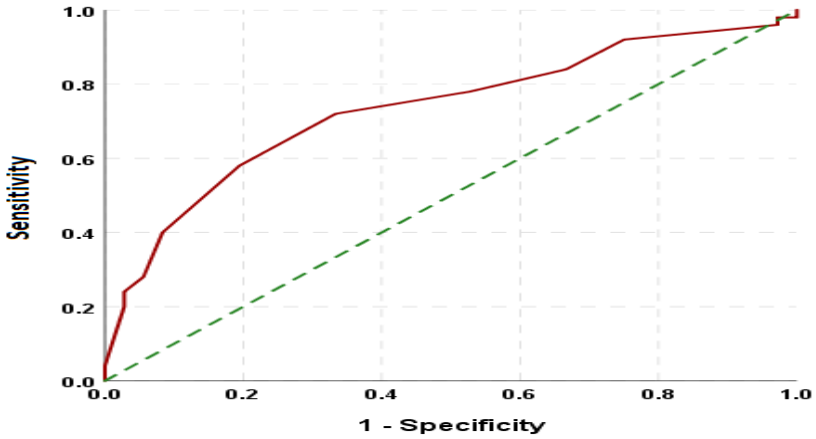

Figure 3. ROC curve for median CSA in the context of discrimination of CTS.

The scientific usefulness of median CSA for distinguishing mild from severe CTS was assessed using the ROC curve. AUC = 0.795, 95% CI= 0.677-0.913. The test has 69% sensitivity and 72% accuracy at median CSA= 15.5 (Figure 4).

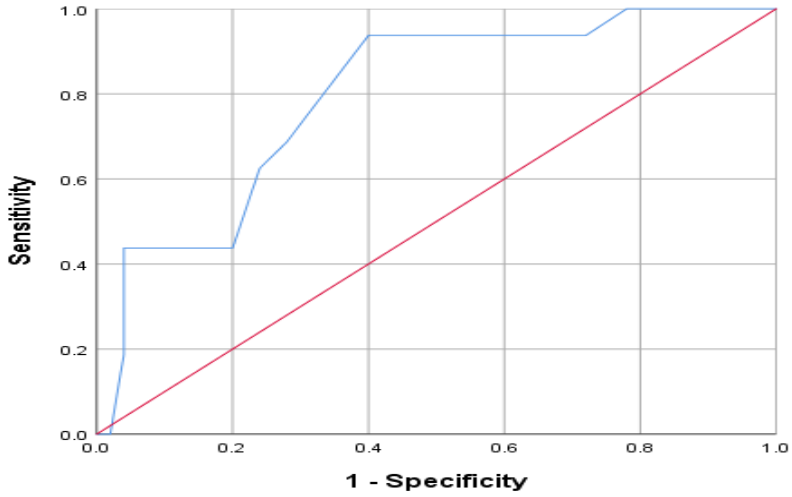

Figure 4. ROC curve for median CSA, context of discrimination between patients with moderate versus severe CTS.

4. Discussion

The most common entrapment neuropathy caused by median compression of the nerve in the carpal tunnel is CTS (10). Electrophysiological tests and clinical evaluations are fundamental for identifying and serve as the gold standard for assessing the effectiveness and sensitivity of alternative diagnostic methods (11). In the present investigation, every patient has been identified through clinical manifestations corroborated through electrodiagnostic assessments. Out of 200 hands included in this study, CTS was detected in 102 hands (51%). Patients diagnosed with CTS had significantly prolonged sensory latencies (SLs) and distal motor latencies (DMLs), significantly lower sensory nerve action potential (SNAP) and combined muscle action potential (CMAP) amplitudes, as well as lower sensory conduction velocities (SCVs) and motor conduction velocities (MCVs), as shown in Table 2.

A significant aspect of the pathology of is the demyelination of the median nerve, occurring at site of compression with extending to internodal segment while preserving the axons. This affects nerve conduction parameters, including prolonged sensory and motor latencies due to compression that slows down nerve impulse transmission, which would eventually lead to reduced sensory and motor conduction velocities. Moreover, decreased CMAP amplitudes are due to loss of nerve fibers or impaired nerve function, causing a reduction in the muscle response to nerve stimulation's strength, which agrees with other study groups (3, 10). In the same table, no significant differences were found in minimal F wave latencies between CTS versus non-CTS groups, which could be explained that the F-wave assesses the entire motor nerve pathway, not just the site of compression at the carpal

tunnel, therefore, it can be anticipated that only in severe cases of compression a profound delay in F wave latency can be revealed as compared to less severe cases, which is in agreement with the findings of other studies (12, 13) Noteworthy, in the present study the number of severe CTS hands were only 16 out of 102 hands which might most probably affect the above statistical results.

Comparing mild, moderate, and severe CTS severity indicated substantial variations in sensory and motor distal latencies, sensory conduction velocities, and sensory and motor amplitudes (Table 3). The Post HOC test showed significant differences in F-wave latencies between mild and severe and between moderate and severe CTS groups. As we mentioned earlier, such findings can be anticipated that F wave parameters are unaffected unless there is severe CTS, and therefore, significant prolongation in minimal F-wave latencies was only noticed between the group of severe CTS and the other groups. Finally, no significant differences were found in the motor conduction velocity between the different studied CTS subgroups. This can be explained by the fact that although the differences in MCVs were highly significant between CTS versus normal hands, both MCVs were within normal range, and the differences were minimal between both groups (Table 2), which might explain the non-significant results when comparing different CTS subgroups.

Neuromuscular ultrasonography (NMUS) is becoming recognized as a routine component in the assessment of peripheral nerve and muscle disorders (14). Ultrasonography has been effective in diagnosing. This technique allows precise assessment of the median nerve CSA in all individuals with CTS. Compression of the median nerve inside the carpal tunnel results in nerve flattening and proximal swelling, leading to endoneurial edema. Consequently, the cross-sectional area of the nerve at its proximal segment is used by ultrasound equipment as a diagnostic criterion (15). The current study shows a significantly larger median nerve CSA in CTS patients versus normal subjects (13.75 mm^2 vs. 10.15 mm^2), with a p-value <0.001. Moreover, according to CTS severity, the median nerve CSA demonstrated a significant increase with CTS severity ($p < 0.001$). Post HOC test revealed that the increment was statistically significant between mild and moderate, between moderate and severe, as well as between mild and severe CTS, as shown in Table 6. Aligning with the above results, several study groups demonstrated that median nerve enlargement is a characteristic of CTS. Alkaphoury & Dola showed that a median nerve CSA of 12 mm^2 demonstrated 99% sensitivity for diagnosing CTS (16). Roll and his colleagues observed a significant elevation in median nerve cross-sectional area at the pisiform level in patients compared to controls, reinforcing that nerve enlargement is a hallmark of this condition (17).

To further analyze the reliability of ultrasonography in the diagnosis of different stages of CTS severity, ROC analysis was performed. It showed that in the context of discrimination between patients with and without CTS, using a cutoff value of median CSA= 11.5 mm^2, the test had a moderate sensitivity and specificity (72% and 76%, respectively) (Figure 1). The sensitivity and specificity of ultrasonography for discrimination between patients with mild versus moderate CTS at a cutoff value of median CSA= 12.5 mm^2 were again modest (72% and 76%, respectively) (Figure 2); similar to the difference between moderate and severe CTS patients (69% and 72%, respectively) (Figure 3). Despite the highly significant increase in median nerve cross-sectional area in CTS hands compared to normal hands and between CTS severity stages, the results were just moderately sensitive and specific, which may reduce the importance of ultrasonography in diagnosing CTS severity.

Several study groups studied the usefulness of ultrasound measurement in the diagnosis of CTS. They found different sensitivity and specificity percentages with varying values of cutoffs for the median cross-sectional area studied. In their study, Moschovos and his colleagues assessed the high-resolution ultrasound accuracy against electrodiagnostic standards using ROC curve analysis. They stated that their median nerve cross-sectional area assessments were accurate (sensitivity and specificity 70% - 80%) (18). Elnady and her colleagues examined the diagnostic validity and cutoff values of many US measures for CTS identification. The area under the ROC curve was computed. The ultrasonography thresholds for CSAd were 11, 12, and 13 mm^2. From their results, the best diagnostic values of the CSAd with the best matching sensitivity and specificity (92%, 94%, respectively) were achieved using a 12mm^2 threshold (19). Recently, another group of workers found that the median nerve cross-sectional area can significantly predict CTS with a p value of 0.001 and a cutoff value of 9.8 mm2, with a sensitivity of 87.1% and a specificity of 83.9% (20). Such differences might be explained by the various sites studied across the tunnel, different population groups included, and different statistical methods used in these studies.

In this research, 34 hands had median nerve at wrist CSA ≥ 11.5 mm2 despite normal NCS, demonstrating the moderate sensitivity and specificity of ultrasonography screening in CTS identification, which supports the moderate sensitivity and specificity of ultrasound examination in the diagnosis of CTS compared to the electrodiagnostic examination. Associated with the above result, a study by Savage and McKell in 2024 claimed that using median nerve CSA to categorize CTS severity may not be reliable, as CSA alone may not consistently reflect the seriousness of the condition, nor may it consistently correlate with electrodiagnostic findings, leading to potential misclassification.

5. Conclusions

The median nerve cross-sectional area in the carpal tunnel is a a valuable diagnostic for CTS diagnosis and severity, which has significant results compared to normal subjects. The US is a less time-consuming, painless, and readily available diagnostic and screening modality, yet it has a moderate sensitivity and specificity in the diagnosis of CTS or assessing its severity; therefore, it should be used as a complementary test to the electrodiagnostic study.

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