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Therapeutic Effect of Ultrasound Guided Injection of Dextrose 5% versus Corticosteroids in Patients with Carpal Tunnel Syndrome

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Abstract

Background: There are several lines for carpal tunnel syndrome (CTS) management. However, no standard therapy exists. Perineural injection therapy with dextrose 5% (D5W) has the ability to reduce neurogenic inflammation, however there are scarce studies about its efficacy in CTS therapy. Therefore,

Aim of Study: This study aimed to compare the effect of ultrasound-guided injection of D5W with triamcinolone in management of idiopathic mild and moderate CTS.

Patients and Methods: 80 patients with mild to moderate CTS were randomized to D5W group where 5cc of D5W was injected (3cc above the median nerve and 2cc below it) and triamcinolone group where a total volume of 2cc was injected below the median nerve. Ultrasound guided injection approach was used in both groups. Patients were followed for 6 months and assessed at 1, 3, and 6 months by Boston Carpal Tunnel Questionnaire (BCTQ), visual analogue scale (VAS), median nerve (cross sectional area (CSA), electrophysiological tests.

Results: This prospective clinical trial involved 80 patients with mild and moderate CTS and they were allocated into two equal groups. Under ultrasound-guidance, one group was treated with D5W perineural injection, and the other group was treated with triamcinolone perineural injection. Significant improvement in Boston Carpal Tunnel Questionnaire BCTQ scores, VAS, and median nerve CSA, sensory latency SL, sensory conduction velocity) with no significant change in median nerve distal motor latency DML was observed in both groups at 1, 3, and 6 months post-treatment compared to baseline. In addition, no significant intergroup difference was detected as regards the above-mentioned parameters.

Conclusion: In patients with mild and moderate CTS, both D5W and triamcinolone injection groups achieved similar improvement for 6 months in pain, function, median nerve CSA, and sensory conduction tests parameters. This points to the effectiveness of D5W as a therapeutic alternative to corticosteroids. Further studies are recommended to verify our findings and illustrate D5w long-term effects.

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Key Words: *Carpal tunnel syndrome – Dextrose 5% – Perineural injection – Triamcinolone.*

Introduction

CARPAL tunnel syndrome (CTS) is the most prevalent compression mononeuropathy in the upper limbs. CTS is mostly caused by ischemia, demyelination, and median nerve injury at the carpal ligament that results from increased pressure within the carpal tunnel. It may be idiopathic or due to local factors, repetitive hand movements, or systemic diseases. Typical clinical manifestations include tingling, numbness, burning sensation, or pain in the median nerve innervated digits with exacerbation at night. CTS can be graded as mild, moderate, or severe according to electrophysiological studies **[1,2].**

CTS can be managed by non-surgical [medications, night splint, physical therapy, and perineural injection therapy (PIT)] and surgical interventions. Despite conservative management is beneficial for mild and moderate CTS, its efficacy is usually short-lived. Surgical intervention is more effective but has possible complications such as surgical pain, weakness and longer recovery period. Therefore, surgery is recommended for severe cases and those with mild and moderate CTS but failed on conservative treatment. Hence, it is necessary to find a new non-surgical intervention for CTS management **[2,3].**

There are no standard guidelines for treating idiopathic mild to moderate CTS **[4].** PIT with corticosteroids is commonly used for CTS treatment due to its anti-inflammatory effect and remarkable therapeutic response at a rate of 70-90%. However, adverse effects such as tissue atrophy, hypopigmentation and neurotoxicity can occur **[2,5].**

Perineural injection of dextrose 5% in water (D5W) was first described by Dr. John Lyftogt in the management of tendinopathy **[6].** Itis also considered a novel therapy for peripheral compression

neuropathy. It is thought that D5W can decrease neuropathic inflammation and induce hydro dissection effect [1]. D5W is considered to be a safe therapeutic option due to lack of adverse effects of steroids [7].

The studies investigating the effect of D5W perineural injection in comparison with steroid injection in treating CTS are sparse. Furthermore, some studies reported that D5W has similar efficacy to steroids [2,7]. While Wu et al. [8] found that D5W was superior to steroids. To the best of our knowledge, there are no studies were done on Egyptian-patients. Therefore, our study aimed to assess the effect of ultrasound-guided injection of D5W in comparison with triamcinolone in the management of idiopathic mild and moderate CTS.

Patients and Methods

This prospective controlled randomized clinical trial (RCT) included a total number of 120 consecutive patients with mild and moderate idiopathic CTS who were invited to take part in the study, and 80 of them had met the eligibility criteria. Patients were recruited from the outpatient clinic of Rheumatology and Rehabilitation Department. The present study was carried out between September 2023 and August 2024. Detailed history, physical examination, and electrophysiological tests were performed to examine the patients for eligibility. This study was approved by institutional research board (code: MS.23.09.2553).

Inclusion criteria:

Patients aged more than 18 years old with idiopathic CTS were diagnosed clinically according to the following criteria [9].

1- Paresthesia, pain, swelling, or clumsiness of the hand, which is increased typically at night and by repetitive hand movements and reduced by handshaking or a change in hand posture.
2- Sensory deficit at the area innervated by the median nerve in the hand.
3- Motor affection or atrophy of the muscles innervated by the median nerve.
4- Positivity of Phalen's and/or Tinel's test.

CTS was described when criterion 1 + at least one criterion from 2 to 4 were fulfilled. Patients who matched criterion 3 were not involved in the current study.

CTS diagnosis and determination of its grades wereconfirmed by the electro diagnostic testing [10]:

o Mild CTS: Prolonged median nerve sensory latency (SL) with normal motor nerve conduction study.
o Moderate CTS: Prolonged median nerve SL with prolongation of distal motor latency (DML).

Cutoff points or abnormal values [11]:

1- Median nerve SL >3.6 milliseconds.
2- Median nerve DML ≥4.3 milliseconds.

Exclusion criteria:

Patients were not included if they had one of the conditions that follow:

Less than 18 years old, diabetes, pregnancy, hypothyroidism, acromegaly, rheumatoid arthritis, renal failure, previous carpal tunnel release surgery, severe CTS, cervical radiculopathy, brachial plexopathy, polyneuropathy, median nerve traumatic injury, thoracic outlet syndrome, local injectionor physical modalities for CTS in the preceding 12 months, or infection at the injection site.

Sample size:

A preliminary power analysis using G* power 3.1.9.2 (UCLA, Los Angeles, CA, USA) power (1-β (= 0.8, α = 0.05, effect size = 0.65) indicated that a sample of 40 in each group was required.

Randomization:

After initial evaluation, patients (n=80) were randomized into 2 groups (1:1 ratio) by drawing sequentially numbered sealed opaque envelopes containing a computer-generated randomized code.

Group 1 (D5W group): Included 40 patients (30 females and 10 males) with ages ranged from 20 to 60 years who underwent ultrasound-guided injection of D5W in a 5cc syringe and a 25-gauge needle (3cc below the flexor retinaculum and 2cc below the median nerve inside the carpal tunnel).

Group 2 (Triamcinolone group): Included 40 patients (29 females and 11 males) with ages ranged from 20 to 60 years who underwent ultrasound-guided injection of 1 cc of 1% lidocaine + 1cc of triamcinolone 40mg in a 3cc syringe and 25-gauge needle below the median nerve inside the carpal tunnel.

Ultrasound-guided (US) injection Technique:

The site of injection was sterilized with antiseptic solution. The palm was directed upward with slight wrist extension. Identification of the median nerve was performedat scaphoid-pisiform level under the guidance of ultrasonography (Sonosite M-Turbo VR, Fujifilm Inc., USA) using a 7-13 MHz linear array probe [9]. Doppler imaging was used to identify the ulnar artery to avoid its injury. The injectate was administered through a 25-gauge needle using the ulnar in-plane technique. After injection, scanning of the entire carpal tunnel was done to confirm that the injectate had spread from the proximal to the distal area of the tunnel. All patients were observed for 30 minutes following injection for the possibility of dysesthesia or bleeding [12].

Outcome Measures:

The following parameters were measuredprior to injection and at 1st, 3rd and 6th month after injection in all patients.

1- Pain visual Analogue Scale (VAS):

The VAS-pain score consists of a continuous horizontal line. The length of this line is 10mm. To indicate the degree of pain, the score is anchored by 0 (no pain) at one end and 10 (worst pain) on the other end. The patient marked the location onthe VAS line that corresponds to the level of pain [13].

2- The Arabic version of Boston Carpal Tunnel Questionnaire (BCTQ-A) [14]:

There are two subclasses in this questionnaire: 11 questions about symptoms and severity are included in the Symptom Severity Scale (SSS), which uses a 5-point rating system from 1 (never/none) to 5 (most severe). Eight items on functional status are included in the Functional Status Scale (FSS), which is rated on a 5-point scale from 1 (no difficulty) to 5 (cannot execute the activity at all).

3- Cross sectional area (CSA) of the Median Nerve by ultrasonography:

As shown in Fig. (1), median nerve CSA was measured at the scaphoid-pisiform level by tracking along the inner edge of the hyperechoic rim that surrounds the nerve (epineurium) [15]. This measurement was done for all patients at the same day of clinical and electrophysiological examination.

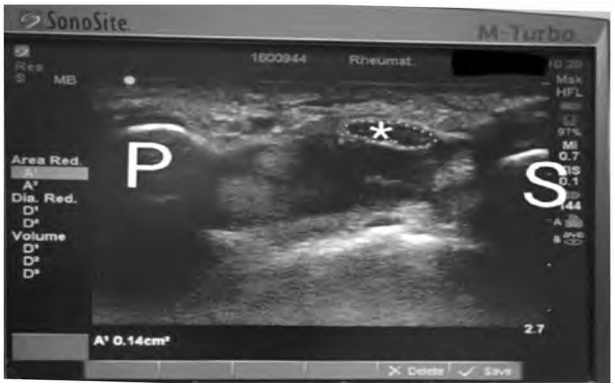

Fig. (1): Measurement of the median nerve CSA at scaphoid-pisiform level.

P: Pisiform. S: Scaphoid. Asterisk: Median nerve.

4- Electrodiagnostic testing:

Electrodiagnostic tests were performed using Neurowerk Sigma medizin-Tchnik machine. Only patients with mild and moderate CTS were included in the study.

Motor nerve conduction study of the median nerve:

Median nerve was stimulated proximally at the elbow and distally above the wrist crease by 2cm. The recording electrode was placed over the belly of the abductor pollicis brevis (APB) muscle. The reference electrode was placed on the tendon insertion. The ground electrode was placed between the stimulating electrode and the recording electrode. DML, motor conduction velocity, and combined muscle action potential (CMAP) amplitude of the median nerve were recorded [10].

Sensory nerve conduction study of the median nerve:

Antidromic median nerve stimulation was done at the wrist at 14cm proximal to the recording electrode which was placed on the proximal phalanx of the second digit, while the reference electrode was placed 4cm distal to the recording electrode. SL, sensory nerve action potential (SNAP) amplitude, and sensory conduction velocity of the median nerve were recorded [16].

Statistical analysis:

SPSS for Windows version 20.0 (SPSS, Chicago, IL) was used for all statistical analyses. All continuous data were presented in mean ± standard deviation (SD) and were normally distributed. Numbers and percentages were used to represent categorical data. For two variables with continuous data, the comparisons were made using the independent sample Student's *t*-test; for repeated measures at time points of the same variable, the paired sample *t*-test was employed. Variables with categorical data were compared using the chi-square test. Statistical significance was set at $p<0.05$.

Results

This study included 80 patients with mild to moderate idiopathic CTS who met eligibility criteria, with 40 patients per group as represented in the study flow diagram (Fig. 2). Both groups are comparable regarding baseline characteristics (Table 1).

As depicted in Table (2), VAS-pain score, BCTQ scores, and median nerve CSA showed significant improvement in both groups at 1, 3, and 6 months after treatment compared to baseline. However, there was no significant difference between both groups as regards the above-mentioned parameters at 1, 3, and 6 months after injection.

Table (3) illustrates the changes in median nerve electrophysiological parameters in both groups before and after treatment. Median nerve SL and sensory conduction velocity showed significant improvement in the D5W group and the triamcinolone group at 1, 3, and 6 months after injection compared to baseline. However, the median nerve DML showed no significant change in both groups at 1, 3, and 6 months after injection compared to baseline. In addition, there was no significant difference between both groups regarding the above-mentioned parameters at 1, 3, and 6 months post-treatment.

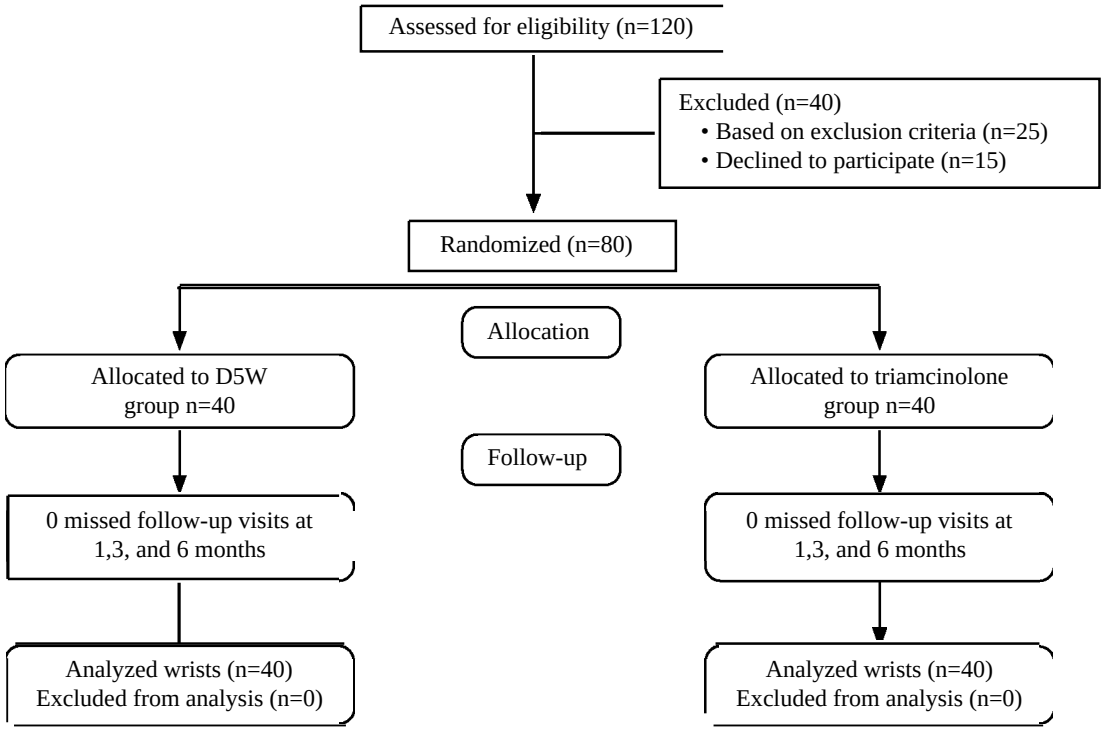

Fig. (2): Study flow diagram. D5W = 5% dextrose in water.

Table (1): Demographic and clinical characteristics of study participants at baseline.

Characteristic	D5W Group (n=40)	Triamcinolone Group (n= 40)	Student's *t*-test P (a)
Age (years) (mean ± SD)	45.8±7.5	46.9±6.2	0.448
Sex (n, %):			
Females	30 75.0	29 72.5	
Males	10 25.0	11 27.5	0.799*
Dominant hand (n, %)	32 80.0	31 77.5	0.785*
BMI (Kg/m^2) (mean ± SD)	30.9±2.1	30.8±1.4	0.990
VAS-pain score (mean ± SD)	8.6±0.9	8.4±0.8	0.201
BCTQ-SSS (mean ± SD)	32.0±5.8	31.4±4.4	0.604
BCTQ-FSS (mean ± SD)	23.2±2.7	22.9±3.0	0.670
CSA (mm^2) (mean ± SD)	13.3±1.3	13.0±1.6	0.447
Sensory latency (m sec) (mean ± SD)	4.2±0.5	4.3±0.3	0.281
Sensory conduction velocity (m/sec) (mean ± SD)	31.8±1.6	31.3±1.5	0.100
DML (m sec) (mean ± SD)	4.5±1.7	4.6±1.5	0.781

* X^2 value.
Chi square test.
a = Independent Student's *t*-test.
BMI = Body mass index.
BCTQ-SSS = Boston Carpal Tunnel Questionnaire symptoms severity scale.
BCTQ-FSS = Boston Carpal Tunnel Questionnaire Functional Status Scale.
CSA = Cross sectional area.
D5W = Dextrose 5% in water.
DML = Distal motor latency.
SD = Standard deviation.
VAS = Visual analog scale.

Table (2): Comparison of changes of VAS-pain score, BCTQ scores, and median nerve CSA between both groups.

	D5W Group (n=40)		Triamcinolone Group (n= 40)		D5W versus Triamcinolon groups
	Mean ± SD	P(a)	Mean ± SD	P(a)	P(b)
VAS-pain score baseline:	8.6±0.9		8.4±0.8		0.201
1 month post-treatment	2.9±1.2	<0.001	3.1±1.6	<0.001	0.528
3 months post-treatment	6.4±1.4	<0.001	6.9±2.0	<0.001	0.199
6 months post-treatment	6.7±1.2	<0.001	7.5±2.1	0.013	0.397
BCTQ-SSS baseline:	32.0±5.8		31.4±4.4		0.604
1 month post-treatment	16.9±3.8	<0.001	17.3±5.4	<0.001	0.702
3 months post-treatment	23.2±4.9	<0.001	25.2±6.8	<0.001	0.135
6 months post-treatment	25.5±3.7	<0.001	27.1±5.9	<0.001	0.150
BCTQ-FSS baseline:	23.2±2.7		22.9±3.0		0.670
1 month post-treatment	11.5±2.3	<0.001	11.9±3.3	<0.001	0.531
3 months post-treatment	15.1±2.8	<0.001	16.4±4.5	<0.001	0.124
6 months post-treatment	19.5±2.1	<0.001	20.4±3.6	<0.001	0.176
CSA (mm^2) baseline:	13.3±1.3		13.0±1.6		0.447
1 month post-treatment	9.9±1.2	<0.001	10.2±1.7	<0.001	0.364
3 months post-treatment	11.2±1.4	<0.001	11.8±1.8	0.002	0.100
6 months post-treatment	11.9±1.5	<0.001	12.1±1.9	0.025	0.603

a = Paired Student's *t*-test (compared to baseline).
b = Independent Student's *t*-test (difference between both groups).
BCTQ-SSS = Boston Carpal Tunnel Questionnaire symptoms severity scale.
BCTQ-FSS = Boston Carpal Tunnel Questionnaire Functional Status Scale.
CSA = Cross sectional area.
D5W = Dextrose 5% in water.

Table (3): Comparison of changes in median nerve electrophysiological parameters between both groups.

	D5W Group (n=40)		Triamcinolone Group (n=40)		D5W versus Triamcinolon groups
	Mean ± SD	P(a)	Mean ± SD	P(a)	P(b)
Sensory latency (m sec) baseline:	4.2±0.5		4.3±0.3		0.281
1 month post-treatment	3.5±0.3	<0.001	3.6±0.3	<0.001	0.140
3 months post-treatment	3.8±0.3	<0.001	3.9±0.9	0.009	0.507
6 months post-treatment	3.9±0.3	0.002	4.0±0.8	0.029	0.461
Sensory conduction velocity (m/sec) baseline:	31.8±1.6		31.3±1.5		0.100
1 month post-treatment	35.1±1.5	<0.001	34.8±1.9	<0.001	0.435
3 months post-treatment	34.4±1.7	<0.001	34.1±1.4	<0.001	0.391
6 months post-treatment	33.1±1.2	<0.001	32.7±1.5	<0.001	0.192
DML (m sec) baseline:	4.5±1.7		4.6±1.5		0.781
1 month post-treatment	4.0±1.2	0.133	3.9±1.3	0.115	0.722
3 months post-treatment	4.1±1.3	0.144	4.3±1.7	0.405	0.556
6 months post-treatment	4.2±0.6	0.185	4.5±0.8	0.459	0.062

a = Paired Student's *t*-test (compared to baseline).
b = Independent *t*-test (difference between both groups).
D5W = Dextrose 5% in water.
DML = Distal motor latency.

Discussion

Our study aimed to assess the effect of ultrasound-guided injection of D5W in comparison with triamcinolone in the management of idiopathic mild and moderate CTS. Our results showed that both D5W and triamcinolone perineural injectionhad significantly improved VAS-pain score,BCTQ symptoms, and function scales as well as CSA of the median nerve at 1, 3, and 6 months following injection compared to baseline. In addition, we revealed that there was no significant difference between both groups as regards the aforementioned parameters at 1, 3, and 6 months following injection. Furthermore, we noticeda significant improvement, compared to baseline, in the D5W group and the triamcinolone group as regards median nerve sensory conduction velocity and SL at 1, 3, and 6 months following injection. Conversely, no significant improvement compared to baseline in median nerve DML in both groups was observed at 1, 3, and 6 months post-injection. Moreover, there was no significant difference between both groups in these electrophysiological parameters at 1, 3, and 6 months following injection.

Ultrasound-guided peripheral nerve injections provide real-time visualization of needle placement, allowing for greater procedural accuracy and enhanced safety. Compared to landmark-based (blind) techniques, ultrasound guidance significantly reduces the risk of complications such as peritendinous fibrosis and iatrogenic injury to the median nerve. Current evidence indicates that the specific technique utilized in ultrasound-guided injections for CTS can differentially impact clinical outcomes, particularly with respect to pain reduction and functional improvement in both short- and long-term evaluations Ozge et al. *[2]*.

It is hypothesized that corticosteroids cause CTS symptom relief through reduction of inflammation and edema of the median nerve and its nearby tissue within the carpal tunnel, which by its turn decreases the pressure on the median nerve *[17]*.

There is no agreement about the duration of corticosteroids efficacy in CTS treatment in the research. Previously, it was reported that the corticosteroid effect could last for one month only after injection *[18]*. Lee et al. *[19]* repored thatimprovement in symptoms and electrophysiological parameters can be detected at three monthsafter ultrasound-guided corticosteroids injection. In addition, significant improvement in VAS-pain score and both BCTQ scores at 3 months after corticosteroid injection was reported by Uzun et al. *[20]*. Moreover, other studies showed that the therapeutic effects ofcorticosteroids injection can extend up to six months *[21,22]*. Furthermore, Aghaei et al. *[23]* showed a significant improvement in VAS-pain score and BCTQ scores in the corticosteroid group along 12 months of post-injection follow-up. In our study, the improvement in the triamcinolone group in the clinical and electrophysiological parameters could be observed up to 6 months post-injection. This variability in the duration of the therapeutic effect may rely on the volume of the injectate, the injection method, or the severity of the symptoms.

Lately, physicians' preference of corticosteroids has been decreasing due to its possible adverse effects, which might develop especially in patients with diabetes and hypertension *[2]*. Recently, it was found that D5W perineural injection help to relieve peripheral compression neuropathy. As it has an osmotic pressure that is similar to normal saline *[24]*. In addition, it can reduce neuropathic pain as it inhibits the activation of capsaicin-sensitive receptors [e.g., transient receptor potential vanilloid-1 (TRPV1)], blocks the release of substance P and calcitonin gene-related peptide, relieves neurogenic inflammatory pain, and hyperpolarizes C fibers, inhibiting pain transmission. In addition, PIT with D5W has a hydrodissection effect, which releases mechanical compression on the median nerve. However, the definite mechanism for its therapeutic effect is not clear *[5]*.

Wu et al. *[25]* designed the first clinical trial to assess the efficacy of ultrasound-guided PIT of D5W for patients with mild and moderate CTS. The study included 49 patients who weredistributed into two groups (D5W group who received 5cc of D5W and control group who received 5cc of normal saline). Similar to our results, they reported that a single session of ultrasound-guided perineural D5W injection had reduced BCTQ scores, VAS-pain score, as well as median nerve CSA significantly at 1, 3, and 6 months after injection compared to baseline and control group. Additionally, statistically significant improvement was observed in median nerve sensory conduction velocity but not in DML at all times of follow-up compared to baseline and control group.

Similarly to our findings, Lin et al. *[26]* designed a randomized controlled clinical trial and injected three different volumes of D5W (1ml, 2ml, and 4ml) in three different groups of patients with idiopathic CTS and followed the patients for 6 months to compare the efficacy of different D5W volumes in the treatment of idiopathic CTS patients. They found that there was a significant improvement in BCTQ scores and VAS-pain score at 1, 3, and 6 months compared to baseline after D5W injection in all groups. In addition, significant improvement was noticed in median nerve CSA in the 2ml and 4ml groups; also, significant improvement was reported in median nerve sensory conduction velocity in the 4ml group along the study period (6 months). There wasno significant difference as regardsmedian nerve DML in all D5W groups (1ml, 2ml, and 4 ml) in comparison to baseline at any point of time during the study period (6 months).

Our findings are parallel with the findings of Ozge et al. [2] who collected 92 wrists with CTS of mild and moderate degree and randomized them into two groups. The first group was injected with 5cc of D5W and a total volume of 5cc was injected in the second group (1cc of triamcinolone 40mg, 2cc of 2% lidocaine, and 2cc of normal saline). They reported that both groups at 1 and 6 months following injection compared to baseline showed significant improvement as regards VAS-pain score, BCTQ scores, and median nerve sensory conduction velocity, but median nerve DML showed no change. Moreover, they showed that there was no significant difference between both groups as regards the above-mentioned parameters indicating that perineural D5W could be an alternative to corticosteroids in the management of patients with mild to moderate CTS.

In line with our results, Aghaei et al. [23] compared the effectiveness of a single local injection of D5W and triamcinolone in 40 wrists (20 wrists per group) over a 12-month period. D5W group was injected with 2 ml of D5w and triamcinolone group was injected with a total volume of 2cc (1ml triamcinolone 40mg and 1ml normal saline). They revealed that both interventions significantly improved BCTQ scores and VAS-pain score at 1,3, and 12 months after injection compared to baseline; also, median nerve SL improved significantly at 3 months following injection in both groups. However, no significant difference between both groups was noticed as regards the above-mentioned clinical and electrophysiological parameters. In contrast to our results, they reported a significant improvement in median nerve DML in both groups at 3 months; this may be related to the usage of night wrist splints and the small sample size in their study (20 per group in their study and 40 per group in our study).

Similar to our results, Nasiri et al. [7] publisheda double-blinded randomized controlled trial that assessed the efficacy of a single perineural injection of D5W compared to steroid in 36 patients with mildtomoderate idiopathic CTS with a 3-month follow-up duration. Patients were randomized into two groups: One group was injected with a total volume of 2cc (1cc of methyl prednisolone acetate and 1cc of normal saline) and the other group was injected with 2cc of D5W. They found that there was a significant improvement in BCTQ-SSS, VAS-pain score, andmedian nerve CSA and SL in both groups at 1and 3 months following injection compared to baseline. However, no significant difference between both groups regarding the above-mentioned parameters indicating that the short-term effects of perineural D5W injection are similar to those of corticosteroids. Conversely, there was an insignificant change in BCTQ-FSS at 3 months after injection compared to baseline in both groups. This may bedue to the difference in injectate volume and sample size.

Wu et al. [8] assessed the efficacy of D5W and triamcinolone acetonide in 54 patients with mild and moderate CTS along 6-month follow-up duration. They found that VAS-pain score, BCTQ scores, and median nerve sensory conduction velocity had significantly improved in both groups at 3 months after injection compared to baseline. Additionally, significant improvement in median nerve CSA was observed in both groups along the study period. There was no significant difference in median nerve DML in both groups along the study period. Moreover, there was no intergroup difference at 3 months post-injection as regards the aforementioned parameters. These all came in line with our findings. On the opposite to our results, their studyreported a higher significant improvement in D5W group compared to steroid group regarding VAS-pain score and BCTQ scores at 4 and 6 months after injection. In addition, median nerve sensory conduction velocity was not improved in both groups significantly after 6 months of follow-up in comparison to baseline. This can be related to the small sample size (27 wrists per group in their study and 40 wrists per group in our study), the dose of triamcinolone was 30mg in their study and 40mg in our study, and to the fact that their study included patients with diabetes and hypertension, which may affect the intervention outcome. Moreover, median nerve DML at 1 month showed significant improvement in the steroid group in comparison to baseline; this can be attributed to the volume of the injectate, as they used a volume of 5ml (3ml of triamcinolone 10mg/ml and 2ml of normal saline). We used a volume of 2ml (1ml of triamcinolone 40mg and 1ml of 1% lidocaine).

Actually, the electrodiagnostic studies provide informations about functional changes of the median nerve and play a crucial role in CTS diagnosis. Additionally, sonographic median nerve CSA is considered a substantial parameter in CTS evaluation [27]. Ultrasound-guided injections provide real-time visualization of needle placement, allowing for greater procedural accuracy and enhanced safety. Compared to landmark-based (blind) techniques, ultrasound guidance significantly reduces the risk of complications such as peritendinous fibrosis and iatrogenic injury to the median nerve [2]. In the present study, injection procedure was employed under the guide of ultrasound which is advantageous. Moreover, the therapeutic efficacy was monitored prospectively through utilization of comprehensive tools including not only subjective methods (VAS and BCTQ scores) but also objective parameters (electrophysiological tests and sonographic CSA). The aforementioned aspects provide strength to our st*udy.*

Study limitations:

Our study has certain limitations. First, it was single-centered with short follow-up. Hence, in future research, the inclusion of larger patientpopu-

lations with longer follow-up durations should be considered. Second, side effects of D5W and triamcinolone were not assessed in this study. Finally, the ideal volume of D5W was not determined. Notwithstanding these drawbacks, we think our research offers useful information that may impact future therapeutic approaches.

Conclusion:

In patients with mild and moderate CTS, both D5W and triamcinolone injection groups achieved similar improvement for 6 months in pain, function, median nerve CSA, and sensory conduction tests parameters. This points to the effectiveness of D5W as a therapeutic alternative to corticosteroids. Further studies are recommended to verify our findings and illustrate D5w long-term effects.

Clinical trial number: Not applicable.

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Authors' contributions: The study's idea and design, data interpretation, paper revision, and final draft approval were all contributed to by the authors.

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Availability of data and materials: Available.

Declerations:

Ethical considerations All participants were informed of the study's purpose and methods prior to their involvement. Written consent was requested from each participant. This work was approved by institutional research board (code: MS.23.09.2553).

Conflict of interest: The investigators declare there was no conflict of interest.

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التأثير العلاجى للحقن الموجه بالموجات فوق الصوتية لدكستروز ٥٪ فى مرضى متلازمة النفق الرسغى

متلازمة النفق الرسغى هى الاعتلال العصبى الأكثر شيوعًا في الطرفين العلويين، وتؤثر على ١–٥٪ من السكان. تظهر الأعراض على شكل تنميل ووخز وألم أو إحساس بالحرقان، خاصةً ليلًا. من عوامل الخطر: السكرى، اضطرابات الغدة الدرقية، الروماتويد، والسمنة، ويُعتقد أن تكرار استخدام اليد يزيد من احتمالية الإصابة.

السبب الدقيق غير واضح، لكن يُرجح أنه ناتج عن ضغط ميكانيكى على العصب، ضعف التروية، التهاب الأوتار، أو إزالة الميالين. يشمل العلاج التحفظى الأدوية، الجبائر، العلاج الطبيعى، وحقن الكورتيزون، ولكن غالبًا ما يكون تأثيره قصير الأمد. الجراحة تُستخدم فى الحالات الشديدة، لكنها قد تفشل، لذا هناك اهتمام بالعلاجات غير الجراحية.

اقتُرح استخدام دكستروز ٥٪ موجه بالموجات فوق الصوتية كبديل للكورتيزون. تهدف الدراسة الحالية لمقارنة فعاليته مع تريامسينولون فى علاج المتلازمة.

شملت الدراسة ٨٠ مريضًا، تم تقسيمهم إلى مجموعتين: مجموعة الدكستروز (٥ سم) ومجموعة التريامسينولون (٢ سم). تمت المتابعة بعد شهر، ٣ أشهر، و٦ أشهر باستخدام مؤشرات الألم، استبيان بوسطن، قياس العصب، ودراسات التوصيل العصبى.

أظهرت النتائج تحسنًا ملحوظًا في المجموعتين في جميع المؤشرات، دون وجود فرق إحصائى واضح بينهما علي مدار ستة اشهر. خلصت الدراسة إلى أن الدكستروز ٥٪ فعال بنفس قدر الكورتيزون ويمكن استخدامه كبديل آمن وغير جراحى.