

Article

The Value of Using Operative Release Vs. Local Corticosteroid Injection in The Treatment of Entrapment Syndrome of The Median Nerve at The Wrist

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Abstract: Aim of the Study: To assess the effectiveness of operative carpal tunnel release compared with local corticosteroid injection in the treatment of moderate carpal tunnel syndrome (CTS). **Patients and Methods:** A prospective randomized trial was conducted involving 42 patients with moderate median nerve entrapment at the wrist between March 2022 and March 2024. Patients were divided into two groups: Group 1 received local steroid injection (LSI), while Group 2 underwent open carpal tunnel release (OCTR). The Global Symptoms Score (GSS) was used to evaluate treatment outcomes at baseline and at one, three, and six months of follow-up. **Results:** Twenty-one patients were treated with local steroid injection in Group 1, and 21 patients underwent open carpal tunnel release in Group 2. The mean age was 40.6 years in Group 1 and 41.1 years in Group 2, with no statistically significant differences between the groups regarding age, sex distribution, affected hand, clinical symptoms such as hand pain and nocturnal paresthesia, or clinical test findings ($p > 0.05$). The baseline mean GSS was 31.3 in Group 1 and 31.16 in Group 2, with no statistically significant difference ($p > 0.05$). At one month, the mean GSS was 10.8 in the LSI group and 11.33 in the OCTR group, with no significant difference ($p > 0.05$). At three months, the mean GSS was 12.3 in Group 1 and 10.33 in Group 2, again showing no statistically significant difference ($p > 0.05$). After six months, however, the mean GSS was 7.3 in the OCTR group and 21.5 in the LSI group. This difference was statistically significant ($p < 0.05$), indicating that surgical treatment provided superior long-term symptomatic relief. **Conclusion:** Local steroid injection provides effective short-term symptomatic relief for up to three months, whereas open carpal tunnel release is more effective for long-term symptomatic improvement in patients with moderate CTS, with benefits extending to at least six months in this study.

Keywords: Carpal Tunnel Syndrome; Median Nerve Entrapment; Corticosteroid Injection; Carpal Tunnel Release

Introduction

Carpal tunnel syndrome (CTS) is the commonest syndrome of nerves entrapment and among the commonest disorders of the upper extremity that lead to disability as well as it is costly. This syndrome arises as a result of median nerve compression inside the carpal tunnel of the wrist [1], [2]. 6.7%-7.8% has been reported to be the incidence of CTS [3], [4]. Patients between thirty and sixty years old are mostly affected and females 5 times more frequently affected than males [5]. Diagnosis of CTS is usually suspected when pain, tingling, or paresthesia that occurs in the allocation of the median nerve, the three radial fingers and half of the ring finger (thumb, index finger, middle finger, and half of the ring finger) [6]. Hyperemia and edema of the nerve caused by ischemia due to raised pressure in the carpal tunnel are the most important reasons [7], [8], [9]. Extended recurrent flexion or extension of the wrist joint are related with raised CTS hazard, mainly when associating to forceful hand grip at work [10], [11], [12]. Rheumatoid arthritis, gestation, underactive thyroid, arthritis, family history of diabetes mellitus, fatness, female sex are suspected risk factors for CTS [13], [14]. Extensive nerve demyelination in advanced stage leads to sensory disturbance, muscle wasting and thenar muscle weakness [15].

Non-operative therapy and surgical method can be used to treat CTS. The American Academy of Neurology has recommended local steroid injections for mild and moderate cases treatment [16]. This study is done to assess the value of using operative decompression versus local corticosteroid injection in those with moderate compression of the median nerve at wrist.

Materials and Methods

This is a prospective study of 42 patients with symptoms of idiopathic CTS are included in this study. Selection done randomly and diagnosis was confirmed by EMG and nerve conduction study. Individuals with moderate median nerve compression over three months and without sensory loss or thenar muscles atrophy were included in this trial. Study was done during the period between March 2022 and March 2024, the patient attended outpatient clinic for initial examination and follow up. Exclusion criteria include 1. contraindication to corticosteroids 2. cervical radiculopathy and other conditions mimic CTS 3. previous local steroid injection or hand surgery 4. CTS due to pregnancy, hypothyroidism, acromegaly, rheumatoid arthritis, wrist injury and diabetes mellitus 5. proximal median nerve disease.

Initially the total number of patients was 48 but because of exclusion criteria 6 cases were excluded from this study, 2 cases excluded due to previous trauma, 2 other cases excluded due to previous local steroid injection, one pregnant woman and one case with cervical radiculopathy. Patients aged between 28-55 years and enrolled 36 women and 6 men. Statistical analysis is done using SPSS version 26 and symptoms assessed with Global Symptoms Score (GSS), which is a standardized symptoms questionnaire. This score assesses symptoms on a scale from zero - fifty, where zero reveals no symptoms and 50 denotes the most severe symptoms.

Two groups of patients were evaluated, group 1 those who undergo local corticosteroid injection (LSI) and group 2 who undergo surgical release (OCTR) of transverse carpal ligament, explanation of the procedures was done for the patients including follow up examination visits and formal consent was taken from them. In bilateral cases, the hand with severe symptoms was enrolled in this study.

Group involved in local steroid injection, composed from 21 individuals who undergo injection in sterile field with a septic technique. The site of injection was sterilized with povidone-iodine 10%, and landmark of injection is identified to be medial to Palmaris longus (P.L) tendon by one cm and one cm proximal to distal palmar crease of the wrist joint (Fig.1). A mixture composed from steroid drug 2ml (80mg methylprednisolone) and local anesthesia 3ml 1% lidocaine, injected through 25 gauge needle. The needle is angled 45 degree with the skin and passes rapidly through skin and directed toward base of the thumb to inject drugs into the space of carpal tunnel with precaution to avoid damage of the median nerve or tendons, steroid drugs act by decreasing inflammation in the tunnel so pressure upon the median nerve will be relieved.

Regarding group that treated by open surgical release, which composed from 21 cases operation is done under GA with use of tourniquet putted over distal arm. Incision at the intersection of the radial border of the fourth ray and the Kaplan cardinal line (K.L) ending at the wrist crease was done (Fig.1) then subcutaneous fat exposed after that superficial palmar fascia exposed then after that

release of transverse carpal ligament was done, after that wound closed and post-operative care is done including antibiotic for three days and analgesia for pain management. Stiches was removed after 14 days.

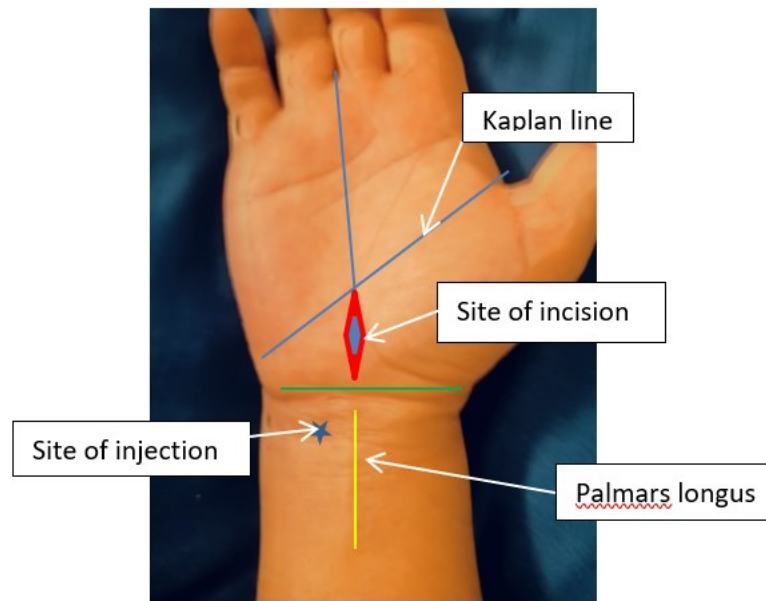


Figure 1. Landmarks for surgical incision and local steroid injection

Results

42 patients were included in this study with age range between 28-55 years. The mean age was 40.6 for group 1 and 41.1 years for group 2. There was no statistical significant difference regarding age, sex distribution hand affection, and other clinical symptoms and clinical tests between two groups (Table 1).

Table 1. Allocation of sample cases via certain clinical and general characteristics

Variables	Group 1	Group 2	P value
Sex(male/female)	2/19	4/17	0.667
Age(years) mean	40.6	41.1	0.923
Affected hand(right/left)	18/3	17/4	1.0
Phalen's test(positive)	19	17	0.67
Tinel's test	18	21	0.107
Hand pain	21	21	1.0
Nocturnal paresthesia	18	20	0.605

Global symptoms score (GSS) of 50 was used to evaluate patients at initial visit and subsequent follow up visits ,the GSS was 31.3 for group 1 and 31.16 for group 2 at the initial evaluation which was statically insignificant (p value >0.05) .

The patients attended follow up evaluation according to previous instructions and after one month ,they returned for checking. The mean of GSS was 10.8 in group 1 (steroid injection) and GSS was 11.33 in group 2(surgical releas) which revealed improvement in both group without statically significant difference(p value >0.05).

Follow up at third month revealed that mean GSS was 12.3 in group 1 and mean GSS was 10.33 patients in group 2, again both groups improved and there was insignificant difference between them(p value>0.05) .

After 6 months, number of patients treated by surgical release of the transverse carpal ligament (group 2) with improved GSS were more than patients undergo local steroid injection(group 1).Mean

GSS was 7.3 cases in group 2 while mean GSS was 21.5 in group 1 , and there was a difference statically significant between the two group I(p value<0.05)indicating OCTR is more effective treatment at six months.

Table 2. Results of treatment in the 2 groups according to GSS

	Group 1	Group 2	P value
baseline	31.3	31.16	.653
1 month	10.8	11.33	.251
3 months	12.3	10.33	.101
6 months	21.5	7.3	.000

Discussion

Currently, consensus regarding proper treatment of CTS at its different stages is lacking [17].Non-operative therapy should be considered in mild and moderate disease[18], [19], [20], [21], [22], [23] .When the disease is advanced with severe symptoms or muscle atrophy surgery is recommended to release transverse flexor retinaculum[24].In this study ,results indicate that injection of local steroid is associated with good result in relieving symptoms of carpal tunnel syndrome which was evaluated by GSS at the first month after injection as compared with release of transverse flexor retinaculum .There was insignificant difference between the two methods(p value>0.05) .After three months, follow up evaluation revealed good result of local steroid injection compared to surgical release and the difference between two methods of treatment was insignificant(p value >0.05).

After 6months ,carpal tunnel release(CTR) revealed better result than local steroid injection and there was a significant difference(p value <0.05).

In this study, surgical interference was more effective than local steroid injection for controlling symptoms beyond 3 months after treatment in case of moderate compression of the median nerve at the wrist indicating that local steroid injection is suitable for controlling symptoms of CTS for short period .Hui ACF(2005) et al. assessed 50 patients with CTS symptoms treated by surgery and by local steroid injection in clinical trial study ,25 cases in each treatment group. follow-up for 20 weeks, at the end of 20 weeks treatment was better in group treated by surgery, which was comparable to results in this study[25].

In study done by Ismatullah (2013) to compare injection of local steroid and carpal tunnel release in 40 patients ,revealed that CTR(carpal tunnel release) operation is better at 12 weeks than LSI and effect of local injection was transient extended for 8 weeks[26] , in contrast to this study which showed good result at 3 months follow up evaluation may be due to that all cases in this trial with moderate cases of the median nerve compression .

In study done by Serpil Demirci (2002), a 90 patients with idiopathic CTS participated in this study ,44 of them treated by surgery (CTR) and 46 treated by two-dose steroid injection and evaluation for symptoms and electrophysiological study were done before and at the 3rd and six months after treatment. .The results of this study show improvement of both groups at 3-month interval, but this improvement is not long lasting for group treated by local steroid injection[27]. and this was comparable to the results of this study.

In a systemic review Shi et al., compared surgical intervention with with non-surgical therapy in treatment of CTS .Surgical treatment has superior advantage regarding symptoms and function at 6 and 12 months while conservative treatment plateaus within three months[28].

Concerning incidence complications in this study was very low .Bruising occurred in one case in group treated by local steroid injection and disappeared within few days .Wound infection occurred in one case in patients treated by OCTR and treated by appropriate antibiotics.

Conclusion

Local steroid injection provide short-term efficacy extend up to three months while OCTR is more effective treatment for long-term symptomatic relief of moderate CTS which extend up to six months in this study

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