

Role of Oral Steroids in The Treatment of Carpal Tunnel Syndrome

Zaheer Ahmad, Muhammad Adnan Alsam*, Arsilan Hasan

Allied Hospital Faisalabad Pakistan, *Services Institute of Medical Sciences, Lahore Pakistan

ABSTRACT

Objective: To compare the efficacy of oral steroids and intracarpal steroids in treating carpal tunnel syndrome.

Study Design: Quasi-experimental study.

Place and Duration of Study: Neurology department, Allied Hospital, Faisalabad Pakistan, from Jul to Dec 2020.

Methodology: Patients of either gender, >18 years of age having carpal tunnel syndrome were included and divided into two groups. The oral steroids group received 20mg Prednisone tablets for two weeks and 2cc 0.9% Saline injection locally in the carpal tunnel on the affected hand by a neurologist. Intracarpal steroids group received 40mg Methylprednisolone locally in the carpal tunnel on the affected hand and placebo tablets for two weeks. Global symptom score was calculated at baseline and four weeks of treatment. Nerve conduction studies were conducted at baseline and four weeks of treatment.

Result: A total of 106 patients were included in the study. There was a statistically significant improvement in the oral steroids group and intracarpal steroids group at four weeks follow up in mean sensory conduction velocity, mean global symptom score, mean motor conduction velocity and mean sensory latency ($p < 0.05$). There was no statistically significant difference in the efficacy of oral Prednisone and intracarpal Methyl prednisone in the groups (p -value 0.579).

Conclusion: Oral steroids and intracarpal steroids are effective as conservative treatment of carpal tunnel syndrome in decreasing symptoms on global symptom score (GSS) and improving the nerve conduction parameters of carpal tunnel syndrome.

Keywords: Carpal tunnel syndrome, Global symptom score, Intracarpal steroid injection, Methyl prednisolone, Prednisone.

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INTRODUCTION

Carpal tunnel syndrome (CTS) occurs due to the compression of median nerve at the wrist and is considered one of the most common forms of entrapment neuropathy.¹ Median nerve entrapment occurs as the nerve crosses under the flexor retinaculum at the wrist in a bony canal called carpal tunnel. CTS is defined as "a constellation of clinical symptoms and signs caused by compression and slowing of conduction of median nerve at the wrist."²

Carpal tunnel syndrome has an incidence of 1-3 cases/1000/year. In a few high-risk groups, the incidence has been reported up to 150 cases/1000 subjects/year.^{3,4} It is imperative to diagnose and treat the condition early as long-standing compression on the median nerve can cause permanent damage and neurological deficits.⁵

Carpal tunnel syndrome is treated with conservative and surgical approaches. Conservative treatment includes intracarpal steroids and splint therapy.⁶ Flexor retinaculum release-surgery is used in a patient who does not respond to conservative treatment or

develops motor weakness.⁷

Intracarpal steroids are considered an effective treatment option that offers significant symptomatic relief from CTS symptoms.⁸ However, there are associated local pain, sometimes severe, with intracarpal steroids. There are also some reports of intraneural injection and tendon rupture. This makes patients apprehensive about local steroid injection and sometimes refuse this mode of therapy.⁹ Oral steroids offer an acceptable treatment option in this scenario. In one study by Chang *et al*, oral Prednisone 20mg per day treatment resulted in a significant decrease in GSS at 4 weeks.¹⁰

This study was conducted to evaluate the efficacy of oral steroids in comparison with intracarpal steroids as oral steroids are easy to use, more acceptable to patients and can be a perfect option for patients hesitant to take intracarpal steroids.

METHODOLOGY

It was a quasi-experimental study carried out at the Neurology Department, Allied Hospital, Faisalabad, from July to December 2020. The Institutional Ethical Review Committee approved the study (ERC No: 1032). Informed consent was obtained from all the study participants. Sample size was calculated

Correspondence: Dr Zaheer Ahmad, Department of Neurology, Allied Hospital Faisalabad Pakistan

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(Epi-info.com calculator) using parameters; GSS at 4 weeks (intra-carpal steroids group)= 4.88 ± 4.64, GSS at 4 weeks (oral steroids group) = 7.67 ± 3.84, confidence interval = 95%, power = 80%. The calculated sample size was 74 (37 in each group).¹¹ A total of 106 patients were included in the study.

Inclusion Criteria: Patients of either gender, >18 years of age having carpal tunnel syndrome were included in this study.

Exclusion Criteria: Patients with thenar muscle atrophy, absent compound muscle action potential (CMAP) on nerve conduction studies, patients of polyneuropathy, cervical radiculopathy, rheumatoid arthritis, pregnancy, hypothyroidism, diabetes mellitus, contraindication to steroids, the patients who received oral steroids or intra-carpal steroids within last 3 months were excluded from the study.

Patients were enrolled using non-purposive consecutive sampling technique and divided into two groups. Oral steroids group received 20mg Prednisone tablets for 2 weeks and 2 cc normal Saline injection locally in the carpal tunnel on the affected hand by a neurologist. Intra-carpal steroids group received 40mg Methylprednisolone locally in the carpal tunnel on the affected hand and placebo tablets for two weeks. The intra-carpal injection was administered by taking 40 mg Methylprednisolone and 1ml 2% Lignocaine in a 25G syringe. Space was identified just medial to palmaris longus tendon and the needle was inserted 1-2cm at a 45° angle in proximal wrist crease directing needle to the middle finger. A slight aspiration was done to avoid intravascular injection. Global symptom score was calculated at baseline and four weeks of treatment. Nerve conduction studies were conducted on the Medelec™ Synergy EMG system at baseline and four weeks of treatment.

CTS is defined clinically as sensory symptoms like numbness, pain and paresthesia involving lateral three and a half fingers, which increase with activities like writing, holding the phone and positive tinell or

Phalen sign.¹²

Following electrophysiological criteria were used: 1) distal motor latency of median nerve recorded from abductor pollicis brevis >4.4 millisecond, 2) sensory peak latency of median nerve recorded from the second digit >3.5millisecond, 3) difference between median and ulnar sensory latency at digit IV >0.5ms, 4) sensory latency difference >0.5ms between median nerve at digit II and ulnar at digit V, 5) distance of measurement same for all readings. 13

Global Symptom Score (GSS) was used in the study. GSS comprises of CTS symptoms measured on a scale of 0 (no symptoms) to 10 (severe) in five different categories: 1) numbness, 2) pain, 3) weakness/clumsiness, 4) paresthesia, 5) nocturnal awakening. The total score was 50 which was calculated by summing each category's score.¹⁴

SPSS-23 was used for the data analysis. Quantitative variables like age, global symptom score at baseline, global symptom score after four weeks of treatment were presented as mean and standard deviation. Qualitative variables were presented as frequency and percentages. GSS, motor distal latency, sensory distal latency, sensory amplitude and motor amplitude were compared at baseline and four weeks of treatment using an independent sample t-test. The efficacy of oral and intra-carpal steroids was compared using the chi-square test. The *p*-value of ≤0.05 was considered statistically significant.

RESULTS

A total of 106 patients were included in the study. Mean age in oral steroids group was 39.45 ± 9.866 years while mean age in intra-carpal steroids was 41.62 ± 9.866 years. There were no significant differences in both the groups with respect to age (*p*-value = 0.236), gender (*p*-value = 0.526), baseline mean GSS (*p*-value = 0.663), baseline mean SNCV (*p*-value = 0.290), baseline mean SDL (*p*-value = 0.678) and baseline mean MDL (*p*-value = 0.476) as shown in the Table-I.

Table-I: Baseline characteristics of both the study groups.

Parameters	Oral Steroids, n=53	Intra-carpal Steroids, n=53	<i>p</i> -value
Age (Years)	39.45 ± 9.866	41.62 ± 9.866	0.236
Gender			
Male	14 (26.4%)	18 (34%)	0.526
Female	39 (73.6%)	35 (66%)	
Global symptom score (GSS) at baseline	33.60 ± 5.603	34.08 ± 5.512	0.663
Sensory Conduction velocity at baseline	29.6604 ± 5.77109	30.9623 ± 6.79072	0.290
Distal Motor Latency at baseline	5.5868 ± 0.78521	5.5245 ± 0.75547	0.678
Sensory Latency at baseline	3.9245 ± 0.39268	3.8660 ± 0.44676	0.476

Carpal Tunnel Syndrome

There was a statistically significant improvement in the oral steroids group and intracarpal steroids group at four weeks follow up in mean sensory conduction velocity, mean GSS, mean motor conduction velocity, mean sensory latency as shown in the Table-II.

have a 4-times more incidence of CTS as compared to males.¹⁶ An *et al*, reported that 75% patients suffering from CTS were females and 25% were males.¹⁷

Very few studies have directly compared oral steroids and intracarpal steroids, demonstrating their

Table-II: Outcome assessment in terms of change in global symptom score (GSS), Sensory nerve conduction velocity (SNCV), distal motor latency (DML) and Sensory latency (SL) at baseline and at 4 weeks in both the study groups.

Parameters	Oral Steroids			Intracarpal Steroids		
	Baseline	4 Weeks	p-value	Baseline	4 Weeks	p-value
Global symptom score (GSS)	33.60 ± 5.603	12.89 ± 10.905	0.001	34.08 ± 5.512	10.53 ± 9.647	0.001
Sensory Conduction velocity	29.6604 ± 5.77109	33.8868 ± 5.19860	0.001	30.9623 ± 6.79072	33.3019 ± 5.85920	0.001
Distal Motor Latency	5.5868 ± 0.78521	4.1283 ± 0.97298	0.001	5.5245 ± 0.75547	3.9509 ± 0.99954	0.001
Sensory Latency	3.9245 ± 0.39268	2.9302 ± 0.56111	0.001	3.8660 ± 0.44676	2.8792 ± 0.60011	0.001

There was no statistically significant difference between the oral steroids group and intracarpal steroids group in the efficacy of these medicines (p-value 0.579) as shown in the Table-III.

Table-III: Comparison of efficacy of oral steroids and intracarpal steroids in treatment of carpal tunnel syndrome.

Efficacy	Groups		p-value
	Oral Steroids	Intracarpal Steroids	
Yes	44 (83%)	47 (88.7%)	0.579
No	9 (17%)	6 (11.3%)	

DISCUSSION

Carpal tunnel syndrome (CTS) is a very common condition. If CTS is not diagnosed and treated early, it can result in weakness of muscles of the hand. Eventually, it can lead to permanent damage to median nerve fibers.¹² CTS is treated early with splint therapy and with intracarpal steroids.¹³ Surgical treatment is used if the condition is refractory to conservative management or progressive muscle weakness of thenar muscles supplied by the median nerve.^{14,15}

In our study, oral steroids were given to one group and intracarpal steroids were administered to the second group. Females were affected more than males in both the groups. Oral steroids and intracarpal steroids showed significant improvement in global symptom score, sensory conduction velocity, sensory latency and motor conduction velocity. Our study evaluated clinical and electrophysiological improvement in CTS at four weeks of treatment with oral and intracarpal steroids. There was no statistically significant difference between the oral steroids group and intracarpal steroids group in efficacy of these medicines.

Females were affected more than males in our study. This was in agreement with previous epidemiological data of CTS. Farioli *et al*, reported that females

efficacy.¹¹ Sadeli *et al*, compared oral and intracarpal steroids. However, this study used Triamcinolone as an oral and injectable steroid.¹¹ It was found that oral and local steroids for treatment of CTS were equally effective and they reduce symptoms of CTS on a global symptom scale and improve nerve conduction study parameters. These findings supported our study, which also showed that oral and local steroids were effective treatment options for CTS.

Wong *et al*, conducted a study and compared oral and intracarpal steroids in the treatment of CTS. They assessed the clinical outcome of CTS treatment and found that local steroids were superior in providing relief to symptoms of CTS on a global symptom scale compared to oral steroids.¹⁸

Chang *et al*, found that a two-week course of oral steroids resulted in a persistent response in the treatment of CTS in 74.1% of the patients.¹⁹ Follow up nerve conduction studies also showed improvement in distal motor latency, motor conduction velocity, sensory latency and sensory conduction velocity. These findings were similar to the results of our study in which oral steroids proved effective and comparable to intracarpal steroids in improving CTS symptoms.

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CONCLUSION

Oral steroids and intracarpal steroids are effective as conservative treatment of carpal tunnel syndrome in decreasing symptoms on global symptom scores and improving nerve conduction study parameters of CTS. These are equally effective compared to each other for the treatment of CTS.

Conflict of Interest: None.

Authors' Contribution

ZA: Concept data collection data analysis, MAA: Supervision concept, AH: Data collection.

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