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# INTRA-CARPAL TUNNEL STEROID INJECTIONS ARE SUPERIOR TO NSAIDS IN MANAGEMENT OF CARPAL TUNNEL SYNDROME.

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## ABSTRACT

**BACKGROUND:** Carpal tunnel syndrome (CTS) is caused by the compression of median nerve in carpal tunnel. Carpal bones make the floor of the carpal tunnel and the transverse carpal ligament forms the roof. Components include median nerve and the flexor tendons. The pain may be localized to the wrist or may radiate to forearm, arm or rarely shoulder. Effectiveness of treatment by intracarpal corticosteroid injection in comparison with NSAID has never been investigated. The objective of this study was to determine if corticosteroid injections for carpal tunnel syndrome are effective compared to NSAID.

**METHODS:** In this study 46 participants with a clinical diagnosis of CTS were recruited. Participants were randomly assigned treatment group A (intra carpal tunnel steroid injection) and B (NSAID) by coin flipping method. Main outcomes, mean score of the Symptom Severity Scale (SSS) of the Boston carpal tunnel questionnaire, subjective improvement during follow-up were collected. Duration of follow-up was 3 months.

**RESULTS:** The median duration of symptoms was 8 months in NSAID group and 7 months in Steroid group post treatment. Steroid group showed better direct treatment response ( $P=0.001$ ) and perceived improvement ( $P=0.001$ ) than the NSAID group in the outcomes. Symptom severity score improved significantly after steroid treatment compared to NSAID group, from (2.79 to 1.01) in steroid group versus (2.58 to 2.45) in NSAID group

**CONCLUSION:** Intracarpal tunnel steroids injection was more effective as compared to NSAID in management of carpal tunnel syndrome.

**Key words:** Carpal tunnel syndrome, steroids, NSAIDs

## INTRODUCTION

Carpal tunnel syndrome (CTS) is caused by the compression of median nerve in carpal tunnel. Carpal bones make the floor of the carpal tunnel and the transverse carpal ligament forms the roof. Components include median nerve and the flexor tendons. The pain may be localized to the wrist or may radiate to forearm, arm or rarely shoulder. Paresthesias are frequently present in medial thumb, index, middle and lateral ring finger. During sleep, paresthesias worsen due to increase in carpal tunnel pressure and nerve ischemia. The annual incidence of CTS is 0.1% among adults and prevalence is 2.7% in general population.<sup>(1,2)</sup> It frequently affects female more than male, literature review on demographic characteristics of CTS in Pakistan population revealed a ratio of 4.8:1 which is

near to ratio of 5.6:1 in a study done by Gomes in Brazil, reason being female population have small carpal tunnels compared to males.<sup>(1,3)</sup> Etiology is likely related to occupations involving excessive use of hand or wrist like in typists, mechanics, carpenters. An interesting study done on prevalence of CTS in dentists working in Karachi, revealed prevalence of 10.31%<sup>(4)</sup> Similar literature on association of CTS with the specific occupation can be found in laboratory workers in India with the prevalence of 21.5% and in Saudi Arabia it was 25.3%<sup>(5,6)</sup> This high prevalence reflects significant association of CTS with the occupation. Risk factors of CTS include diabetes, obesity, age, pregnancy, hypothyroidism, rheumatoid arthritis, gout, acromegaly, amyloidosis, arterio-venous shunts for hemodialysis

and fractures at the wrist. Diagnosis of CTS can be made clinically and confirmed by American Academy of Neurology (AAN) electro diagnostic criteria. (11) On examination sensory changes like impaired pin-prick and two point discrimination in the distribution of median nerve can be elicited. Symptoms can be reproduced by Phalen maneuver (7,8) (flexion at both wrists for 1 minute) and Reverse Phalen maneuver (hyperextension of the wrist). Percussion at the wrist causes paresthesias in the distribution of median nerve suggestive of positive Tinel's sign is also a specific clinical sign of CTS. In severe cases patients develop muscle weakness and atrophy(9,10). Treatment of CTS includes oral analgesics, NSAIDS, wrist splinting, intra-carpal tunnel steroid injections or tendon release surgery. NSAIDs provide anti-inflammatory effects and reduces edema in carpal tunnel leading to relieve of symptoms. Though literature search showed limited benefit with NSAIDs in the management of CTS but NSAIDs still are considered first line for conservative management (12).

## METHODS:

Setting: Patients were recruited from the outpatient department of Ziauddin university hospital

### Patient recruitment and inclusion/exclusion criteria:

Patients presenting with symptoms and signs suggestive of carpal tunnel syndrome were eligible for inclusion. Exclusion criteria were thenar atrophy, being less than 18 years of age, presence of contraindications for corticosteroid injection (hypersensitivity to corticosteroids, local skin infection), prior treatment for CTS in the last six months with steroid injection or surgery, traumatic or neoplastic origin of symptoms, co-existing diseases such as polyneuropathy, cervical radiculopathy and thoracic outlet syndrome, inability to fill in follow-up forms or absence of self-determination in the participant. After applying in- and exclusion criteria, written informed consent was obtained from participants by their general practitioner.

### Randomization:

Through flip coin method

Outcome measurement:

1. Direct treatment response (based on consensus between physician and patient):

- 0 = no response
- 1 = partial response, but not satisfactory, warranting further treatment
- 2 = partial response, satisfactory, not warranting further treatment

- 3 = complete resolution of symptoms and signs

2. Improvement as perceived by patient:

- -2 = much worse
- -1 = worse
- 0 = not better/not worse
- + 1 = better
- + 2 = much better

Symptom severity was assessed by using the Symptom Severity Scale (SSS), which is the part of Boston Carpal Tunnel Questionnaire (BCTQ). The BCTQ is a patient-reported outcome measure for CTS and has been tested for validity, reliability and responsiveness. The SSS has 11 questions- use a five-point scale. Each scale generates a final score (sum of individual item scores divided by number of items), which ranges from 1 to 5. Higher SSS correlate with more severe symptoms.

Follow up measurements were performed by sending questionnaires to participants 1, 3 months.

### Sample size and data analysis:

At the significance level of 5%, power of the study 80%, percentage success in control NSAID group 50% and percentage success in experimental steroid group as 86% (10), the sample size from sealed envelope was calculated to be 23 per group and total 46

## RESULTS:

Characteristics	Total	Intervention		P-value
		Nsaiid 23(50)	Steroid 23(50)	
Age in years	38.35±11.97	36.78±12.12	39.9±11.87	0.381**
Duration of symptoms	8.30±3.83	8.86±4.07	7.73±3.58	0.332**
<b>Gender</b>				1.000**
Male	16(34.8)	8(34.8)	8(34.8)	
Female	30(65.2)	15(65.2)	15(65.2)	
<b>Symptoms</b>				0.038*
Pain	17(37)	4(17.4)	13(56.5)	
Paresthesias	17(37)	12(52.2)	5(21.7)	
Tingling	8(17.4)	5(21.7)	3(13)	
Numbness	4(8.7)	2(8.7)	2(8.7)	
<b>Phalen Test</b>				0.233**
Positive	43(93.5)	20(87)	23(100)	
Negative	3(6.5)	3(13)	0(0)	
<b>Tinel Test</b>				0.233**
Positive	43(93.5)	20(87)	23(100)	
Negative	3(6.5)	3(13)	0(0)	
<b>Symptom severity score</b>				0.054**
Mean score at baseline	2.69±0.36	2.58±0.39	2.79±0.30	
Mean score after 1 month	1.73±0.76	2.45±0.31	1.01±0.03	<0.001*
Mean score after 3 month	1.72±0.76	2.45±0.31	1.00±0.02	<0.001*
<b>Direct Treatment Response at 1 month</b>				<0.001*
No response	6(13)	6(26.1)	0(0)	
Partial response but not satisfactory, warranting further treatment	17(37)	17(73.9)	0(0)	
Partial response but satisfactory, not warranting further treatment	6(13)	0(0)	6(26.1)	
Complete resolution of symptoms and signs	17(37)	0(0)	17(73.9)	
<b>Improvement as perceived by patient at 1 month</b>				<0.001*
Not better/not worse	22(47.8)	22(95.7)	0(0)	
Better	7(15.2)	1(4.3)	6(26.1)	
Much better	17(37)	0(0)	17(73.9)	
<b>Direct Treatment Response at 3 month</b>				<0.001*
No response	2(4.3)	2(8.7)	0(0)	
Partial response but not satisfactory, warranting further treatment	21(45.7)	21(91.3)	0(0)	
Partial response but satisfactory, not warranting further treatment	4(8.7)	0(0)	4(17.4)	
Complete resolution of symptoms and signs	19(41.3)	0(0)	19(82.6)	
<b>Improvement as perceived by patient at 3 month</b>				<0.001*
Not better/not worse	22(47.8)	22(95.7)	0(0)	
Better	5(10.9)	1(4.3)	4(17.4)	
Much better	19(41.3)	0(0)	19(82.6)	

**Summary main findings:**

The median duration of symptoms was 8 months in NSAID group and 7 months in Steroid group. Steroid group showed better direct treatment response ( $P=0.001$ ) and perceived improvement ( $P=0.001$ ) than the NSAID group in the outcomes. Symptom severity score improved significantly after steroid treatment compared to NSAID group. From (2.79 to 1.01) in steroid group versus (2.58 to 2.45) in NSAID group

**Comparison with existing literature:**

As far as isolated effect of Local steroid injections was concerned literature revealed that they have been proved effective for treating carpal tunnel syndrome. Patient satisfaction, clinical improvement, symptoms, function and pain were shown to improve after cortisone injections.<sup>(13-19)</sup> Similar to our study where we have proven superiority of steroid injections. Cochrane database systemic review showed that local corticosteroid injection for carpal tunnel syndrome provides greater clinical improvement in symptoms one month after injection compared to placebo. They also added that steroid injection provides significantly greater clinical improvement than oral steroid for up to three months. Two local corticosteroid injections do not provide significant added clinical benefit compared to one injection.<sup>(20, 21)</sup> Another trial which is part of a larger study called the Groningen Hand and Wrist Injection Therapy Trial (HAWITT) evaluated the efficacy and feasibility of steroid injections for carpal tunnel syndrome, de Quervain's tenosynovitis and trigger finger in primary care. The results of this study suggest that intra-carpal tunnel injection with 1 ml triamcinolone acetate 10 mg/ml are effective with respect to short-term outcomes when compared to placebo-injections in patients presenting to their general practitioner with a clinical diagnosis of CTS. Long-term effectiveness is less clear: the achieved treatment effects seem to diminish slowly in half of the cohort of patients that responded to steroid injections during the 12 months after the intervention and recurrences occurred in the other half of the cohort of steroid responders. When comparing the effectiveness of local steroid injection and carpal tunnel release operation for the treatment of CTS, local steroid injections give transient relief where as carpal tunnel release surgery provides long-lasting relief as shown in a short series of 40 patients with short-term follow-up of 12 weeks<sup>(22)</sup> Optimal treatment of CTS has not been established. This study compared the effects of local steroid injection versus surgical decompression in new-onset CTS of at least 3 months' duration. Both

treatment groups had comparable severity of CTS at baseline. Eighty wrists were randomly assigned to the surgery group and 83 wrists to the local steroid injection group. In the intent-to-treat analysis, at 3 months of follow-up, 94.0% of the wrists in the steroid injection group versus 75.0% in the surgery group reached a 20% response for nocturnal paresthesias ( $P = 0.001$ ). At 6 and 12 months, the percentages of responders were 85.5% versus 76.3% ( $P = 0.163$ ) and 69.9% versus 75.0% ( $P = 0.488$ ), for local steroid injection and surgical decompression, respectively. Over the short term, local steroid injection is better than surgical decompression for the symptomatic relief of CTS. At 1 year, local steroid injection is as effective as surgical decompression for the symptomatic relief of CTS. Gurcay et al conducted a randomised clinical trial in patients with CTS, assessing functional findings and electrophysiologic examinations on initial visit and at the third month, comparing treatment either with NSAID or local steroid injection. The results showed that neither of the groups demonstrated superior efficacy.<sup>(23)</sup> These were contrary to our results.

**Strength and limitations:**

To our knowledge this is the first randomized clinical trial comparing efficacy of steroids with NSAID. Strong points in our study were that randomization was rigorous, we used valid patient assessment tool. Our trial did not include nerve conduction study because our study dependent on the clinical signs and symptoms of CTS. Due to small sample size our study cannot be generalizable for the population of patients presenting with CTS.

**Conclusion**

In our opinion steroid injection into the carpal tunnel is a safe, easy to learn and apply therapeutic intervention and it is superior in efficacy compared to NSAID. We feel that initial treatment of patients with CTS should be intra carpal tunnel steroid injections.

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**Saba Zaidi;** data collection, data analysis, manuscript writing, manuscript review

**Shafaq Abbas;** data collection, data analysis, manuscript writing, manuscript review