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Extra-corporeal shock wave therapy versus local corticosteroid injection in treatment of chronic trigger finger in diabetic patients

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Abstract

Background Trigger finger is one of the most common causes of pain and dysfunction. The aim of our study was to compare the effectiveness of shock wave therapy versus local corticosteroid injection in the treatment of trigger finger in diabetic patients.

Results The two groups were matched on age, HbA1c, VAS score, and grip force at week zero. There was statistically significant improvement in both groups after treatment. In comparing the two groups after 6 weeks of starting treatment either by shockwave therapy or by local corticosteroid injection, there was a statistically significant improvement in group 1 as regards VAS pain score (p = 0.012), clinical signs (finger extension and locking) (p = 0.018), hand grip dynamometer (p < 0.001), and musculoskeletal ultrasound findings in comparison to group 2.

Conclusion Trigger finger is a common complication of DM. Shockwave therapy was able to reduce pain and improve hand functional level and quality of life. Shockwave is an effective, safe, non-invasive method for conservative management of trigger finger.

Keywords DM (diabetes mellitus), HbA1c (hemoglobin A1c), VAS (Visual Analogue Scale)

Background

Trigger finger is one of the most common causes of hand pain and dysfunction, with a prevalence of 3% in the population [1]. It is also known as stenosing tenosynovitis, characterized by hypertrophy at the intersection of the tendon with its pulley. This constriction of the tendon prevents smooth gliding through the ligament pulley, resulting in sudden finger release or locking during flexion, extension, or hand movement [2].

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Trigger finger is primarily diagnosed clinically and is associated with risk factors such as aging and female gender. It is often encountered in the elderly population, especially due to the high prevalence of diabetes mellitus (DM) in this age group [3]. Commonly affected digits include the thumb and ring finger of the dominant hand. The classic presentation involves finger popping and locking, while patients with acute trigger finger often experience pain, swelling, and limited range of motion [4]. It can be either idiopathic or secondary to conditions such as rheumatoid arthritis, type 2 diabetes, or mucopolysaccharidoses. Some studies suggest a correlation between trigger finger and hand overuse or repetitive hand trauma [5].

Diabetes mellitus (DM) is a substantial risk factor for trigger finger, elevating the risk by up to 10%. DM leads to the accumulation of glycosylated proteins and less soluble collagen in connective tissues. These pathological changes can damage blood vessels and nerves, giving rise



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to musculoskeletal manifestations that may contribute to significant physical disability and a decline in quality of life [6].

Conservative treatment is recommended for uncomplicated patients referred after the onset of symptoms [7].

Local corticosteroid injections are typically the firstline treatment for trigger finger due to their convenience and effectiveness, with response rates ranging from 42 to 92% across all grades of the condition. Accurate injection into the flexor tendon sheath is crucial to maximize therapeutic effects and minimize side effects such as skin atrophy, tendon rupture, and skin discoloration. Corticosteroid injections exert their anti-inflammatory effects by inhibiting the formation of inflammatory mediators like cyclooxygenase and phospholipase A2 [8].

Extracorporeal shock wave therapy (ESWT) has appeared as an alternative and promising method for treating musculoskeletal disorders. ESWT utilizes pressure waves, resembling a rocket mechanism, to stimulate healing. Physically, a shockwave is described as the propagation of acoustic energy that disperses in threedimensional spaces and can be transmitted, reflected, or absorbed. Shock wave therapy regulates growth and proliferation factors and reduces pain through substances like calcitonin gene-related peptides and substance P [9]. Numerous studies have demonstrated its effectiveness in various pathologies, including trigger finger [10]. Additionally, it can serve as an alternative conservative treatment option for diabetic patients who may not be suitable candidates for corticosteroid injections due to complications.

Musculoskeletal ultrasound is a non-invasive imaging technique for visualizing soft tissues, making it the preferred method for diagnosing wrist and hand pathologies. It provides dynamic imaging, offering valuable information about the thickness of annular pulleys, the structure of flexor tendons, irregularities in tendon margins, and fluid accumulation in tendon sheaths [11]. Our study aims to compare the effectiveness of shock wave therapy versus local corticosteroid injections in the treatment of chronic trigger finger in diabetic patients.

Methods

Patients, study design

Fifty patients with type II diabetes mellitus, who were nonsmokers and presented with chronic trigger finger grades II and III based on Green's classification [12], were recruited from outpatient clinics at university hospitals. The Green classification categorized trigger finger as follows: grade I—a history of catching and tenderness over the A1 pulley; grade II—demonstrable catching with the patient's ability to actively extend the digit; grade IIIA demonstrable catching requiring passive extension; grade IIIB—demonstrable catching requiring passive flexion; and grade IV—fixed flexion contracture of the proximal interphalangeal joint [12].

The patients were randomly divided into two groups. Group 1 consisted of 25 patients who received six shockwave therapy sessions, one session per week, while the other 25 patients in group 2 received a single local corticosteroid injection into the affected flexor tendon sheath.

Inclusion criteria for this study encompassed patients with type II diabetes aged 50 years or older, diagnosed with chronic trigger finger based on the clinical presentation, which includes the presence of pain, tenderness, discomfort, or a palpable nodule over the flexor tendon sheath for months or years. Patients with Green's classification grades I and IV, type I diabetes mellitus, uncontrolled diabetes (HbA1c>7), rheumatological diseases, current pregnancy, traumatic trigger finger, local infection, a history of malignancy, or prior surgery for trigger finger were excluded from the study. Informed consent was obtained from all study participants, and the research received approval from the Research Ethics Committee.

Clinical assessment

All patients underwent a comprehensive medical history assessment along with general and local examinations. Finger pain was evaluated using a Visual Analogue Scale (VAS), where respondents choose a whole number on a scale of 0 to 10, with "0" representing no pain and "10" signifying extreme pain. Range of motion (ROM) assessments for all fingers included both active and passive movements, measured with a goniometer.

Grip force in the affected hand was quantified as the maximum grip strength using a baseline hand dynamometer. This measurement was taken with the patient seated, the shoulder at 0° abduction, in a neutral position, and the elbow flexed at 90°. A 30-s pause was allowed between measurements, and the mean value of three measurements was recorded in kilograms [13].

The Green classification was used to assess each trigger finger, categorized as either grade II or III. HbA1c levels were measured in all patients before starting treatment using an enzymatic assay.

Musculoskeletal ultrasound

High-resolution ultrasound was conducted using a linear transducer (12 MHz) (LOGIQ 9 Pro Series; GE Medical Systems, USA). Patients were seated in front of the examiner, with their hands and arms extended, resting on the examination table. The musculoskeletal ultrasound machine was positioned beside the patient. The patient's hand was placed in a supine position, and a suitable amount of transmission gel was applied. A sterile field was maintained around the transducer's edge.

The scanning technique was carried out first in the transverse position and then in the longitudinal position. This allowed for the assessment of key parameters, including the thickness of the A1 pulley (with an average thickness of less than 0.5 mm) [14], the thickness of the synovial sheath surrounding the flexor tendons (with an average thickness of less than 1 mm) [15], and the use of power Doppler ultrasound to assess hypervascularity. Power Doppler ultrasound was initially used to confirm the diagnosis of trigger finger.

A reevaluation of both groups was conducted after 6 weeks from the initiation of treatment.

Extra-corporal shock wave therapy (ESWT)

The shockwave device (Technikwave GmbH & Co. KG, China) was utilized with a handheld probe to administer high-energy pulses, akin to sound waves, to the A1 pulley of the affected finger. This shock wave device delivered waves at an energy flux density of 0.2 mJ/mm² and a frequency of 6 Hz.

In group 1, patients received a total of six sessions of extracorporeal shock wave therapy (ESWT) spanning 6 weeks, with one session conducted per week. Each session comprised 2000 impulses, and standard ultrasound gel was employed to facilitate coupling between the shock wave generator and the film drape.

Local corticosteroid injection

In group 2, patients received a single local corticosteroid injection guided by ultrasound. The patient was seated in a face-to-face position with the physician, and the physician palpated the flexor tendon nodule on the A1 pulley. The patient's palm was sanitized with alcohol, and the affected finger was positioned in a flexed state. A 25-gauge needle was inserted at a 45° angle, deep into the flexor tendon, starting from the proximal to the distal part of the A1 pulley. Care was taken to ensure that the needle and puncture site did not come into contact with the ultrasound probe.

The finger was then moved through a range of bending and extending motions to confirm that the needle moved in tandem with the finger's movements. The injection proceeded by repeating flexion and extension until the needle no longer moved. Subsequently, a mixture consisting of 0.5 ml of 40 mg/ml triamcinolone acetonide and 0.5 ml of lidocaine was injected into the flexor tendon sheath, beginning proximally and progressing distally at the nodule site. The success of intra-sheath injection was confirmed using musculoskeletal ultrasound, which also allowed monitoring of the injected solution's flow beneath the A1 pulley. After the injection, a small sterile adhesive dressing was applied, and the patient was allowed to move the finger immediately. Nonsteroidal anti-inflammatory drugs (NSAIDs) and anti-edematous drugs were prescribed post-injection.

Statistical methods

The collected data were reviewed, coded, tabulated, and entered into a computer using Statistical Package for the Social Sciences version 20 (SPSS-V20) in the USA. The data were then presented and analyzed according to the type of data obtained for each parameter.

For numerical data, the mean, standard deviation (SD), and range were calculated. Non-numerical data were presented as frequencies and percentages. To compare two groups of quantitative data, Student's *t*-test was employed. The linear correlation coefficient was utilized to assess the strength of association between nonparametric variables within the same group.

An ANOVA test was applied to compare data at different time points within the same group for quantitative data. Results were considered statistically significant at $p \le 0.05$ and highly significant at $p \le 0.001$.

Results

Table 1 presents demographic, clinical, and laboratory data, along with scoring parameters for each group. The two groups were well-matched in terms of age, sex, and HbA1c.

When comparing the pre- and post-treatment assessments of group 1, there was a highly significant improvement in Green's classification (p < 0.001), VAS pain score (p < 0.001), clinical signs (finger flexion, extension, and locking) (p < 0.001), hand grip strength (p < 0.001), presence of a palpable nodule (p = 0.027), and musculo-skeletal ultrasound findings (thickness of A1 pulley and synovial sheath thickness) (Fig. 1, Tables 2 and 3).

When comparing the pre- and post-treatment assessments of Group 2, we found highly significant improvements in Green's classification (p < 0.001), VAS pain score (p < 0.001), finger flexion and locking (p < 0.001), hand grip strength (p < 0.001), and musculoskeletal ultrasound findings (thickness of A1 pulley and synovial sheath thickness) (Tables 4 and 5).

When comparing the two groups after receiving treatment, group 1 exhibited statistically significant improvements compared to group 2 in terms of VAS pain score (p=0.012), clinical signs (finger extension and finger locking) (p=0.018), hand grip strength (p<0.001), absence of palpable nodules (p=0.021), and musculoskeletal ultrasound findings (size of A1 pulley) (p=0.002)(Table 6).

		Group					
		Shock wave		Injection			
Age (years)	Range	51–71		50–73			
	Mean±SD	57.360 ± 5.098		57.240 ± 6.092			
HbA1c	Range	5-6.3		5.1-6.4			
	Mean±SD	5.656 ± 0.396		5.692 ± 0.395			
Duration (months)	Range	1.5–30		2-35			
	Mean±SD	14.620±8.811		15.520±9.211			
Chi-square		Ν	%	Ν	%		
Sex	Male	10	40.00	10	40.00		
	Female	15	60.00	15	60.00		
Dominant	Right	25	100.00	25	100.00		
	Left	0	0.00	0	0.00		
Affected hand	Right	15	60.00	14	56.00		
	Left	10	40.00	11	44.00		
Finger affected	Thumb	13	52.00	11	44.00		
-	Index	6	24.00	8	32.00		
	Ring	4	16.00	5	20.00		
	Little	2	8.00	1	4.00		

Table 1 Demographic, clinical, and laboratory data in the two groups

HbA1c, hemoglobin A1c; SD, standard deviation; N, number; %, percentage; T test, Student's t-test; chi-square test, chi-square test



Fig. 1 Longitudinal view of the flexor pollicis tendon of the right thumb showing the pretreatment thickness of the A1 pulley **a** pretreatment $(0.16 \times 0.75 \text{ mm})$ and **b** post-treatment (average thickness) in group 1

Table 2 Comparison between pre- and post-treatment assessment of group 1 as regards Green's classification, finger extension, presence of nodules, locking, and hypervascularity

		Shock wave				Chi-square	
		Before		After			
		N	%	N	%	χ ²	P-value
Green's classification	I	0	0.00	16	64.00	27.139	< 0.001**
	Ш	9	36.00	7	28.00		
	III	16	64.00	2	8.00		
Finger extension	No	9	36.00	0	0.00	8.672	0.003*
	Extend	16	64.00	25	100.00		
Presence of nodule	No	17	68.00	24	96.00	4.878	0.027*
	Present	8	32.00	1	4.00		
Locking	Negative	0	0.00	20	80.00	30.083	< 0.001**
	Positive	25	100.00	5	20.00		
Hypervascularity	Negative	22	88.00	24	96.00	1.087	0.297
	Positive	3	12.00	1	4.00		

N, number; %, percentage; P > 0.05 NS; * $P \le 0.05$ S, ** $P \le 0.001$ HS, chi-square test

Table 3 Comparison between pre- and post-treatment assessment of group 1 as regards VAS pain score, hand grip strength, flexion range, thickness of the A1 pulley, and synovial sheath thickness

		Shock wave		Differences		Paired test	
		Before	After	Mean	SD	t	P-value
VAS	Range	2–6	1-3	2.040	0.978	10.428	< 0.001**
	$Mean \pm SD$	4.000 ± 1.443	1.960 ± 0.841				
Hand grip strength	Range	6–30	15-50	- 14.800	5.354	-13.821	< 0.001**
	$Mean \pm SD$	17.400 ± 7.751	32.200 ± 11.456				
Finger flexion	Range	0–70	15-90	-22.800	7.083	- 16.095	< 0.001**
	$Mean\pmSD$	37.800 ± 19.044	60.600 ± 20.783				
Thickness of A1 pulley	Range	0.6-1.4	0.4-1	0.296	0.102	14.513	< 0.001**
	$Mean \pm SD$	0.908 ± 0.250	0.612±0.190				
Synovial sheath Thickness	Range	0.7-3.1	0.4-2.3	0.556	0.434	6.405	< 0.001**
	$Mean\pmSD$	1.664 ± 0.825	1.108 ± 0.590				

N, number; %, percentage; SD, standard deviation; VAS, Visual Analogue Scale. P>0.05 NS; *P ≤ 0.05 S, **P ≤ 0.001 HS, paired T test

Discussion

Diabetes mellitus is a chronic metabolic global disease that is rapidly increasing in prevalence, morbidity, and mortality [16]. DM affects the structure of the extracellular matrix, impairs cell viability, and causes pathological alterations [6].

Trigger finger is a clinical disorder that is a common complication of DM. It is characterized by pain and locking of the digits because of the disproportion between the diameter of the flexor tendons and the A1 pulley [17].

Musculoskeletal ultrasound has been proven to be an effective diagnostic tool for a variety of conditions and has been used for the evaluation of small, relevant structures of the wrist and hand. It is a highly dynamic imaging technique that allows an accurate evaluation of the tendons, joints, nerves, and vessels of the hand and wrist [18].

Treatment of trigger finger includes NSAIDS, physical therapy, corticosteroid injections, and recently, ESWT therapy [19]. The effectiveness of the best treatment is still lacking evidence. Steroid injections have an established role as the first-line treatment for trigger digit, but their efficacy varies with a slightly lower total efficacy with time and may need further injections, which increase the suitability of the occurrence of complications of injection such as hypopigmentation of the skin, digital necrosis, and fat atrophy [20]. ESWT is a safe conservative treatment as it seems to reduce pain and improve the

Table 4 Comparison between pre- and post-treatment assessment of group 2 as regards Green's classification, finger extension, presence of nodules, locking, and hypervascularity

		Injection				Chi-square	
		Before		After			
		N	%	N	%	χ ²	P-value
Green's classification	I	0	0.00	9	36.00	15.550	< 0.001**
	Ш	10	40.00	12	48.00		
	Ш	15	60.00	4	16.00		
Finger extension	No	10	40.00	5	20.00	1.524	0.217
	Extend	15	60.00	20	80.00		
Presence of nodule	No	15	60.00	18	72.00	0.357	0.551
	Present	10	40.00	7	28.00		
Locking	Negative	0	0.00	12	48.00	13.268	< 0.001**
	Positive	25	100.00	13	52.00		
Hyper vascularity	Negative	24	96.00	25	100.00	1.020	0.312
	Positive	1	4.00	0	0.00		

N, number; %, percentage; P > 0.05 NS; * $P \le 0.05$ S, ** $P \le 0.001$ HS, chi-square test

Table 5 Comparison between pre- and post-treatment assessment of group 2 as regards VAS score, hand grip strength, flexion range, thickness of A1 pulley, and synovial sheath thickness

		Injection		Differences		Paired test	
		Before	After	Mean	SD	t	P-value
VAS	Range	2-7	1-4	1.600	0.866	9.238	< 0.001**
	$Mean \pm SD$	4.240 ± 1.535	2.640 ± 0.995				
Hand grip strength	Range	6–22	12-40	-6.400	4.243	-7.542	< 0.001**
	$Mean \pm SD$	14.080 ± 4.941	20.480 ± 7.725				
Finger flexion	Range	0–75	10-80	-9.720	4.560	-10.658	< 0.001**
	$Mean \pm SD$	41.080±21.362	50.800 ± 20.599				
Size of pulley	Range	0.7-1.6	0.5-1.3	0.224	0.060	18.754	< 0.001**
	$Mean \pm SD$	1.052 ± 0.271	0.828 ± 0.265				
Synovial sheath thickness	Range	0.6-2.9	0.5-2.6	0.280	0.212	6.600	< 0.001**
	$Mean \pm SD$	1.596 ± 0.696	1.316 ± 0.666				

N, number; %, percentage; SD, standard deviation; VAS, Visual Analogue Scale; paired T test, P>0.05 NS; *P ≤ 0.05 S; **P ≤ 0.001 HS

functional level and quality of life [7]. Our study aimed to compare the effectiveness of shock wave therapy versus local corticosteroid injections in the treatment of chronic trigger finger in diabetic patients.

In our study, the mean age was 57.365.098 in group 1 and 57.246.092 in group 2, which agreed with Ko et al. [21], who reported that the mean age of diabetic patients in their study was 55 years. Also, our results agreed with Sarkar et al. [6], who showed that 61% of patients in their study were more than 55 years old. We revealed no statistically significant difference in the mean age between the two groups, which was in agreement with Ferrara et al. [2], who reported no difference in patients' ages in their study groups.

In our study, the mean disease duration was 14.628.8 months in group 1 and 15.529.211 months in group 2, which was not in agreement with Hollins et al. [1], whose study was done in patients with a 2.5-month duration. In our study, a longer disease duration was chosen to verify the effect of the chosen therapy on chronic trigger finger and to have a larger number of patients participate in the study.

We reported that the affected hand with trigger finger was the dominant hand in the two groups, which was also reported by Rydberg et al. [22] who found that all affected hands with trigger finger were the dominant ones, while another study done by Ferrara et al. [2] showed that only 66% of the affected hands were their dominant hands. We **Table 6** Comparison between group 1 and group 2 as regards post-treatment assessment of VAS pain score, hand grip dynamometer, finger flexion, thickness of A1 pulley, synovial sheath thickness, Green's classification, finger extension, presence of palpable nodules, finger locking, and hypervascularity

After		Group	dr.				T-test	
		Shock wave		Injection		τ	P-value	
VAS	Range	1-3		1-4		-2.610	0.012*	
	$Mean \pm SD$	1.960 ± 0.841		2.640 ± 0.995				
Dynamometer	Range	15–50		12–40		4.241	< 0.001**	
	$Mean \pm SD$	32.200 ± 11.456		20.480 ± 7.725				
Finger flexion	Range	15-90		10-80		1.675	0.101	
	$Mean \pm SD$	60.600 ± 20.783		50.800 ± 20.599				
Size of pulley	Range	0.4-1		0.5–1.3		-3.309	0.002*	
	$Mean \pm SD$	0.612±0.190		0.828 ± 0.265				
Synovial sheath thickness	Range	0.4–2.3		0.5–2.6		-1.168	0.248	
	$Mean \pm SD$	1.108		1.316±0.666				
		± 0.590						
Chi-square		Ν	%	N	%	X ²	P-value	
Green's classification	I.	16	64.00	9	36.00	3.942	0.139	
	Ш	7	28.00	12	48.00			
	ш	2	8.00	4	16.00			
Finger extension	No	0	0.00	5	20.00	5.556	0.018*	
	Extend	25	100.00	20	80.00			
Presence of nodule	No	24	96.00	18	72.00	5.357	0.021*	
	Present	1	4.00	7	28.00			
Finger locking	Negative	20	80.00	12	48.00	5.556	0.018*	
	Positive	5	20.00	13	52.00			
Hypervascularity	Negative	24	96.00	25	100.00	1.020	0.312	
	Positive	1	4.00	0	0.00			

N, number; %, percentage; SD, standard deviation; VAS, Visual Analogue Scale; paired T test, chi-square test, P > 0.05 NS; *P ≤ 0.001 HS

found that the thumb was affected by 52% in group 1 and by 44% in group 2. This was in accordance with the study that was done by Ryzewiez et al. [23] who showed that the thumb finger was the most common affected digit with trigger finger.

As regards group 1 in our study who received 6 shockwave sessions, they showed improvement in VAS score (p (0.001), extension range (p 0.003), flexion range (p 0.001), locking of the finger $(p \ 0.001)$, absence of palpable nodules (p 0.027), and grip strength by dynamometer (p0.001). This was also reported by Dogru et al. [7], whose study showed a decrease in pain, an increase in grip strength, and an increase in the range of motion of the affected digit, showing the positive effects of shockwave therapy. Also, their study concluded that the treatment of trigger finger with shockwave might be a non-invasive option as shockwave therapy fastens the process of cell regeneration and increases perfusion, angiogenesis, and growth factor upregulation, which helps to regenerate musculoskeletal and vascular structures in the surrounding tissues. Furthermore, we revealed statistically significant improvements regarding musculoskeletal findings such as the thickness of the pulley (p 0.001) and synovial sheath thickness (p 0.001) after shockwave therapy.

Local hydrocortisone injection was the first method used in the treatment of trigger finger. In our study, group 2, who was treated by a single local steroid injection, reported statistically significant improvement as regards VAS pain score (p 0.001), locking, finger flexion, and hand grip strength (p 0.001), which was also reported by Massoud et al. [24] who revealed a statistically significant difference as regards flexion range (p 0.001), but there was no statistically significant difference as regards extension range.

We revealed that patients in group 2 showed a statistically significant difference in thickness of A1 pulley and synovial sheath thickness pre- and post-treatment with steroids injection, but there was no statistically significant difference in the presence of palpable nodules and hypervascularity detected by ultrasound, which was in agreement with Massoud et al. [24] who injected steroids with musculoskeletal ultrasound guidance, showed a decrease in size of A1 pulley and synovial sheath thickness, and suggested that accurate injection of steroids would increase the therapeutic results of steroids.

In comparing the results of the two groups, we found that there was a statistically significant improvement more in group 1 than in group 2 as regards VAS score (p=0.012), as the role of shockwave in decreasing pain through stimulating soft tissue healing by inhibition of nociceptors decreases calcification, neovascularization, and hyperemia. Also, it has a direct effect on hyperstimulation, which blocks the gate control mechanism [7]. Ferrara et al. [2] suggested that shockwaves may facilitate the healing process by promoting the catabolic process, removing damaged matrix, and stimulating the synthesis of nitric oxide. Also, comparing the two groups, there was a statistically significant improvement regarding the size of the A1 pulley and synovial sheath thickness, which were detected by musculoskeletal ultrasound more in group 1, while Yildirim et al. [25] recommended that three sessions of shockwave could be as effective as steroid injection and suggested shockwave as an alternative treatment for patients who refuse injection or surgery. There was a statistically significant improvement in group 1 as regards the range of finger flexion and extension, while in group 2 there was a statistically significant improvement in the flexion range only and no statistically significant improvement in the extension range. This may be attributed to the improvement in pain, which was greater in group 1, as the prevalence of pain is one of the major causes of decreased joint movement. Shock wave therapy had a long-term effect on hand grip strength, which was proved by a study done by Dogru et al. [7]. Also, our study reported statistically significant improvements in hand grip strength in group 1 in comparison to group 2, which can be explained by the fact that pain decreases hand function and so improves hand grip strength.

Limitations of the study

One limitation of our study was the limited sample size, which was influenced by financial constraints. Additionally, there was a lack of long-term follow-up data due to poor patient compliance.

Conclusion

Trigger finger is a common complication of DM. The present study concluded that shock wave therapy was superior to local steroid injection in improving hand function and quality of life in patients with chronic trigger finger.

Recommendations

Shockwave therapy is an effective, safe, and non-invasive method for conservative management of trigger finger, especially in patients with uncontrolled DM or patients who refuse local steroid injections. Further studies are necessary to clarify the efficacy of different physical therapies on trigger finger.

Abbreviations

CTSCarpal tunnel syndromeDMDiabetes mellitusESWTExtracorporeal shock wave therapy

HBA1c Hemoglobulin A1c

VAS Visual Analogue Scale

Acknowledgements

Not applicable.

Authors' contributions

SL wrote the paper with revision. RH followed the patients and collected the patients' data. SL gave idea, put a study design, and revised the manuscript. NN revised the statistics. NG performed the therapeutic ultrasound before and after intervention and revised the methodology. They all approved the final version of the manuscript.

Funding

This study had no funding from any resource.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

This study was approved by the Research Ethics Committee (REC) of the Faculty of Medicine at Ain Shams University in Egypt. Reference number of approval: FMASU R 126/ 2023. All patients included in this study gave written informed consent to participate in this research.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Received: 10 July 2023 Accepted: 24 September 2023 Published online: 13 November 2023

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