

Evaluation of the Effect of Combined Hand Therapy and Local Steroid Injection for the Treatment of Idiopathic Carpal Tunnel Syndrome

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Abstract. Oral non-steroidal anti-inflammatory drugs and local steroid injection are the standard treatment of carpal tunnel syndrome. The objective of this study is to reassess the efficacy of this non-surgical treatment. One hundred and nineteen patients with carpal tunnel syndrome were categorized into 3 groups (based on symptom severity inferred by physicians). Group I included 68 patients, Group II 31 and Group III 20 patients, respectively. All patients received nonsteroidal anti-inflammatory drugs. The first group received in addition to hand therapy, wrist splinting, while intra-canal injection of triamcinolone acetonide was added to patients of group II. Follow up was for 6 months. Assessment was for the degree of pain relief, and improvement in hand grip strength. Most patients were females, having right hand disease. After 6 months, results were as follows: In group I, 36 % had less pain, but with no affect on hand grip strength. In group II, less pain was found in 75% of patients with 12.76% increase in hand grip strength. In group III, the response was minimal. The study demonstrates that in carpal tunnel syndrome, hand therapy with wrist splinting is appropriate for early cases, and that local steroid injection potentiates its response.

Keywords: Carpal tunnel syndrome, Nonsurgical treatment.

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Introduction

Advanced stages of nerve compression in carpal tunnel syndrome result in irreversible intraneural changes affecting nerve regeneration and recovery after treatment^[1]. The disease was first described by Paget in 1854, while the term of carpal tunnel syndrome (CTS) was not popular before Phalen^[2] in 1950. The diagnosis of the disease depends primarily on the patient's local symptoms and signs, like paresthesia in the distribution of the median nerve and weakness of the affected hand, often made worse with activity. Proximal radiation of pain and parasthesia up to the shoulder at night is not uncommon^[4], while thenar atrophy points to advanced disease. A variety of provocative tests have been described to help confirm the diagnosis clinically. Phalen's test describes paresthesias in the median nerve distribution on flexion of the wrist with reproduction of the patients' symptoms within a minute, whereas Tinel sign describes tingling sensation on tapping the nerve over the transverse carpal ligament.

The usual management of CTS requires splinting the wrist in a neutral position to reduce or even relieve symptoms. An initial trial of full-time splinting for a month followed by part-time night splinting is recommended^[4]. Non steroidal anti-inflammatory drugs may be prescribed even in the absence of acute inflammatory process^[5]. In addition to its diagnostic importance, accurate local injection of corticosteroids into the carpal canal can be very useful. A good response to injection with immediate pain relief correlates well with an excellent response to subsequent surgery^[6]. Recurrence of symptoms within the first three months can be expected in 65% to 90% of the patients, while 11% of them remain symptomless for up to 45 months. The simultaneous use of oral steroids, pyridoxine and diuretics may increase the degree of clinical improvement^[7], while local insulin injection in diabetics may potentiate their effect. If given in a frequency of 3 MHz at 1.0 W/cm² for five minutes daily for two weeks^[8], ultrasound treatment- due to thermal and nonthermal effects- gives satisfactory symptomatic relief. This occurs in early, mild to moderate disease and not associated with significant electro- physiologic changes^[10]. This is augmented if combined with infra- red low intensity laser therapy^[9]. Other physiotherapeutic measures include eight weeks practice of yoga, carpal bone mobilization, magnetic therapy, laser acupuncture and chiropractic

care. These were in vogue at a time, but did not demonstrate symptom benefit when compared to placebo^[7].

Surgery in CTS is indicated when non-operative management fails. Traditionally, this has meant open division of the transverse carpal ligament under direct vision. The therapeutic outcome of surgery is better than other measures, particularly for severe cases^[11]. One of the important limitations in evaluating surgery is that patients could not be blinded to their treatment and are always biased.

Endoscopic carpal tunnel release is the latest innovation in CTS surgery^[12-14]. The equipment required is expensive and takes longer time to set up in the operating room than the required open procedure, which adds to the total surgical cost. Incomplete release of the transverse carpal ligament requires a second open operation reported in patients^[13, 15], and in 50% of cadaver studies^[16]. Added is the risk of injuring the neurovascular structures in the hand, due to their close proximity to the carpal canal and occasional difficulty visualizing them. The ulnar and superficial palmar arch arteries and the common digital nerve in the third web space are mostly at risk^[16]. Contrary to open release, bowstringing of the flexor tendons does not occur^[12], and postoperative pain is less severe. This facilitates an earlier return of grip strength and an earlier return of the patient to work. It may not be the procedure of choice because of the consequent advanced thenar atrophy, tenosynovitis, and or mechanical problems^[17]. Similarly, it does not suit cases of failed open surgery.

Patients and Methods

A total of 119 patients with CTS categorized into 3 groups were enrolled in this study. Group placement was based on symptom severity inferred by physician/author. Group I included 68 patients, Group II included 31 and Group III included 20 patients, respectively. Patients of all 3 Groups received nonsteroidal anti-inflammatory drugs; in addition, the first group received physiotherapy, while intra-canal injection of triamcinolone acetonide was added to patients of Group II. Patients having the disease combined with obesity, cervical or dorsal spine problems, diabetes mellitus, myxoedema or pregnancy were excluded. The recommended NSAIDs treatment for all patients was 100 mg of Aceclofenac 12 hourly for a month. The drug was selected because of its

efficacy and of its least side effects on elderly and hypertensive patients. To lessen gastrointestinal irritation; 40 mg of the proton pump inhibitor Omeprazole was given early in the morning on an empty stomach. Supportive neurotonic drugs known to be effective in inflammatory and degenerative lesions were also given *viz*; (benfotiamine + pyridoxine + thioctic acid and cyanocobalamin). Splinting the hand in 20° dorsiflexion continuously for a week, and then at night for 3 weeks was part of the treatment for patients of Group I. The previous treatment was combined with local injection of 40 mg triamcinolone acetonide mixed with 1 ml Lidocaine 2%, for patients of group II. The injection was precisely at the midpoint over the transverse carpal ligament to a depth of 1 cm, and repeated on day 15.

Present pain intensity (PPI) scale and a dynamometer were used to assess improvement of pain and hand grip, respectively. The PPI scale is a graphing rating scale with numerical values placed at equal distances along a line, from zero to four. Pain intensity is scored as being no pain = 0, mild pain = 1, moderate pain = 2, severe pain = 3 and unbearable pain as 4^[18], and registered as a percentage. Hand grip strength measurements are done using a calibrated isometric hydraulic hand dynamometer with adjustable handle (Jamar) that displays grip force in pounds. The patient should be sitting, shoulder adducted with zero rotation and the elbow 90 degrees flexed. It is done three times, consecutively, and the average reading is taken as the patient's score. A score of 110 pounds for the right hand and 100 pounds for the left hand are considered normal if corrected to age^[19]. Objective assessment was by median nerve conduction velocity study using computerised Tonnes Neuroscreen plus 1.59, for electromyography with a stimulating unit amplifier and two electrodes. The test is done in an air-conditioned room.

Results

The mean age of patients of the 3 groups was 34 years, and except for 13 (11%) females, all patients were males below 60 years and suffering from unilateral non-recurrent disease. In 18 (15%) patients, the disease was affecting the left hand. Improvement after group specific treatment was assessed by Chi-square measurement, where high values reflect better results. Conservative treatment alone in Group III, yielded negligible relief of pain as well as in hand grip strength (36% and 0%,

respectively). In Group I (physiotherapy added), they were 75% and 12.8%, respectively, while in group II (NSAIDs + physiotherapy local steroid injection) they were 82% and 20.5% (Table 1).

Table 1. Comparison of results in the three groups of the present study.

Group I: Medical treatment + Physiotherapy^(*)

(n = 68: 61 females, 7 males. Age range 22-42 years, 49 with right hand disease)

Item	Mean Before	Mean After	% Age Improvement	Chi-square Value
Pain (PPI scale)	56.00	14.00	75.0	126
Grip strength ^(*)	67.78	76.67	12.8	1.04
MNC	D	60 D 8 N		

Group II: Medical treatment + Physiotherapy+ Local steroid

(n = 31: 27 females, 3 males. Age range 23-50 years, 28 with right hand disease)

Item	Mean Before	Mean After	% Age Improvement	Chi-square Value
Pain (PPI scale)	75.00	12.50	82.0	312.5
Grip strength ^(**)	68.33	82.00	20.5	2.28
MNC	D	All = N		

Group III: (Control Group). Medical treatment *alone*

(n = 20: 19 females, 1 male. Age range: 19-55 years. All with right hand disease)

Item	Mean Before	Mean After	% Age Improvement	Chi-square Value
Pain (PPI scale)	47.90	31.25	36.0	8.37
Grip strength ^(*)	71.67	71.67	00.0	0
MNC	D	D		

Abbreviation:

PPI: present pain intensity scale^[18].

^(**) Grip strength measured in pounds.

MNC: median nerve conduction: N = Normal; D = Delayed

Physiotherapy: splinting the hand in 20° dorsiflexion

In Group I physiotherapy improved nerve conduction in 13.9% of patients compared to medical treatment alone. In Group II intrathecal triamcinolone acetonide injection improved median nerve conduction in all patients.

Discussion

Carpal tunnel syndrome is a common condition causing hand pain, dysfunction, and paresthesia. It is necessary to distinguish between improvement in symptoms that are due to local irritation, and

improvement in neurologic function of the motor and sensory components of the nerve that usually associates intrathecal injection and surgery^[20]. Carpal tunnel syndrome (CTS) must be differentiated from other conditions that mimic its signs and symptoms as proximal or distal median nerve compression. Proximal compression occurs in cervical disc herniation and thoracic outlet syndrome. Distal compression occurs in the forearm or at the elbow^[21]. Thenar atrophy from other causes (disuse & neuropathies) and pain due to osteoarthritis of the first carpometacarpal joint are sometimes confused with CTS. The disease is sometimes associated with Trigger fingers and DeQuervain's stenosing tenosynovitis.

The five risk factors listed by Kaplan^[22] help physician to define more accurately, patients likely to respond to non-surgical treatments. They include patient age greater than 50 years, the presence of symptoms for 10 months or more, constant paresthesias and the presence of associated trigger fingers. Approximately, 60% of patients were cured without surgery if they had only one risk factor, but 93% of those with 3 factors and 100% of those with 4 or more risk factors had unsuccessful non-operative management. In our series, where Kaplan's factors were not considered, the rate of pain improvement was only 36% after 6 months, while for hand grip, it was nil. This minimal improvement is probably attributed to splinting, as medical treatment alone is not more effective than placebo^[23]. Doubling improvement rate in Group II was simply achieved by adding intra-canal corticosteroid injection to conservative therapy (70.2% and 5.78% for pain and hand grip strength). This result might suggest steroid injections to be limited to cases in which nerve entrapment is expected to be temporary^[4], as in pregnancy or when sufficient activity modifications can be made promptly to diminish the contributing stresses at the wrist. To avoid pain during injection, a local anesthetic is added. An effort should be made to avoid the potential risk of median nerve injury, or injecting into a tendon leading to its rupture. For these reasons, an alternative approach was suggested where the drug is injected proximal to the tunnel rather than directly inside^[23]. This also lessens concomitant swelling at the volar side of the forearm. Although more effective than non-steroidal anti-inflammatory drugs, orally administered steroids are not recommended for their serious side effects.

When non-operative management fails, surgical treatment is indicated. It should be always considered from the start in patients with severe symptoms even without trial of conservative therapy or local steroids. It is also indicated if severe median nerve entrapment is detected in conduction studies, in thenar muscle atrophy and in cases with evident motor weakness, as those patients appear to be the most likely to benefit from it. It is an outpatient procedure that can be performed using regional anesthesia.

Operation entails division of the transverse carpal ligament under direct vision with an open procedure. It is important for the surgeon to recall the variable anatomy of the palmar cutaneous branch of the median nerve to avoid damaging it causing a painful neuroma. Most important is to consider the variations in the anatomy of the motor branch to the thenar muscles to avoid its injury^[24]. Complications of the operation are rare but have been reported, including the devastating complete median nerve transection and massive necrosis of the palm^[25]. Operation must be followed by splinting the hand for 3-4 weeks. In the present work, surgery, although kept for patients with severest symptoms, gave excellent results compared to conservative management after 6 months follow up (Table 1), with no recurrence, denoting possible permanent cure. This conclusion is not in accordance with the previous reports that recommend keeping surgery for patients having severe symptoms only. It should be attempted in all cases having moderate to severe symptoms and conservative treatment should be resorted to for those having a contraindication to surgery or anesthesia, or if the patient refuses the operation.

Conclusion

A change in the current choice of treatment of CTS appears currently crucial. Though three options are available, the choice of therapy should be thoughtful, as they yield unequal response. Conservative management may be applicable for mild cases, while local steroids double increase the therapeutic relief, but requires experience to undertake. However, final conclusion in these methods is undetermined as larger number of patients and in-depth study is required. Conservative treatment does not suit patients with severe symptoms as open surgical releases the carpal ligament, thus, the only reliable modality.

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فى علاج متلازمة الكهف الرسغى الأولة

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جدة - المملكة العربية السعودية

المستخلص. يعتبر العلاج التحفظى لمتلازمة الرسغ الكهفي هو الأساس فى الحالات المبكرة، أما الحالات المتأخرة فتعالج بالجراحة، وهدف هذا البحث هو إعادة تقييم هذا النوع من العلاج. وتمت هذه الدراسة على ١١٩ مريضاً تلقوا جميعاً مضادات الالتهابات الستيرويدية ثم قسموا إلى ثلاث مجموعات: المجموعة الأولى (٦٨ مريضاً) تلقت علاجاً يدوياً مع عمل جبيرة للرسغ، والمجموعة الثانية (٣١ مريضاً) تلقت بالإضافة إلى ماسبق حقناً موضعياً للكورتيزون، أما المجموعة الثالثة (٢٠ مريضاً) فلم تتلق شيئاً إضافياً. وتم تقييم النتائج بعد ٦ شهور من بداية العلاج لدراسة أثر ذلك على درجة الألم، وقوة قبضة اليد، وكانت النتائج كما يلى:

معظم المرضى كانوا من النساء اللائى يستخدمن اليد اليمنى. بعد ٦ شهور من العلاج تحسن ٣٦%، ٧٥% و ٠% من مرضى المجموعات ٣، ٢، ١ بالترتيب بالنسبة للإحساس بالألم فى حين تحسنت قوة قبضة اليد فى المجموعة الثانية فقط التى عولجت بالعلاج الطبيعى إضافة للعلاج المعتاد وكذا حقن الكورتيزون الموضعي (الزيادة بلغت ١٢,٧٦%). الخلاصة: العلاج الدوائى مع الحقن الموضعي للكورتيزون علاج مناسب للحالات المبكرة.