

COMPARISON OF LOCAL STEROID INJECTION AND SURGICAL DECOMPRESSION IN TREATMENT OF CARPAL TUNNEL SYNDROME

RAHMAN RASOOL AKHTAR¹, JUNAID KHAN², RIAZ AHMED³, KANZA BATOOL⁴

ABSTRACT

OBJECTIVE: To compare the efficacy of local steroid injection versus surgical decompression in treatment of carpal tunnel syndrome in terms of frequency of pain.

STUDY DESIGN: A Randomized controlled study.

PLACE AND DURATION: At Benazir Bhutto Hospital, Rawalpindi, Pakistan for a duration of 02 years from 3rd January, 2013 to 2nd January, 2015.

METHODOLOGY: The study included 130 patients with carpal tunnel syndrome. Patients were graded according to severity of pain based upon Visual Analog Pain Scale (VAS). Lottery method was used to allocate the patients randomly into two groups. Group A contained 65 patients who were subjected to surgical decompression and 65 patients were in Group B who were injected with local steroid injection. Complete history was obtained from all patients. All the surgical decompressions through mini incision technique. Information were recorded on a pre designed Performa.

RESULTS: Efficacy (at least one grade improvement in pain at one month) was observed to be significantly high in group B patients who were treated with local steroid injection (87.8%) as compared to group A patients who underwent surgical decompression for carpal tunnel syndrome (72.3%).

CONCLUSION: The steroid injections are more effective than surgical decompression in management of carpal tunnel syndrome.

KEY WORDS: Carpal tunnel syndrome, steroid injection, surgical decompression, pain, entrapment neuropathy, Visual Analog Pain Scale (VAS).

INTRODUCTION

Median nerve is mechanically compressed at the wrist leading to carpal tunnel syndrome. It is the most common nerve compression syndrome encountered. This may result from various reasons which reduce carpal tunnel capacity and in turn, enlarge the volume of the contents.¹ Its incidence has been estimated to be between 0.1% and 10%.² 50% cases are idiopathic. Associations with other conditions such as diabetes mellitus, thyroid disease, rheumatoid arthritis, pregnancy, trauma etc have been found.³ It occurs in certain industrial settings which has led to its increased recognition in past few years. At present, it is amongst the commonest occupation associated dysfunctions reported.⁴

Nocturnal pain associated with tingling and numbness along the distribution of median nerve in hand makes up the prototypical

feature of carpal tunnel syndrome. Tinel's test, Phalen's test and a number of other physical examination tests have been employed to aid in diagnosis of carpal tunnel syndrome but none of these tests have been found to be diagnostic alone. Diagnostic tests that are considered gold standard are median nerve conduction studies with their sensitivity varying between 49%-84% and specificity in the range of 95%-99%.⁵

Conservative management comprising of non-steroidal anti inflammatory drugs (NSAIDs), steroid injections and physiotherapy besides surgical modalities like the conventional open approach with long palmar curvilinear incision (consists of making an incision up to 2 inches in the wrist), minimal incision (1.5- 2cm mid palmar incision) and endoscopic carpal tunnel release have been employed.⁶ Open carpal tunnel release (OCTR) is still considered to be the safe and effective for carpal tunnel syndrome because not only the ligament is under direct vision but complete section of ligament is guaranteed with treatment of other pathologies in carpal tunnel syndrome at the same time^{7,8}.

Many clinical guidelines have been proposed for the treatment of carpal tunnel syndrome but no therapy has been accepted universally despite the recognition of the importance of this condition.⁹ Although various treatment options are available but there is still a great concern regarding the best possible and non-invasive solution in our population, therefore this study was carried out to compare the effectiveness of local steroid injection versus decompression of median nerve done surgically.

We have conducted this study to compare the efficacy of local steroid injection versus surgical decompression in treatment of carpal tunnel syndrome in terms of frequency of pain.

1. Senior Registrar
2. Post-graduate resident
3. Consultant
Department of Orthopaedics,
Benazir Bhutto Hospital, Rawalpindi, Pakistan
4. Final year Medical student
Rawalpindi Medical College, Rawalpindi, Pakistan

Correspondence to:

Rahman Rasool Akhtar
Senior Registrar Orthopaedics
Benazir Bhutto Hospital, Rawalpindi, Pakistan
Email: virgo_r24@hotmail.com

Received for Publication: 19-09-16

Accepted for Publication: 19-11-16

METHODOLOGY

This Randomized Controlled Study was carried out in the Orthopaedic Department of Benazir Bhutto Hospital, Rawalpindi, Pakistan for duration of 02 years from 3rd January, 2013 to 2nd January, 2015. Patients were divided in to 2 groups with equal number of patients. The technique used for grouping was Consecutive (Non-Probability) Sampling. An inclusion criterion was all patients with carpal tunnel syndrome with moderate to severe pain and aged between 25 to 60 years belonging to either gender. Assessment of patients was done by Visual Analog Pain Scale (VAS).¹⁰ We graded pain scale from a minimum of 0 to a maximum of 10 using VAS.

Based upon this scale, patients were divided into three grades. Those with mild pain (VAS score 1-3) were classified as Grade I. Patients with moderate (VAS score 4-6) and severe pain (VAS score 7-10) were divided into Grade II and III respectively. Patients with previous history of trauma, diagnosed cases of rheumatoid arthritis, diabetes mellitus, hypo- and hyperthyroidism were excluded from the study groups.

Carpal tunnel syndrome was diagnosed by Phalen's test and Tinel's sign.¹¹ Confirmation of diagnosis was done through nerve conduction study (NCS), which is considered a reliable indicator.¹² All patients meeting the inclusion criteria were included in the study. The patients were informed about the purpose and benefits of the study and risks explained. An informed consent was obtained in writing and random allocation into two groups was done. Group A patients were subjected to surgical decompression whereas local steroid injection was administered in Group B patients. Complete history was obtained from all patients followed by complete routine examination and routine investigations including nerve conduction study to rule out confounders and bias in the study results.

Surgical decompression of Group A patients was planned and done as a day care procedure. A longitudinal incision was made on the palmar aspect of hand and after visualization of median nerve, transection of transverse carpal ligament was done.

Group B patients were also treated on day care basis. They received 20mg methylprednisolone in 1 ml injection, which was injected 1cm proximal to the flexion crease of distal wrist and medial to Palmaris longus tendon at an angle of 45 degree distally. These patients were observed for 30 minutes after injection.

First follow up was done on the 10th day of procedure for removal of stitches in group A patients and to observe redness or swelling of the injection site of group B patients if any. In order to determine the efficacy in at least one grade of pain, all patients of Group A and B were advised for a 2nd follow up visit to the OPD after one month.

The same consultant orthopaedic surgeon performed all the surgical decompressions through mini incision technique and injection procedures. All the results were followed and recorded on a Performa.

SPSS version 22 was used to store and analyze the data. Age, mean and standard deviation were calculated. To compare the

efficacy between local steroid injection and mini incision technique, Chi square test was used. P value less than 0.05 taken as significant.

RESULTS

The study included 130 patients with carpal tunnel syndrome who had moderate (Grade 2) and severe (Grade 3) pain. The subjects were allocated into two groups randomly based on lottery method. 65 patients were placed in Group A who underwent surgical decompression while 65 were in Group B who were injected with local steroid injection. The mean age of the patients was 45.20±7.42 years. The minimum age was 25 with a maximum of 60 years, with age distribution of patients shown in Figure - 1.

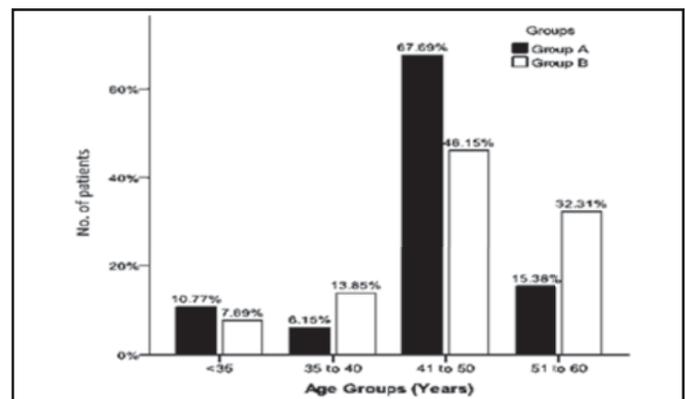


FIGURE-1: AGE DISTRIBUTION OF THE PATIENTS (N=130)

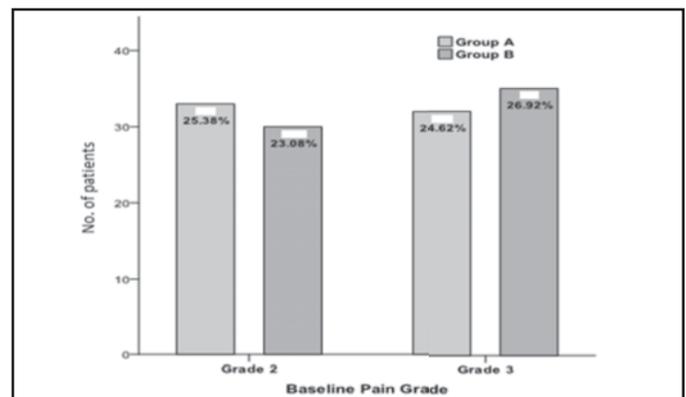
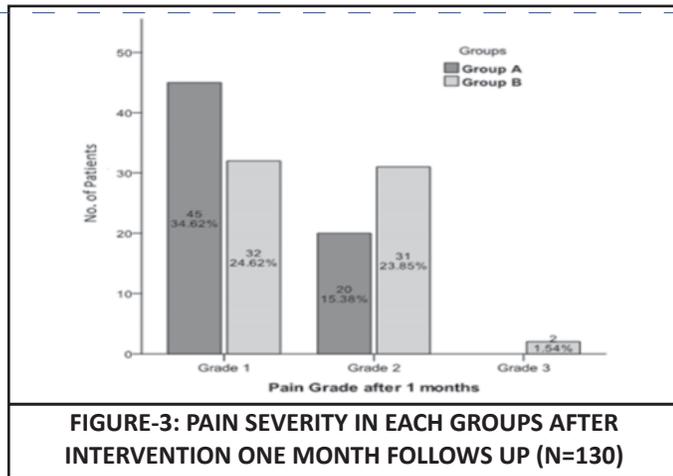


FIGURE-2: PAIN SEVERITY IN EACH GROUP BEFORE INTERVENTION (N=130)

Out of 130 patients, 63.1% (82/130) were males and 36.9% (48/130) were females. Out of these 82 male patients, 37 were placed in group A and 45 in group B. There were 28 females in group A and 20 in group B.

Baseline pain grade of the patients was grade 2 (moderate) and 3 (severe) in both groups while after one month of management, pain grade dropped from grade 2 (moderate) to grade 1 (mild) and grade 3 (severe) to grade 2 (moderate) as estimated by VAS as shown in Figure-2 and 3.



DISCUSSION

For the treatment of CTS, certain clinical guidelines have been set.¹³ Conservative treatments are used in cases where the patient is less symptomatic with splinting of the wrist employed as the initial approach.¹⁴ NSAIDs are added by many physicians to the treatment regimen although no evidence has supported their utility in CTS management.¹⁴ Failure of splinting along with NSAIDs is followed by local corticosteroid (CS) injection which is considered the second step in the management of CTS.¹⁵ Superiority of local corticosteroid injection over placebo has been reported.^{16,17} An improvement in symptoms was seen in 75% of the patients after corticosteroid injection.¹⁸ Greater clinical efficacy was observed after 1 month in patients who were treated with local steroid injection for CTS when compared with placebo.^{19,20} Placebo has not been found to be effective beyond one month of its administration.¹⁹ Patients who had the symptoms of CTS for less than a year and who did not present with any significant muscular weakness or atrophy best responded to local CS injections as was reported in a study carried out by Gelberman et al.¹⁸ A correlation has been described by Padua et al between symptoms of CTS present for short duration and a satisfactory prognosis even when no specific treatment is given.²¹

In Carpal Tunnel Syndrome of long duration and severe symptoms with loss of sensation, weakness or atrophy of thenar eminence and nerve conduction compromise, surgical treatment is preferred over conservative management.¹⁵ No published evidence regarding optimal treatment modality for the subtypes of CTS classified on the basis of severity, motor nerve impairment with or without neurophysiological confirmation has been seen.²²

In our study, the patients had a mean age of 45.20±7.42 years with a range of 25 to 60 years. Bongers et al found out the average age of patients to be between 45 and 64years.²³ Bland reported a bimodal peak in the incidence of carpal tunnel syndrome with the first rise seen in age group of 50-54 years and second peak between 75-84 years.²⁴ Geogeghan carried out a study on risk factors of carpal tunnel syndrome and concluded the mean age of CTS as 45 years which was in concordance with our study.²⁵ In a study carried out by Shaker et al in Cairo in 2008, it was seen that age most vulnerable to CTS was from 30-

Efficacy (at least one grade improvement in pain at one month follow up) was observed significantly high in group B as compared to group A (87.7% vs. 72.3%; p=0.028) as presented in Table - I.

TABLE - I: COMPARISON OF OUTCOME OF INTERVENTION IN BOTH GROUPS (N=130)

Efficacy	Group A n=65	Group B n=65	Total n=130	P-Value
Yes	47(72.3%)	57(87.7%)	104(80%)	0.028
No	18(27.7%)	8(12.3%)	26(20%)	

Chi-Square test applied

49.²⁶ 63.1% of the patients in our study were males whereas 36.9% who presented with CTS were females. Studies carried out previously showed CTS to be more prevalent in females as compared to males.^{24,25,26} This was in stark contrast with our results. A probable reason for this deviation from the result may be because the severity of CTS in males is greater as compared to women and they may only seek medical help when the severity increases.²⁷ In our society, males make up majority of the work force therefore they compose the greater part of the patients who present for treatment of carpal tunnel syndrome as it interferes with their routine activities as well as occupation. Surgical decompression was performed in Group A subjects and Group B patients were treated with local steroid injection. In both groups, the baseline pain was of Grade II and III. After one month of follow up, a reduction was seen in both group patients from grade III to II and from grade II to I. This improvement in atleast one grade of pain was significantly high for the subjects of group B as compared to group A. (87.7% vs. 72.3%; p=0.028). Awan et al observed that steroid injection was effective in 69% of the patients of carpal tunnel syndrome whereas only 56.9% of the patients undergoing mini incision technique showed improvement.²² A study done by Ly-Pen Et al. in 2005 suggested that local steroid injection was superior to surgery at 3 months after the treatment when the three symptom domains considered by us were evaluated.¹⁵ 93.7% of the patients showed improvement in mild carpal tunnel syndrome in a study carried out by Agarwal et al.²⁸ Prolonged relief can be achieved in patients who have mild to moderate degree of pain with 33% of the patients presenting with mild pain improving spontaneously after administration of corticosteroid.^{29,30} Michael Chammas in his study carried out in 2014 concluded that efficacy of corticosteroid injection in carpal tunnel syndrome was seen after a few days to 2-3 weeks of administration of the injection.³¹

In a study carried out by Ahmed et al, local corticosteroid injections were found to relieve the tingling sensation associated with carpal tunnel syndrome by 100% and numbness was improved in 40% of the patients.³² Muradian showed in his study carried out in 2007 that local steroid injections provided long term benefit to patients who had mild compression whereas surgical management was required for the management of nerve compression with severe symptoms.³³ In

a study carried out by Gurcay et al, no superiority of corticosteroid over surgical decompression was found which led to the conclusion that local steroid could be opted over surgical management as it was a less invasive procedure and offered equal efficacy to surgery.³⁴

Hui et al in his subsequent assessor-blinded controlled trial randomly assigned 50 patients (48 were female) with CTS to a single injection of methylprednisolone 15 mg or open surgical carpal tunnel decompression³⁵. At 20 weeks, surgical treatment was associated with significantly greater symptomatic improvement in the Global Symptom Score (GSS), the primary outcome, than local glucocorticoid injection (24.2 versus 8.7, respectively). The dose of methylprednisolone (15 mg) used in the trial is much less than the 40 mg most commonly used in practice.

CONCLUSION

Steroid injections were found to be superior to the surgical management when follow up was done after 1 month of treatment after both steroid injection and mini incision technique of open surgery. Thus its administration as a routine treatment in all patients with Carpal tunnel syndrome is suggested.

Contribution of Author's:-

Rahman Rasool Akhtar: Design Research Study, Literature Search, Data Collection, Manuscript Writing, Manuscript final reading and approval

Junaid Khan: Literature Search, Data Collection, Literature Review, Statistical Analysis,

Riaz Ahmed: Conceived Idea, Data Interpretation

Kanza Batool: Data Collection, Data Interpretation

REFERENCES

1. Salter M, Sinha NR, Szmigielski W. Thrombosed persistent median artery causing carpal tunnel syndrome associated with bifurcated median nerve: a case report. *Pol J Radiol.* 2011;76(2):46–48.
2. Ralte P, Selvan D, Morapudi S, Kumar G, Waseem M. Haemostasis in Open Carpal Tunnel Release: Tourniquet vs Local Anaesthetic and Adrenaline. *Open Orthop J.* 2010;4(1):234–36.
3. Aroori S, Spence RA. Carpal tunnel syndrome. *Ulster Med J.* 2008;77(1):6-17.
4. American Academy of Orthopaedic Surgeons. Clinical guideline on wrist pain. National Guideline Clearinghouse. Website: [www.guideline.gov].
5. Jun II, Hidehiro H, Hiroyuki N, Toshisuke S. Carpal tunnel syndrome: electrophysiological grading and surgical results by minimum incision open carpal tunnel release. *Neurol Med Chir Tokyo.* 2008;48(1):554-49.
6. Young YJ. Limited mini–open carpal tunnel release. *Korean J Spine.* 2008;5(1):18-23.
7. Badger SA, O'Donnell ME, Sherigar JM, Connolly P, Spence RAJ. Open Carpal Tunnel Release – still a safe and effective operation. *Ulster Med J.* 2008;77(1):22–24.
8. Ly-Pen D. Surgical decompression versus local steroid injection in carpal tunnel syndrome: a one-year, prospective, randomized, open, controlled clinical trial. *Arthritis Rheum.* 2005;52:612-19.
9. Verdugo RJ, Salinas RS, Castillo J, Cea JG. Surgical versus non-surgical treatment for carpal tunnel syndrome. *Cochrane Database Syst Rev.* 2002;(2):1552.
10. Okamura A, Meirelles LM, Fernandes CH, Raduan J, Neto, Gomes JB, Faloppa F. Evaluation of patients with carpal tunnel syndrome treated by endoscopic technique. *ActaOrtop Bras.* 2014; 22(1): 29–33.
11. Naranjo A, Ojeda S, Mendoza D, Francisco F, Quevedo JC, Erasquin C. What is the diagnostic value of ultrasonography compared to physical evaluation in patients with idiopathic carpal tunnel syndrome? *ClinExpRhemumatol.* 2007;25:853–59.
12. Claes F, Verhagen WIM, Meulstee J. Current Practice in the Use of Nerve Conduction Studies in Carpal Tunnel Syndrome by Surgeons in the Netherlands. *J Hand SurgEur* 2007;32(6):663-67.
13. American Academy of Orthopaedic Surgeons (AAOS). Clinical practice guideline on the treatment of carpal tunnel syndrome. National Guideline Clearinghouse. Website: [www.guidelines.gov/content.aspx?id=13304].
14. Anthony J. Viera. Management of Carpal Tunnel Syndrome. *Am Fam Physician* 2003;68:265-72.
15. Ly-Pen D, Andreu JL, de Blas G. Surgical decompression versus local steroid injection in carpal tunnel syndrome: a one-year, prospective, randomized, open, controlled clinical trial. *Arthritis Rheum.* 2005;52(11):612.
16. Girlanda P, Dattola R, Venuto C, Mangiapane R, Nicolosi C, Messina C. Local steroid treatment in idiopathic carpal tunnel syndrome: short- and long-term efficacy. *J Neurol.* 1993;240:187-90.
17. Dammers JW, Veering MM, Vermeulen M. Injection with methylprednisolone proximal to the carpal tunnel: randomised double blind trial. *Br Med J.* 1999;319:884-86.
18. Gelberman RH, Aronson D, Weisman MH. Carpal-tunnel syndrome. Results of a prospective trial of steroid injection and splinting. *J Bone Joint Surg Am.* 1980;62(7):1181-84.
19. Marshall S, Tardif G, Ashworth N. Local corticosteroid injection for carpal tunnel syndrome. *Cochrane Database Syst Rev.* 2007;(2):5400.
20. Armstrong T, Devor W, Borschel L, Contreras R. Intracarpal steroid injection is safe and effective for short-term management of carpal tunnel syndrome. *Muscle & Nerve* 2004;29(1):82–88.
21. Padua L, Padua R, Aprile I. Multiperspective follow-up of untreated carpal tunnel syndrome: a multicenter study. *Neurology.* 2001;56(11):1459.
22. Awan AS, Khan A, Afridi SA, Khan I, Bhatti SN, Ahmed E et al. Early response of local steroid injection versus miniincision technique in treatment of carpal tunnel syndrome. *J Ayub Med Coll Abbottabad.* 2015;27(1):192-96.
23. Bongers JM, Schellevis FG, Bosch JHM, van der Zee J. Carpal tunnel syndrome in general practice: incidence and the role of occupational and non-occupational factors. *British Journal of General Practice.* 2007;21:51-54.

24. Bland JDP, Rudolfer SM. Clinical surveillance of carpal tunnel syndrome in two areas of the United Kingdom, 1991–2001. *Neuro|Neurosurg Psychiatry*. 2003;74(12):1674-79.
25. Geoghegan JM, Clark DI, Bainbridge LC, Smith C, Hubbard R. Risk factors in carpal tunnel syndrome. *The Journal of Hand surgery: British and European Volume*; 29(4) :315–20.
26. Shaker HA, Gharib NM, Sharaf MA, El-Kahky AM. Prevalence of Carpal Tunnel Syndrome in Subjects Complaining from Hand Pain. *Bull. Fac. Ph. Th. Cairo Univ*; 13(1) :243-50.
27. Padua L, Padua R, Aprile I, Tonali P, for the “Italian CTS Study Group. ” Italian Multicentre study of carpal tunnel syndrome: differences in the clinical and neurophysiological features between male and female patients. *J Hand Surg* 1999; 24 (B):579–82.
28. Agarwal V, Singh R, Sachdev A, Wiclafl, 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. *Rheumatology (Oxford)* 2005;44(5):647–50
29. Visser LH, Ngo Q, Groeneweg SJ, Brekelmans G. Long term effect of local corticosteroid injection for carpal tunnel syndrome: a relation with electrodiagnostic severity. *Clin Neurophysiol*. 2012; 123(4): 838-41.
30. Shi Q, MacDermid JC. Is surgical intervention more effective than non-surgical treatment for carpal tunnel syndrome? A systematic review. *J Orthop Surg Res*. 2011;6:17.
31. Chammas M, Boretto J, Burmann LM, Ramos RM, Neto FS, Silvac JB. Carpal tunnel syndrome – Part II (treatment). *Rev Bras Ortop*. 2014;49(5):437–45.
32. Ahmed A, Islam R, Rahman HZ, Bhuiyan M, Majumder S, Sarker PK et al. Efficacy of Local Corticosteroid in Idiopathic Carpal Tunnel Syndrome: A Randomized Controlled Trial. *Bangladesh Journal of Neuroscience*. 2012; 28 (1): 10-15.
33. Muradian AA. Local steroid injection or surgery in the management of carpal tunnels syndrome; the possible predictive factors for the choice of treatment. *Bas J Surg* 2007; 13(1): 1-7.
34. Gurcay AG, Karaahmet OZ, Gurcan O, Kazanci A, Karsli PB, Umay EK, et al. Comparison of Short-Term Clinical and Electrophysiological Outcomes of Local Steroid Injection and Surgical Decompression in the Treatment of Carpal Tunnel Syndrome. *Turk Neurosurg* 2016. DOI: 10.5137/1019-5149.JTN.15936-15.0
35. Hui AC, Wong S, Leung CH. A randomized controlled trial of surgery vs steroid injection for carpal tunnel syndrome. *Neurology*. 2005;64(12):2074.