Original Article

The Efficacy of Single Dose Local Steroid Injection versus Standard Carpal Tunnel Release in the Treatment of Carpal Tunnel Syndrome in Population of D.I. Khan Division, Pakistan

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ABSTRACT

OBJECTIVE: To evaluate the efficacy of a single dose local steroid injection versus standard carpal tunnel release in treating carpal tunnel syndrome in district Dl Khan, Pakistan.

METHODOLOGY: This randomized controlled trial was conducted at the Department of Orthopaedics Gomal Medical College Dl Khan, Pakistan, from November 2021 to October 2022. Seventy-four patients with a substantiated diagnosis of Carpal Tunnel Syndrome were randomly selected by lottery method into two groups, i.e. Surgical treatment (control) and medical treatment by Steroid injection (Experimental). Clinical assessments for pain (visual analog score) and numbness (Michael-Griffin figure) were done at baseline and 3, 6, and 12 months after treatment. Gender, age, pain and numbness were demographic variables, while pain and numbness at 3, 6 and 12 months were research variables. Gender is nominal, while other variables were measured on a ratio scale. Data for a sample was described by count & percentage with 95% Confidence interval. Statistical analysis was done by independent sample t-test for comparing the mean of 2 variables, and a p-value of < 0.05 was acknowledged as statistically significant.

RESULTS: Mean numbness & mean pain scores were different in the control vs. experimental group three months after treatment; results were statistically significant (p-value<0.05) and similar at 6 & 12 months after treatment.

CONCLUSION: Single-dose steroid injection retrieved similar results as carpal tunnel release operation in the short term of one year. So, steroid injection is a good treatment option before surgical decompression for the treatment of carpal tunnel syndrome.

KEYWORDS: Median nerve, Carpal Tunnel Syndrome, Carpal Tunnel Entrapment Neuropathy, Carpal Tunnel, Steroids.

INTRODUCTION

Carpal tunnel syndrome (CTS) occurs due to median nerve compression at the wrist, and it is the most common peripheral entrapment neuropathy. It was first described as focal entrapment mononeuropathy by Sir James Paget in 1863.[1] The prevalence in a general population of carpal tunnel syndrome is 15 %.[2] The most common symptoms are pain, paresthesia & tingling in the radial three & half fingers, i.e. thumb, index, middle & lateral half of ring finger, supplied by the median nerve.[3] The diagnosis of CTS is made by clinical examination, i.e., the Carpal compression test, Phalen's test & Tinel's test, Nerve conduction studies, and ultrasonography.[4] Many treatment options for CTS include both surgical & conservative options, but no single treatment option is accepted universally.[5] Conservative treatment options are usually preferred in mild or early disease. If conservative management does not relieve symptoms, the patient is offered Carpal Tunnel Release (CTR) surgery.[6]

Pen et al.[7] from Madrid in 2002, Spain, did a randomized control trial and found that overall improvement of symptoms i.e. paresthesia at night, diurnal pain and functional disability in CTR surgery group at 3,6,12 & 24 months was 97.1%, 91.3%, 82.6% & 79.71% (55)(55*100/69=79.71) respectively, while in Local steroid injection group it was 97.5%, 93.9%, 81.7% & 59% (48)(48*100/82=59) respectively. Demirci et al.[8] 2001 from Isparta, Turkey, in a randomized control trial, found that at three months, 52% (23)(23*100/44=52) patients in the Open Carpal Tunnel release (OCTR) group had betterment of symptoms as compared to 43% (20)(20*100/46=43) patients in Local Steroid injection group (LSIG). At six months, 95% of patients in the OCTR group had better symptoms than 87% in the LSIG.

Ucam et al.[9] 2005 from Ankara, Turkey, found that at three months period, 36% (4)(4*100/11=36) patients in the Surgical treatment group had improvement of symptoms as compared to 43% (10)(10*100/23=43) patients in Local Steroid injection group. During the six months, 45% (5)(5*100/11=45) patients in the Surgical

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treatment group had improvement in symptoms as compared to 30% (7)(7*100/23=30) in the Local steroid injection group. Dawood et al.[10]2019 from Tikrit, Iraq, in a randomized control trial of 48 patients, having 24 patients in both groups, found that at three months, 79% of patients in Local Steroid injection group had relief of symptoms compared to 66% in the Open Surgery group. At six months, 42% of patients in the Local Steroid injection group had relief of symptoms compared to 92% in the Open Surgery group. At 12 months, 13% of patients in the Local Steroid injection group had improvement in symptoms compared to 88% in the Open Surgery group. Saboor et al.[11]2013 from Abbottabad, Pakistan, in a randomized control trial, found that at a month in Mini incision surgical group, 57% (33)(33*100/58=57) patients had improvement of symptoms as compared to 69% (40)(10*100/58=69) patients in Local Steroid injection group & the results were not statistically significant (p-value=0.80).

The objective of this study was to compare the efficacy of single-dose local steroid injection vs standard carpal tunnel release at baseline, three months, six months & 12 months in treating carpal tunnel syndrome in district DIKhan, Pakistan. This study will provide essential data about the efficacy of single-dose local steroid injection & carpal tunnel release in treating carpal tunnel syndrome. It will guide surgeons about the best short-term & long-term treatment options for CTS.

METHODOLOGY

This randomized control trial was conducted in the Department of Orthopaedics, Gomal Medical College DI Khan, Pakistan, from November 2021 to October 2022. The data for the study was collected from patients coming to OPD & admitted to the orthopaedic unit DHQ Teaching Hospital DIKhan, Pakistan. Approval for this research was acquired from the ethical committee in the Hospital & consent in informed form was obtained from patients or attendants. We included all adult patients aged more than 16 years with a confirmed diagnosis of CTS on clinical assessment, i.e. Tinel's & Phalen's tests & EMG studies, who have taken different analgesics & wrist splints at night for at least one month. All recurrent cases of CTS which were previously operated, wrist fractures, diabetics, pregnancy & other associated neuropathies were excluded from the study. Seventy-four patients with a substantiated diagnosis of Carpal Tunnel Syndrome were randomly allocated by lottery method into two groups, i.e. Surgical treatment group (control group) and medical treatment by Steroid injection group (Experimental group).

All patients included in the study were divided by toss method into two groups, i.e. the Steroid injection and surgical treatment groups. In the Steroid injection group, patients were given 20mg methylprednisolone mixed with 2ml of Xylocaine, injected 1cm proximal to wrist flexion crease & lateral to palmaris longus tendon with angulation of needle 45 degrees distally & radially. A 23-gauge needle was advanced for approximately 1cm, with a puncture of the transverse carpal ligament noted by resistance. Injection of a single dose of 20mg methylprednisolone was done in all patients; after injection, patients were observed for 15 minutes.

Surgery was done under regional anesthesia & 5ml of Xylocaine containing 50mg of the solution was used as a local anesthetic. The flexor retinaculum was completely separated via a short incision on the ulnar aspect of the middle finger just beyond the wrist fold. Hemostasis was secured, and the skin was closed with prolene 2-0 interrupted sutures.

Clinical assessments for pain (by visual analog score) and numbness (by Michael-Griffin figure) were done at baseline and 3, 6, and 12 months after treatment. Gender (men/women) & age groups (≤40 years & ≥40 years) were our matching variables. At the same time, the treatment of CTS by single dose injectable steroids and carpal tunnel release surgery & their assessment at baseline, three months, six months & 12 months were our research variables. The data for the sample were described by counts & percentages, and for the population, a confidence interval with 95% confidence level. Each variable in our study was compared by independent sample t-test between 2 groups, i.e. Experimental & control groups.

RESULTS

There were a total of 74 patients in our study. Thirty-seven patients in the experimental group included 21 (56.75%) females and 16 males (43.25%), while 37 patients in the control group included 20 (54%) females and 17 (46%) males, almost similar in proportion. The mean age was 39.60±2.86 years in the experimental group, while it was 38.68±3.28 years in the control group. The mean duration of illness was 09±2.11 months in the experimental group and 08±1.79 months in the control group; both were almost similar.

At three months of follow-up, 8% (3)(3*100/37=8) patients in the CTR surgery group (Control group) had improvement of numbness (Michael Griffin figure score=1-10) as compared to 19% (7)(7*100/37=19) patients in Steroid injection group. At six months of follow-up, 92% (34)(34*100/37) patients in the CTR surgery group had improvement of numbness (Michael Griffin figure score=1-10) as compared to 84%(31)(31*100/37=84) patients in Steroid injection group. At 12 months of follow-up, 92% (34) (34*100/37=92) patients in CTR surgery group had no numbness as compared to 86%(32)(32*100/37=86) patients in Steroid injection group while 8% (3) (3*100/37=8) patients in CTR surgery group had improvement of numbness (Michael Griffin figure score=1-5) as compared to 14% (5)(5*100/37=14) patients in Steroid injection group.

At three months of follow-up, 5% (2)(2*100/37=5)

patients in the CTR surgery group (Control group) had improvement of pain (VAS score=1-2) as compared to 19% (7)(7*100/37=19) patients in Steroid injection group. At six months of follow-up, 54% (20)(20*100/37=54) patients in the CTR surgery group had improvement of pain (VAS score=1-2) as compared to 62% (23)(23*100/37=62) patients in the Steroid injection group. At 12 months of follow-up, 92% (34)(34*100/37=92) patients in each group, i.e.

Table I: Mean numbness score at baseline

Groups	Mean	SD	Difference of means	95% CI of Difference		t-value	d.f.	p-value (2-tailed)
				Upper limit	Lower limit			
Control	5.11	0.809	-0.03	0.297	-0.357	-0.183	72	0.855
Experimental	5.14	0.585						

Table II: Mean numbness score at three months

Groups	Mean	SD	Difference of means	95% CI of Difference		t-value	d.f.	p-value (2-tailed)
				Upper limit	Lower limit			
Control	3.43	.765	.486	0.810	.163	3.002	72	0.004
Experimental	2.95	.621						

Table III: Mean numbness score at six months

Groups	Mean	SD	Difference of means	95% CI of Difference		t-value	d.f.	p-value (2-tailed)
				Upper limit	Lower limit			
Control	1.95	.664	-0.162	0.124	-0.448	-1.129	72	0.262
Experimental	2.11	.567						

Table IV: Mean numbness score at 12 months

Groups	Mean	SD	Difference of means	95% CI of Difference		t-value	d.f.	p-value (2-tailed)
				Upper limit	Lower limit			
Control	0.08	.277	-0.054	0.091	-0.199	-0.741	72	0.461
Experimental	0.14	.347						

Table V: Mean pain score at baseline

Groups	Mean	SD	Difference of means	95% CI of Difference		t-value	d.f.	p-value (2-tailed)
				Upper limit	Lower limit			
Control	4.73	0.450	0.216	0.464	-0.031	1.741	72	0.086
Experimental	4.51	0.607						

Table VI: Mean pain score at three months

Groups	Mean	SD	Difference of means	95% CI of Difference		t-value	d.f.	p-value (2-tailed)
				Upper limit	Lower limit			
Control	2.24	0.548	0.405	0.636	0.175	3.503	72	0.001
Experimental	1.84	0.442						

Table VII: Mean pain score at six months

Groups	Mean	SD	Difference of means	95% CI of Difference		t-value	d.f.	p-value (2-tailed)
				Upper limit	Lower limit			
Control	1.46	0.505	0.81	0.312	-0.150	0.700	72	0.486
Experimental	1.38	0.492						

Table VIII: Mean pain at 12 months

Groups	Mean	SD	Difference of means	95% CI of Difference		t-value	d.f.	p-value (2-tailed)
				Upper limit	Lower limit			
Control	0.08	0.277	0.00	0.128	-0.128	0.00	72	1.00
Experimental	0.08	0.277						

CTR surgery group and steroid injection group, had no pain, while 8% (3)(3*100/37=8) patients in each group had improvement of pain (VAS score=1=2).

Tables I, II, III and IV show mean numbness scores at baseline, at three months, at six months and 12 months, respectively, while **Tables V, VI, VII and VIII** show mean pain scores at baseline, at three months, at six months and 12 months respectively.

DISCUSSION

Carpal tunnel syndrome occurs due to median nerve compression at the carpal tunnel and is one of the standard peripheral neuropathy.[13-14] There are different treatments for carpal tunnel syndrome, including splinting of the wrist, steroid injection in the carpal tunnel & surgical release of the transverse carpal ligament. Each method has its results.[15-16] Many studies have reported response rate of single-dose local steroid injection in a range of 34% to 90%.[17-18]

In our study, the mean post-operative numbness on Michael Griffin's figure score at baseline was 5.11 in the control (CTR surgery) group as compared to 5.44 in the experimental (Steroid injection) group & the results were statistically non-significant (p-value >0.05). At the same time, mean pain was also the same (p-value>0.05) on the Visual Analogue scale at baseline, i.e. 4.73 in the control group compared to 4.51 in the experimental group. Saboor et al.[11] from Abbottabad, Pakistan, found that at a month in Mini incision surgical group, 57% of patients had improvement of symptoms as compared to 69% of patients in the Local Steroid injection group & the results were not statistically significant (p-value=0.80).

In our study, the mean numbness score at three months post-op time was 3.43 in the control group as compared to 2.95 in the experimental group & the results were statistically significant (p-value<0.05) while mean pain at three months also had statistically significant results (p-value<0.05) & was 2.24 in the control group as compared to 1.84 in the experimental group. Numbness improved at three months in 8% of patients in the control group & 19% of patients in the experimental group. We found similar results in three studies & one study had a different result. Dawood et al.[10] from Tikrit, Iraq, found that at three months, 79% of patients in Local Steroid injection group had improvement in symptoms compared to 66% in the Open Surgery group. Ucam et al.[9] from Ankara, Turkey, found that 36% of patients in the Surgical treatment group had improved symptoms compared to 43% of patients in the Local Steroid injection group. Pain improvement was found in 5% of patients in the control group compared to 19% of patients in the experimental group. Pen et al.[7] from Madrid, Spain, found that at three months, 97.1% of patients in the CTR group had improvement in symptoms compared to 97.5% of patients in the steroid injection group.

Demirci et al.[8] from Isparta, Turkey, found that at three months, 52% of patients in surgical group had improvement in symptoms compared to 43% of patients in the Local Steroid injection group. In our study, the mean numbness score at six months was 1.95 in the control group as compared to 2.11 in the experimental group & the results were statistically not significant (p-value>0.05), while mean pain at six months was statistically not significant (p-value>0.05) & was 1.46 in the control group as compared to 1.38 in the experimental group. Improvement of numbness at six months was found in 92% of patients in the control group & 84% of patients in the experimental group, while improvement of pain was found in 54% of patients in the control group compared to 62% of patients in the experimental group.

Dawood et al.[10] from Tikrit, Iraq, found that at six months, 42% of patients in Local Steroid injection group had improvement in symptoms compared to 92% in the surgical group. Ucam et al.[9] from Ankara, Turkey, found that in six months, 45% of patients in the Surgical treatment group had improved symptoms compared to 30% of Local steroid injection group patients. Demirci et al.[8] from Isparta, Turkey, found that at six months, 95% of patients in OCTR group had improvement of symptoms compared to 87% in LSIG. Pen et al.[7] from Madrid, Spain, found that overall improvement of symptoms at six months was found in 91.3% of patients in the CTR group & 93.9% of patients in the Local Steroid injection group.

In our study, the mean numbness score at 12 months was 0.08 in the control group as compared to 0.14 in the experimental group & the results were statistically not significant (p-value>0.05), while the mean pain at 12 months was also statistically not significant (p-value>0.05) & was 0.08 in control group & 0.08 in the experimental group. At 12 months, 92% of patients in the control group & 86% of patients in the experimental group had no numbness, while 92% of patients in both the control group & 92% of patients in experimental group had no pain. Two studies from the literature retrieved similar results. Dawood et al.[10] from Tikrit, Iraq, found that during 12 months, 13% of patients in Local Steroid injection group had improvement in symptoms compared to 88% in the Open Surgery group. Pen et al.[7] from Madrid, Spain, found that at 12 months, 82.6% of patients in the CTR group had improved symptoms compared to 81.7% in the Steroid injection group.

CONCLUSION

Single-dose steroid injection retrieved similar results as carpal tunnel release surgery for a short term of one year. So, steroid injection is a good treatment option before surgical decompression for the treatment of carpal tunnel syndrome.

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AUTHOR'S CONTRIBUTION

Shahab:
Aamir M:
Shafiq M: All authors contributed equally to all parts of the study.

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