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

Background: *Surgery for carpal tunnel syndrome is reserved for severe cases having intractable or longstanding symptoms. Conservative management is appropriate when symptoms duration is short and diagnosis is less certain. This includes hand therapy with wrist splinting, oral non-steroidal anti-inflammatory drugs, and local steroid injection. The objective of this study is to study the efficacy of this non-surgical treatment.* ***Patients and methods:*** *One hundred and nineteen patients with carpal tunnel syndrome were categorized into 3 groups. Group I included 68, and Group II included 31 and Group III included 20 patients respectively. Patients of the 3 groups received nonsteroidal anti inflammatory drugs and neurotonics. The first group received physiotherapy in addition, while intra-canal injection of triamicinolone acetonide was added to patients of Group II .Treatment was given for the recommended period for each modality, and the follow up was for 6 months. Assessment was for the degree of pain relief, and improvement in hand grip strength using the ppi scale, and a dynamometer.* ***Results:*** *Most patients were females, having right hand disease. After 6 months, results were as follows: Conservative treatment alone in group III, yielded negligible relief of pain and so 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 %.* ***Conclusion:*** *In carpal tunnel syndrome physical therapy treatment is appropriate when symptom duration is short and diagnosis is less certain, Local steroid injection potentiates the response to this treatment. Surgery is kept for patients with severe symptoms.*

Key Words: *Carpal Tunnel Syndrome, CTS, nonsurgical treatment.*

INTRODUCTION

An advanced stage of nerve compression in carpal tunnel syndrome, particularly in elderly, usually results in irreversible intraneural changes, and is expected to compromise nerve regeneration and recovery[1]. The disease was first described by Paget in 1854, while the term 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 paresthesias 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, while Tinnel's sign describes tingling sensation on taping the nerve over the transverse carpal liga ment.

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/cm^2 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 is 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[12,13,14]. The equipment required, is more expensive and takes longer time to set up in the operating room than that required for an open procedure, which adds to the total surgical cost. Incomplete release of the transverse carpal ligament requiring second open operation have been reported in patients[13,15], and in 50% of cadaver studies[16]. Added is the risk of injuring 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 most at risk[16]. Contrary to open release bowstringing of the flexor tendons does not occur[12] and postoperative pain is less severe which 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]. Also 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 I included 68, Group II included 31 and Group III included 20 patients respectively. Patients of the 3 groups received nonsteroidal anti inflammatory drugs (NSAIDs); the first group received NSAIDs plus physiotherapy in the form of wrist splinting, tendon gliding exercises and nerve gliding exercises. While intra-canal injection of triamicinolone 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 its least side effects on elderly and hypertensive patients. To lessen gastrointestinal irritation; 40 mg of the proton pump inhibitor Omiprazol 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 cyanocobalamine). Splinting the hand in 20^o dorsiflexion continuously for a week and then at night for 3 weeks was part of the treatment for the patients of group I. The used splint is of the rigid type with a metal or plastic support. Some specific restrictions that apply to both work and non-work related activities were given to patients. In addition a positive effect on neurophysiology through alterations in vascular and axoplasmic flow, median nerve gliding exercises (series of flexion and extension movements of the hand and wrist) were applied. Passive hand movements designed to modulate pain and increase wrist range of movements and reduce inflammation and induce relaxation and improve tissue extensibility were found useful .Ultrasound therapy was not applied due to denied therapeutic effect.This 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 scale (ppi) 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 females (11%), all patients were males below 60 years and suffering from unilateral non-recurrent disease. In 18 patients (15 %) 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 and so 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):

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		

(a)

Group II: Medical treatment + Physiotherapy + Local steroids
(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		

(b)

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		

(c)

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 triamicinolone acetonide injection improved median nerve conduction in all patients
Chi-Square: better improvement with higher values of the square.

DISCUSSION

Carpal tunnel syndrome is a common condition causing hand pain, dysfunction, and paresthesia and 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]. 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 carpo-metacarpal joint are sometimes confused with CTS. The disease is sometimes associated with Trigger fingers and de Quervain'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 anaesthetic is added and effort should be paid 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 palmer cutaneous branch of the median nerve to avoid damaging it causing a painful neuroma. Also 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 I), 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 now crucial. Though three options are available, the choice of therapy should be thoughtful, as they yield unequal response. Conservative management may be tried for mild cases while local steroids nearly more than doubles the therapeutic relief, but needs experience to do. Conservative treatment does not suit patients with severe symptoms as open surgical release of the carpal ligament is the only reliable modality.

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الملخص العربي

تقييم تأثير العلاج الطبيعي لليد مع الحقن الموضعي بالكورتيزون في علاج ضغط العصب الأوسط عند الرسغ

هناك تغير فى الطب الحديث فى التعامل مع مرض ضغط العصب الأوسط عند الرسغ حيث توجد ثلاثة اختيارات لا تعطى نفس النتيجة العلاجية . ويجب بصفة عامة محاولة العلاج التحفظى للحالات قليلة الشدة فى حين أن الحقن الموضعى بالكورتيزون قد يزيد نسبة التحسن بمقدار الضعف ولكنه يحتاج إلى خبرة خاصة عند المعالج . وعندما تكون الأعراض شديدة لذا يصبح التدخل الجراحى هو الأمثل . فقد جاءت هذه النتائج عقب الدراسة التى شملت 119 مريضاً وزعت على 3 مجموعات كما يلى : 1- المجموعة الأولى: شملت 68 مريضاً عولجوا بالعلاج الدوائى بأدوية مضادات الالتهاب بالإضافة إلى جبيرة معدنية عند الرسغ وتمرينات علاج طبيعي أيضاً . 2- المجموعة الثانية: شملت 31 مريضاً أضيف إليها العلاج الذي طبق في المجموعة الأولى حقن موضعي للكورتيزون . 3- المجموعة الثالثة: شملت 20 مريضاً مجموعة ضابطة.