ORIGINAL ARTICLE

EARLY RESPONSE OF LOCAL STEROID INJECTION VERSUS MINI INCISION TECHNIQUE IN TREATMENT OF CARPAL TUNNEL SYNDROME

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Background: Carpal tunnel syndrome (CTS) is one of the commonest peripheral neuropathies which effects mainly middle aged women. Different techniques are being tried to decrease the post-operative pain in patients operated for CTS. The objective of this study was to compare effectiveness of local injection of steroid and mini incision technique in the treatment of carpal tunnel syndrome. **Methods:** This randomized control trial was conducted at department of Orthopedics and department of Neurosurgery, Ayub Teaching Hospital, Abbottabad from Aug 2011 to Feb 2013. A total of 116 patients of CTS were randomly allocated to either of the two groups. Fifty-eight Patient in Group A were subjected to local steroid injection and the same number of patient in Group B underwent mini incision technique. All patients of were advised to report to the OPD after one month to determine intervention effectiveness in terms of improvement in at least one grade of pain. **Results:** In this study mean age of the patients was 32.8±5.1 years. Female gender was in dominance with 99 (86.3%) cases. In this study we compared the effectiveness of local steroid injection and mini incision technique in the treatment of carpel tunnel syndrome. We found out that the steroid injection was effective in 69.0% cases while mini incision technique was effective in 56.9% cases. The difference being statistically insignificant with a *p*-value of 0.17. **Conclusion:** The difference in pain after 1 month of the intervention was not statistically significant.

Keywords: Carpal tunnel syndrome, neuropathy, nerve compression syndromes

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INTRODUCTION

Carpal tunnel syndrome (CTS) is a common neuropathy caused by the compression of median nerve at the level of wrist and is estimated to occur in 4% of the general population. Higher prevalence is reported in women (3% to 5.6%) than men (0.6–2.8%).[1] In half of the cases the exact cause of compression is unknown (idiopathic). However, different medical conditions like diabetes mellitus, thyroid disease, rheumatoid arthritis, pregnancy, trauma etc.[2] The classic symptoms include nocturnal pain associated with tingling and numbness in the distribution of median nerve in the hand.[2] Different clinical signs used to diagnose CTS include Tinel sign, Phalen test and Durans test help in the diagnosis. But none of these tests are diagnostic on their own.[2] Median nerve conduction studies are the gold standard diagnostic tests. The sensitivity of nerve conduction studies ranges from 49% to 84% and specificity ranges from 95% to 99%. The diagnosis of CTS should be based on history, physical examination and results of electrophysiological studies.[2]

Treatment modalities for CTS include physiotherapy, non-steroidal anti-inflammatory drugs (NSAIDs), steroid injection and various surgical options[3], like conventional open technique with long palmar curvilinear incision (consists of making an incision up to 2 inches in the wrist)[4], minimal incision (1.5–2 cm mid palmar incision) and endoscopic carpal tunnel release.[5,6] The endoscopic carpal tunnel release is a reliable method in the treatment of idiopathic carpal tunnel syndrome. And it has the advantages of slight scar tenderness, less operation time, less in hospital stay, early functional recovery, safety, and high- satisfaction rate compared with open method.[1,7]

Traditional open carpal tunnel release (OCTR) is the gold standard for the surgical treatment of carpal tunnel syndrome. This procedure provides direct vision and access to the ligament. This in turn gives a better chance for complete section of the ligament and allows treatment of any co-existant pathology associated with or contributing to symptoms of carpal tunnel syndrome. Its main drawbacks of this procedure being are tender scar, healing period pillar pain, reflex sympathetic dystrophy long, flexor tendon bowstringing, adherence of tendons, and cosmetic complaints. All these symptoms are related to the incision itself.[8] To obviate these potential complications mini open technique is used, which is simple, safe, cosmetically satisfactory and cost

effective. It can be used by hand surgeons especially in those areas where endoscopic release is expensive and not widely available[8], especially in our part of the world. Pain is improved in 51.3% of surgical treated patients by mini incision and 77.1 % of patients treated by steroid injection therapy.[9]

MATERIAL AND METHODS

This randomized control trial was conducted at department of Orthopaedics and department of Neurosurgery, Ayub Teaching Hospital, Abbottabad from Aug 2011 to Feb 2013, after taking approval from institutional ethical committee. Sample size of 58 patients in each group was determined using 77.1% effectiveness of steroid[9] and 51.3 % effectiveness of pain in Mini incision technique[9], 95% confidence level and 80% margin of error under WHO software for sample size. All 116 patients were included by Consecutive (Non probability sampling) sampling technique. All male and female patients of any age group with carpal tunnel syndrome (diagnosed clinically by both Phalen test & Tinel's sign) having moderate (grade 2) to severe (grade 3) pain were included in the study. Pain assessment was done using visual analogue scale (VAS). Patients with Diabetes Mellitus (diagnosed by history and fasting blood sugar of more than 126 mg/dl), history of trauma, hypo/hyperthyroidism (diagnosed by TSH, T3 and T4 levels), and rheumatoid arthritis (diagnosed by history and positive RA factor) were excluded from the study.

Written informed consent was obtained and patients were randomly allocated in two groups by lottery method. Patient in Group A were subjected to local steroid injection and patient in Group B underwent mini incision technique. Patients in group A received 20mg in 1ml injection of methyl prednisolone injected 1cm distal proximal to the distal wrist flexion crease and medial to Palmaris longus tendon at a 45 degree angle distally. After injection the patients were observed for 30 minutes. Patients in group B were admitted to the ward and were prepared for mini incision surgical decompression on the next OT day. Through a 1cm mid palmer longitudinal incision made in the axis of the radial border of the ring finger, median nerve was visualized through sharp dissection and the transverse carpal ligament was transacted. Skin was closed using non absorbable sutures.

After surgery the patients were discharged on first post-operative day. All patients of group A and B were advised to report to the OPD after one month to determine intervention. Pain based on VAS was assessed on the follow-up visit and compared to the baseline pre-intervention VAS score. Effectiveness was assessed in terms of improvement in at least two grade score on VAS scale. All the data were recorded on a pre-designed *pro forma*, and analysed using SPSS-14. Chi-square test was used to assess the difference between the two groups *p*-value ≤ 0.05 was considered significant.

RESULTS

The mean age of all the study patients was 32.8±5.1 years. Female gender was in dominance with 99 (86.3%) cases. All of our patients have positive Phalens and Tinels sign.

The baseline characteristics of patients were compared among study groups, i.e., group A (steroid injection) and group B (mini incision technique). The mean age in group A was 33.4±5.1 years while in group B it was 32.2±5.1 years, the difference being statistically insignificant. Out of total 58 cases in group A, 36 (63.1%) were above 30 years of age compared to 34 (58.6%) in group B out of the similar number of cases. The gender breakdown was similarly distributed among study groups; we found out that 49 (84.5%) cases in group A and 50 (86.2%) cases in group B were females.

According to the baseline pain grading, 24 (41.4%) patients in group A had moderate pain and 34 (58.6%) were having severe pain at baseline. In group B, 28 (48.3%) patients had moderate and 30 (51.7%) patients had severe pain at baseline. The difference in baseline pain grading among the two study groups was statistically not significant (*p*-value=0.45).

The effect of the study interventions was assessed after 1 month according to pain grade. In group A (inj. Steroid) 10 (17.2%) patients still had severe pain, 32 (55.2%) were having moderate pain, 16 (27.6%) patients had mild pain while none of patients was pain free. Similarly, in group B (mini incision) also 10 (17.2%) patients still had severe pain, 35 (60.3%) had moderate pain, 13 (22.4%) were having mild pain and none of patients was pain free according to the pain grading scale. The difference in pain after 1 month of the intervention was not statistically significant (*p*-value=0.80).

The effectiveness of steroid injection was seen in 69.0% cases while mini incision technique was effective in 56.9% cases. Though there seems a better response to steroid injection compared to mini incision, however, this difference could not be statistically proven (*p*-value=0.17), as shown in table-1.

The effectiveness of interventions was stratified according to baseline pain grading between the two study groups. In group A, of those cases who were having moderate pain at baseline, 16 (21.9%) cases had an effect of the intervention while 8 (18.6%) remained ineffective. From those who had severe pain at baseline, in 24 (32.8%) the steroid injection was effective while in 10 (23.2%) it was found non-effective, however, this difference was not statistically significant (*p*-value=0.75), as shown in table-2.

In group B, of those having moderate pain at baseline, in 13 (17.8%) cases the intervention was effective and in 15 (34.8%) cases it was found non-effective. In this group, of those who had severe pain at baseline, 20 (27.3%) had an effect while 10 (23.2%) patients had no effect. However, this difference was not statistically significant (p=0.12) (Table-2).

Similarly, the effectiveness of interventions was seen according to age of patients between the two study groups. In group A, of those cases who were up to 30 years of age, 16 (21.9%) cases had an effect of the intervention while in 6 (13.9%) it remained ineffective. From those who were above 30 years of age, in 24 (32.8%) the steroid injection was effective while in 12 (27.8%) it was found non-effective, however, this difference was not statistically significant (p-value=0.62). In group B, those up to 30 years of age, in 14 (19.1%) cases the intervention was effective and in 10 (23.9%) cases it was non-effective. In the same way, of those who were above 30 years of age in this group, 19 (26.0%) had an effect of mini incision while 15 (34.8%) patients had no effect. And this difference was also statistically not significant (p=0.85)

The effectiveness of interventions was also stratified according to gender between the two study groups. In group A, of male cases, 5 (6.8%) cases had an effect of the intervention and in 4 (9.3%) cases it remained ineffective. From the female cases, in 35 (47.9%) patients the steroid injection was effective while in 14 (32.5%) cases it was found non-effective, however, this difference was not statistically significant (p-value= 0.34). In group B, of male cases, in 3 (4.1%) cases the intervention was effective and in 5 (11.6%) cases it was non-effective. In the same way, of the female cases, in 30 (40.1%) the intervention had an effect while 20 (46.5%) patients had no effect. And this difference was also statistically not significant (p=0.23)

Table-1: Effectiveness of procedure

Effectiveness/ Groups	Group A (Steroid Inj.) (n=58)	Group B (mini incision) (n=58)	*p*-value
Yes	40 (69.0%)	33 (56.9%)	0.17
No	18 (31.0%)	25 (43.1%)	

Table-2: Effectiveness of procedure on the basis of severity of baseline pain

Group	Baseline pain	Effectiveness		*p*-value
		Effective (n=73)	Non-effective (n=43)	
Group A (Steroid inj)	Moderate	16 (21.9%)	8 (18.6%)	0.75
	Severe	24 (32.8%)	10 (23.2%)	
Group B (mini incision)	Moderate	13 (17.8%)	15 (34.8%)	0.12
	Severe	20 (27.3%)	10 (23.2%)	

DISCUSSION

Carpal tunnel syndrome is the most common compression neuropathy. The incidence of carpel tunnel syndrome varies with region specific distribution data from west suggest 1–3.5 cases per 100000 person years.[10] It is estimated that annually about one million adults in United States have CTS that requires medical treatment.[11,12] The surgical decompression rates for UK are 43–74 per 100,000 per year.[13] The incidence and prevalence varies, 0.125–1% and 5–16%, depending upon the criteria used for the diagnosis.[11,14–19]

CTS was first described by Phalen in the 1950s.[20] After Phalens various studies have reported female preponderance and a peak incidence around 55–60 years.[16,21] In the first population based study, Stevens *et al* noted that the mean age at diagnosis was 50 years for men and 51 years for women.[16] This corresponds to the results of our study which shows the higher prevalence of disease in females, but the mean

Einhorn *et al* reported 1% incidence of CTS in general population and 5% of workers in certain industries which require repetitive use of the hands and wrists.[17]

All of our patients in this study were complaining of pain in the hand and wrist and it will get worse during the night. The Tinel's sign is associated with sensitivities of 23–67%, and specificities of 55–100%.[22,23] In a review, Kuschner *et al* summarized the frequency of Tinel's sign and reported that it is positive from 8% to 100% of CTS patients.[24] Tinel's sign was positive in all the patients in our series (100%).

The reported sensitivity of Phalen's test ranges between 10% and 91% and specificity between 33% and 100%.[25,26] Phalen's test was positive in all the patients in our study of 126 patients (100%). The combination of clinical symptoms and signs with electro-diagnostic findings is the most valid way of diagnosing CTS.[20] The reason for such high yield of both Phalens and Tinels test might be that patients in our part of the world present pretty late after the onset of disease when the disease process at the advanced age.

The effectiveness of interventions was stratified according to baseline pain grading between the two study groups. In group A, of those cases who were having moderate pain at baseline, 16 (21.9%) cases had an effect of the intervention while 8 (18.6%) remained ineffective. From those who had severe pain at baseline, in 24 (32.8%) the steroid injection was effective while in 10 (23.2%) it was found non-effective, however, this difference was not statistically significant (p-value=0.75). In group B, of

those having moderate pain at baseline, in 13 (17.8%) cases the intervention was effective and in 15 (34.8%) cases it was found non-effective. In this group, of those who had severe pain at baseline, 20 (27.3%) had an effect while 10 (23.2%) patients had no effect.

Hui *et al* in their randomized, single blind controlled study evaluated the role of steroid injection in patients with idiopathic CTS confirmed by NCS.[27] The primary outcome of the study was symptomatic relief measured by a global symptom score, which rated symptoms on a scale of 0 (no symptoms) to 50 (most severe). The authors randomized 50 patients, 25 into steroid and 25 into the open surgical group. This study revealed greater symptomatic relief in surgical group at 20 weeks follow-up. This is contrary to the findings of our study that showed no significant difference among the two groups.[27]

Agarwal *et al* in their study evaluated the possible role of methyl prednisolone acetate injection in 40 patients with mild idiopathic CTS. Patients were evaluated at 3 and 12 months.[28] The authors noted marked improvements of symptoms in 93.7% patients at 3 months follow up while in our study steroid injection was effective in 69.0% at one month follow up.[28]

Ly-Pen *et al* in their randomized control trial compared the role of local steroid injection with open surgery. They suggested that local steroid injection had better results as compared to surgical decompression for the symptomatic relief from nocturnal paresthesia at 3 and 6 months. These findings are again contrary to the results of our study but at 12 months follow up local steroids injection was as effective as surgical decompression.[29]

Most authors suggest surgery, i.e., CT release (CTR) in muscular atrophy.[30] American Academy of Orthopaedic Surgeons (AAOS) recommended a course of non-operative treatment as an option in patients diagnosed with carpal tunnel syndrome. Early surgery is an option when there is clinical evidence of median nerve denervation or the patient elects to proceed directly to surgical treatment.[31]

A modification in surgical release is a limited open release performed by Atik *et al* in 2001.[32] The overall success rate of open carpel tunnel release (OCTR) with this technique is more than 95% with a complication rate of less than 3%.[33]

The present study depicts only the results based on one month follow-up of the patients, which might be different if patients are followed up for a longer duration of time. In the present study we did not measure the motor and sensory latency values at the start and at the follow-up after the therapy, which is along with short follow-up is a limitation of the study

CONCLUSION

Our study concluded that the difference in pain after 1 month of the intervention was not statistically significant among the patients receiving the steroid injection and those undergoing surgery by mini incision technique.

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