Original Article

Comparison of Local Steroid Injection and Carpal Tunnel Release in Carpal Tunnel Syndrome

Kashif Raza Khan, Asim Rasool, Majid Rashid, Haroon-ur-Rehman Gillani, Muhammad Umair and Ghulam Murtaza

ABSTRACT

Objective: To compare the efficacy of local steroid injection (LSI) and carpal tunnel release (CTR) for the treatment of carpal tunnel syndrome (CTS).

Study Design: Randomized controlled trial study

Place and Duration of Study: This study was conducted at the Department of Orthopedics, Sahiwal Teaching Hospital, Sahiwal from May 2022 to November 2022.

Materials and Methods: A total of 112 patients of either gender, aged between 18 and 70 years, having symptoms of CTS for at least 3 months and a visual analogue scale (VAS) pain score of more than 4 were analyzed. Random allocations were done and in Group-A, patients were managed by LSI and Group-B patients by CTR. After 3 months, nocturnal paresthesia relief was assessed on the basis of VAS.

Results: In a total of 112 patient, 80 (71.4%) were female. The mean age was 48.54±11.31 years. The mean baseline VAS score in Group-A was 6.09±1.240 versus 6.04±.90 in Group-B. Post-procedure VAS after 3 months in Group-A was 2.29±1.00 versus 2.75+1.10 in Group-B. The mean decrease in VAS in Group-A was 3.80+1.38 while in Group-B, it was 3.29+1.35 (p=0.047). The efficacy of LSI group was found in 50 (89.3%) patients versus 40 (71.4%) with in CTR group (p=0.0174).

Conclusion: Our study concluded that LSI was a better option than CTR in terms of decrease in the severity of symptoms at 3 months follow-up in the treatment of carpal tunnel syndrome.

Key Words: Carpal tunnel syndrome, Local steroid injection, carpal tunnel release.

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INTRODUCTION

Carpal tunnel syndrome (CTS) is considered to be the commonest kind of entrapment neuropathy. CTS is caused by compression of the median nerve as it travels through the wrist's carpal tunnel, with paresthesia, pain, and numbness as its main manifestations.[1] In the USA, the incidence of CTS is estimated to be between 1-3 per 1000 persons.[2] In females, the prevalence of CTS is three fold to males and is more likely to affect the middle-aged population.[3] Among computer users and people doing physical labor, its frequency is higher. Numbness and pain in the hand, particularly in the thumb, index, middle, and radial half of the ring finger, are its clinical manifestations, which often get worse with sleep at night.[4] The treatment options for CTS vary from conservative to surgical interventions. There are a number of studies through which both conservative and surgical approaches have been established as a significant reliever of symptoms.[5,6] Multiple modalities are used commonly for the treatment of CTS.[7,8] Local steroid injection (LSI) management is known to be as simple that it can be carried out in clinical settings.[7] Its effectiveness has been in the reports but the time taken in achieving these benefit is vital and relapse frequency have been described. Carpal tunnel release (CTR) has been advocated by many researchers.[8] CTR is done either as open release or endoscopic release of the transverse carpal ligament, and both have been shown to be effective.

Among current treatment options, LSI and open CTR are two of the methods that are used most frequently to relieve the symptoms of CTS.[9] A study showed that more wrists in the injection group than in the surgery group attained a nocturnal paresthesia response judged by the visual analogue scale (VAS) at 3-month follow-up (94 vs 75% respectively; p=0.001).[10] The major end criterion was the proportion of wrists obtaining at least a 20% decrease in the VAS for nocturnal paresthesia because nocturnal symptoms, as compared to daytime pain or functional impairment, are more annoying for

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the patients. However, no consensus of opinion regarding the effectiveness of various modalities of treatment is available through the existing literature on CTS, therefore, rigorous studies are required to establish standard criteria for treatment.

We planned this study to assess the effectiveness of LSI and CTR for CTS at 3 months of follow-up and to find out which one of these two treatment modalities is better at reducing nocturnal paresthesia so that it may be advocated as the treatment of choice. This research was aimed to compare the efficacy of LSI and CTR for the treatment of CTS.

MATERIALS AND METHODS

This randomized controlled trial was performed at the Department of Orthopedics, Sahiwal Teaching Hospital, Sahiwal from May 2022 to November 2022. A sample size of 112 (56 in each group), considering the anticipated success rate in the LSI group as 94%, the open CTR group as 75%,[10] level of significance as 5%, and the power of the study as 80%. Inclusion criteria were patients of either gender, aged between 18 and 70 years, having symptoms of CTS (≥t 3 months) and a VAS of more than 4. Exclusion criteria were patients with thenar atrophy, a history of previous carpal tunnel release surgery or local injection for CTS, or suffering from inflammatory arthropathy. Patients with polyneuropathy, diabetes mellitus, hypothyroidism, or pregnancy were also excluded. CTS was clinically diagnosed on the basis of the presence of at least two typical signs and symptoms of CTS: i) intermittent pain and paresthesia in the hand; ii) shaking or flicking one's hand for relieving the symptoms; iii) sensory deficit in the thumb, index, and middle fingers of the hand; iv) a positive Phalen's test (reproducing pain and paresthesia by holding the wrist in a hyperflexed positon for 60 seconds); and v) a positive Tinel's sign (tapping over the volar aspect of the wrist reproduces pain and paresthesia). The presence of numbness, tingling, or burning sensations in the hand occurring during the night (assessed by VAS) defines nocturnal paresthesia.

Detailed informed and written consents were obtained. Approval from institutional research board was acquired. At the time of enrolment, socio-demographic information was collected. A baseline assessment of the nocturnal paresthesia was recorded before the procedure, assessed by a visual analogue scale (VAS) (0 for no symptoms and 10 for most intense). The lottery method was used to form two groups, LSI and CTR. Patients in LSI group were treated with LSI. Local anesthesia was infiltrated, and corticosteroid injection (methylprednisolone 40 mg/ml) was given using a 27-g needle. Patients in CTR group were treated with an open CTR operation. Proper follow-up of the patients was ensured by obtaining their phone numbers and addresses.

Steroid injection therapy consisted of 1 ml of 1% lidocaine solution and 1 ml suspension containing 40mg of methylprednisolone acetate. It was injected into the carpal tunnel. A 1.5 inch 27-g needle was used, and fluid was injected from proximal to distal through carpal tunnel. With the patient seated facing the operator, actively flex wrist with the thumb and little finger opposed to localize the palmaris longus tendon planned to inject at level of distal wrist crease medial (on ulnar side) of palmaris tendon. Among 15% of patients, same position with no palmaris tendon was carried out. To avoid any veins, orange needle was used which was inserted to the hilt at 60 degrees. We checked that it did not withdraw blood, and touch the median nerve inadvertently. Standard protocols were adopted for CTR.

Final outcome was measured at 3 months in both study groups and nocturnal paresthesia relief was assessed on the basis of VAS. The treatment was measured effective if the final decrease in VAS from baseline at 3-month follow-up visit was more than 2.

Data was analyzed using "Statistical Package for Social Sciences (SPSS)", version 26.0. Qualitative variables were shown as frequency and percentages. Quantitative variables were represented as mean and standard deviation (SD). Chi-square test was applied to compare the efficacy in both groups while VAS at different study points were compared using independent sample t-test. Effect modifiers like age, gender, and occupation were controlled by stratification. Post stratification chi-square test was also applied. P<0.05 was considered significant.

RESULTS

In a total of 112 patients, the mean age was 48.54±11.31 years. There were 80 (71.4%) females. There were 35 (31.3%) patients who were housewives. Table-1 is showing comparison of baseline characteristics in both study groups.

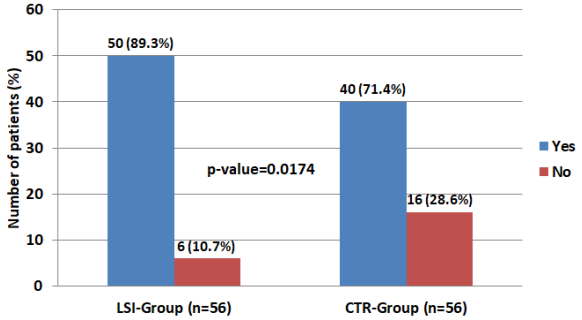

Figure No. 1: Comparison of Efficacy in Both Study Groups (N=112)

The mean baseline VAS score in LSI group was 6.09+1.24 versus 6.04+1.90 in CTR group (p=0.8281). Patients in LSI group showed better decrease in VAS score after 3-months compared to patients in CTR group B (2.29±1.00 vs. 2.75±1.10, p=0.0224). The mean decrease in VAS in LSI group was also better when compared to CTR group (3.80±1.24 vs. 3.29±0.09, p=0.0027) as shown in table-2.

Table No.1: Comparison of Baseline Characteristics (N=112)

Characteristics		LSI Group (n=56)	CTR Group (n=56)	P-value
Gender	Male	19 (33.9%)	13 (23.2%)	0.2095
	Female	37 (66.1%)	43 (76.8%)	
Age	18-40	16 (28.6%)	20 (35.7%)	0.4183
	41-70	40 (71.4%)	36 (64.3%)	
Occupation	Housewife	20 (35.7%)	15 (26.8%)	0.3822
	Manual worker	6 (10.7%)	14 (25.0%)	
	Executive	8 (14.3%)	8 (14.3%)	
	Farmer	12 (21.4%)	11 (19.6%)	
	Others	10 (17.9%)	8 (14.3%)	

Table No.2: Comparison of Visual Analogue Scale in Both Study Groups (n=112)

Parameter	LSI Group (n=56)	CTR Group (n=56)	P-value
Baseline VAS	6.09±1.24	6.04±1.19	0.8281
After-3 months VAS	2.29±1.00	2.75±1.10	0.0224
Decrease in VAS	3.80±1.24	3.29±0.09	0.0027

LSI group had significantly better efficacy compared to CTR group (89.3% vs. 71.4%, p=0.0174) as shown in figure No.1. Details of stratification of the efficacy between study groups based on various baseline characteristics are shown in Table No. 3.

Table No.3: Comparison of Efficacy with respect to Baseline Characteristics in Both Study Groups (N=112)

Characteristics		Groups	Efficacy		P-value
			Yes	No	
Gender	Male	LSI	18 (94.7%)	1 (5.3%)	0.051
		CTR	9 (69.2%)	4 (30.8%)	
	Female	LSI	32 (86.5%)	5 (13.5%)	0.117
		CTR	31 (72.1%)	12 (27.9%)	
Age (years)	18-40	LSI	15 (93.8%)	1 (6.2%)	0.134
		CTR	15 (75.0%)	5 (25.0%)	
	41-70	LSI	35 (87.5%)	5 (12.5%)	0.054
		CTR	25 (69.4%)	11 (30.6%)	
Occupation	Housewife	LSI	18 (90.0%)	2 (10.0%)	0.014
		CTR	8 (53.3%)	7 (46.7%)	
	Manual worker	LSI	5 (83.3%)	1 (16.7%)	0.573
		CTR	10 (71.4%)	4 (28.6%)	
	Executive	LSI	7 (87.5%)	1 (12.5%)	0.522
		CTR	6 (75.0%)	2 (25.0%)	
	Farmer	LSI	12 (100%)	-	0.286
		CTR	10 (90.9%)	1 (9.1%)	
	Others	LSI	8 (80.0%)	2 (20.0%)	0.800

DISCUSSION

In this study, the mean age of the patients with CTS was 48.54±11.31 years while 67.9% were aged between 41-70 years. The occurrence rate of CTS is highest among the age group of 35–60 years,[11] so our findings are pretty consistent with the existing literature. The present study reported the female to male ratio among patients with CTS to be 2.5:1 while researchers in the past have shown that a clear female predominance exists in CTS.[12,13]

Our study revealed that the incidence of CTS was relatively higher in housewives who were doing house work by spending most of their time. Among males, its presence was more in laborers, sweepers, plumbers and those who frequently used vibratory tools. This study also revealed that CTS was quite prevalent in the farmers whereas those people who had executive jobs and used to sit on chair most of the time were relatively few. Most of the studies[10,14,15] analyzed risks of CTS by job title and found that various jobs had high prevalence rates because repetitive and forceful gripping were involved there. A positive association of CTS with work that required repetitive or forceful movements of the hands at a higher degree was concluded to be evident, and there was 'strong evidence' of a relationship with the combination of these exposures.

In one recent study done by Ly-Pen et al,[10] the effects of surgical decompression were compared between LSI and CTR approaches. After a follow up of 3 months, a 20% response for nocturnal paresthesia was achieved in 94.0% of the wrists in the LSI group against 75.0% in the CTR group, whereas in our study 89.3% and 71.4% had efficacy for LSI and CTR groups respectively (p=0.0174).Another research noted that while comparing LSI to placebo, LSI showed clinically improved symptoms of CTS after one month of its administration.[16] Moreover, against oral steroid too, it provided significantly greater clinical improvement. The study by Agarwal et al showed that 93.7% of patients with LSI at 3 months follow up achieved considerable improvement in the symptoms.[17] Moreover, the distal motor and sensory latency at the wrist showed a significant improvement in their mean

values at 3 months of follow-up. The study by Bland JD showed that the initial response rate to a single steroid injection is about 70% but relapse is common.[18] The literature is devoid of any significant amount of data regarding long term relapse rates. Moreover, not much endorsements are available regarding the need and timing of the 2nd or 3rd injection. By using the LSI, a considerable number of the patients still need a second injection or may eventually need surgery.[19] In majority of cases, surgery is likely to be definitive. Being a single center study conducted on a relatively small size and no long term outcomes noted were some of the limitations of this study.

CONCLUSION

It is concluded that local steroid injection is better than carpal tunnel release surgery in terms of efficacy for the treatment of carpal tunnel syndrome. Local steroid injection gives significant short-term relief of symptoms to the patients at the follow-up of 3 months.

Author's Contribution:

Concept & Design of Study:	Kashif Raza Khan
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Data Analysis:	Haroon-ur-Rehman Gillani, Muhammad Umair, Ghulam Murtaza
Revisiting Critically:	Kashif Raza Khan, Asim Rasool
Final Approval of version:	Kashif Raza Khan

Conflict of Interest: The study has no conflict of interest to declare by any author.

REFERENCES

1. Genova A, Dix O, Saefan A, Thakur M, Hassan A. Carpal Tunnel Syndrome: A Review of Literature. Cureus 2020;12(3):e7333.
2. Hegmann KT, Merryweather A, Thiese MS, Kendall R, Garg A, Kapellusch J, et al. Median nerve symptoms, signs, and electrodiagnostic abnormalities among working adults. J Am Acad Orthop Surg 2018;26(16):576-584.
3. Dale AM, Harris-Adamson C, Rempel D, Gerr F, Hegmann K, Silverstein B, et al. Prevalence and incidence of carpal tunnel syndrome in US working populations: pooled analysis of six prospective studies. Scand J Work Environ Health 2013;39(5):495-505.
4. Wright AR, Atkinson RE. Carpal Tunnel Syndrome: An Update for the Primary Care Physician. Hawaii J Health Soc Welf 2019; 78(Suppl-2):6-10.
5. Flondell M, Hofer M, Björk J, Atroshi I. Local steroid injection for moderately severe idiopathic carpal tunnel syndrome: protocol of a randomized double-blind placebo-controlled trial (NCT 00806871). BMC Musculoskelet Disord 2010;11:76.
6. Nanavati N, Walker-Bone K, Stanworth H, Williams C. Outcomes of open carpal tunnel decompression. N Z Med J 2013;126:60-7.
7. Klokkari D, Mamais I. Effectiveness of surgical versus conservative treatment for carpal tunnel syndrome: A systematic review, meta-analysis and qualitative analysis. Hong Kong Physiother J 2018;38(2):91-114.
8. Ostergaard PJ, Meyer MA, Earp BE. Non-operative Treatment of Carpal Tunnel Syndrome. Curr Rev Musculoskelet Med 2020;13(2):141-147.
9. Saeed MA, Irshad M. Seasonal variation and demographical characteristics of carpal tunnel syndrome in a Pakistani population. J Coll Physicians Surg Pak 2010;20:798-801.
10. Ly-Pen D, Andréu JL, Millán I, de Blas G, Sánchez-Olaso A. Comparison of surgical decompression and local steroid injection in the treatment of carpal tunnel syndrome: 2-year clinical results from a randomized trial. Rheumatol (Oxford) 2012;51:1447-54.
11. Povlsen B, Aggelakis K, Koutroumanidis M. Effect of age on subjective complaints and objective severity of carpal tunnel syndrome: prospective study. JRSM Short Rep 2010;1(7):62.
12. Campos-Serna I, Garcia-Espinoza JA, Cahuana-Quispe AI, Marquez-Espriella C, Marco AC, Jose CM, et al. Diagnosis and treatment of carpal tunnel syndrome in a tertiary care center in Mexico City. World J Plast Surg 2020;9(2):213-218.
13. Joshi A, Patel K, Mohamed A, Oak S, Zhang MH, Hsiung H, et al. Carpal Tunnel Syndrome: Pathophysiology and Comprehensive Guidelines for Clinical Evaluation and Treatment. Cureus 2022;14(7):e27053.
14. Burt S, Deddens JA, Crombie K, Jin Y, Wurzelbacher S, Ramsey J. A prospective study of carpal tunnel syndrome: workplace and individual risk factors. Occup Environ Med 2013;70(8): 568-74.
15. Palmer KT. Carpal tunnel syndrome: the role of occupational factors. Best Pract Res Clin Rheumatol 2011;25(1):15-29.
16. Marshall S, Tardif G, Ashworth N. Local corticosteroid injection for carpal tunnel syndrome. Cochrane Database Syst Rev 2007;(2):CD001554.
17. Agarwal V, Singh R, Sachdev A, Wiclaff, Shekhar S, Goel D. A prospective study of the long-term efficacy of local methyl prednisolone acetate injection in the management of mild carpal tunnel syndrome. Rheumatol (Oxford) 2005;44:647-50.
18. Bland JD. Carpal tunnel syndrome. BMJ 2007;335(7615):343-6.
19. Peters-Veluthamaningal C, Winters JC, Groenier KH, Meyboom-de Jong B. Randomised controlled trial of local corticosteroid injections for carpal tunnel syndrome in general practice. BMC Fam Pract 2010;11:54.