Assessment of Therapeutic Efficacy of Topical Application of Steroid In The Treatment Of Carpal Tunnel Syndrome (CTS)

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Abstract

Background: Carpal tunnel syndrome (CTS) is the most common compressive neuropathy with high incidence rates of the upper limb, occurring due to compression of the median nerve at the wrist [1].

Aim: is to determine the therapeutic effect of topical steroid application as an alternative therapy for surgical and local injection of steroids.

Method: 30 female patients ranging were selected randomly and divided into 2 groups; 10 of them were selected as control group and 20 of them were selected to test our therapy (topical Clobetasol ointment). EMG and NCS were done before and after the therapy to determine the success of the proposed drug.

Results: There was a significant result both clinically and by EMG and NCS finding after 30 days of treatment in which about 80% of patient were approximately free of pain after treatment as a clinical assessment with a significant EMG and NCS finding at $P < 0.05$.

Conclusion: topical skin application over carpal tunnel is of a great value as an alternative conservative treatment for CTS.

Key words: carpal tunnel syndrome; topical steroid application.

Introduction

It has been approximated that one in every five subjects who complain of symptoms such as pain, numbness, and a tingling sensation in the hands could have CTS[1]. It is estimated to occur in 3.8% of the general population [2]. Idiopathic CTS is the most common cause [3].

The development of idiopathic CTS is closely related to abnormalities of the synovial tissue within the carpal tunnel [4].

The highest incidence is among middle-aged and elderly women [2,5]. The CTS incidence rate in the US has been estimated at 1–3 per 1000 persons per year [2,5]. The prevalence is approximately 50 cases per 1000 subjects in the general population [6,7].

CTS is the major disabling diseases and illnesses in all private industries [8,9]. Also, according to the National Institutes of Health, the average lifetime cost of CTS, is approximately $30,000 for each affected worker. [10]

Occupational risk factors of repetitive tasks, force, posture, and vibration have been cited. Other common causes may include rheumatoid arthritis, pregnancy, fractures of the wrist, diabetes mellitus, hypothyroidism, and acromegaly [11].

The diagnosis can be done Clinical tests include The Tinel test [12], Phalen's test [13], Durkan test: [14], and the tourniquet test [15] or by using special technique like Nerve conduction studies [16] in which decreased amplitude on the affected side and sensory nerve action conduction velocity (SNCVs) are usually the first potentials affected, a velocity of less than 44 meters/second across the carpal tunnel indicates slowing [16,17]. An amplitude difference of more than 50% is considered significant [18]. Electromyography may show a distal latency of more than 4.2 milliseconds that is usually indicates CTS [19, 20].

The modalities for treatment of CTS may include (1)-Conservative treatment includes

local injection of corticosteroids, oral cortico-steroids, and non-steroidal anti-inflammatory drugs [21]. (2)- Surgery: Open carpal tunnel release (CTR) is indicated when conservative treatment fails [22]. Endoscopic CTR is less invasive but has a risk of iatrogenic median nerve injury [23].

Patients and methods

In this study, 30 patients average between 40-50 years old females were selected randomly. They were divided into two groups; 10 of them were selected as placebo group and they received Vaseline as a placebo therapy, and 20 patients were selected as testing group. The second group was given a potent topical steroid (2 grams of Dermodin- SDI company, contains 0.05W/W Clobetasol, over the skin above the carpal tunnel at night only every day). Both groups was received the medications for 30 days.

A base line full neurological examination, EMG and NCS study (at room temperature 37 Ć were done. A second full physical examination, EMG, and NCS tests were done after 30 days at the same room temperature to compare them with the initials.

Statistical analysis

In this study, the statistical analysis was performed by using SPSS (version 20) in which paired *t* test was used as statistical method at *p* value < 0.05.

Results

1- NCS: it performed by electrically stimulating a nerve and collecting data from a point proximal or distal along that nerves anatomical course [16,17].

A- ***SNAPs velocity***

Table (1): there was an increase in the velocity of SNCV (sensory nerve conduction velocity) after 30 days of treatment at p value <0.05. **B-** ***Amplitude difference:*** decreased amplitude on the affected side could indicate either an axonal lesion of the median nerve (not specific as to where along the course of the nerve) or a conduction block across the carpal tunnel (if proximal amplitude is less than 50% of distal mid palm amplitude) [18]. As shown in table 2. **EMG findings:**

Distal latency: In carpal tunnel syndrome, sensory nerve conduction tests are more sensitive than motor nerve conduction studies [19,20], as shown in table 3.

Table (2): there was a statistically significant reduction in the amplitude difference between both sides of the same patient at p < 0.05.

Table (3): a significant reduction in distal latency was observed at p value <0.05

Table 1. ***SNAPs velocity***

Parameter / Group	*SNCVs (meters/second) before treatment (mean ±SD)*	*SNCVs (meters/second) after treatment (mean ±SD)*	*Statistical significance*
Placebo group	36.8 ± 6.4	36.6 ± 5.4	Not significant
Treated group	37.2 ± 4.0	45. ± 6.8	significant

Table 2. ***Amplitude difference***

Parameter / Group	*Amplitude difference (%) before treatment (mean ±SD)*	*Amplitude difference (%) after treatment (mean ±SD)*	*Statistical significance*
Placebo group	**53.5 10.3**	**54.1 6.3**	**Not significant**
Treated group	**58.6 5.2**	**50.7 4**	**Significant**

Table 3. Distal latency

Parameter / Group	*Distal latency (millisecond) before treatment (mean ±SD)*	*Distal latency (millisecond) after treatment (mean ±SD)*	*Statistical significance*
Placebo group	5.27 ± 0.69	5.46 ± 0.71	Not significant
Treated group	5.67 ±0.76	4.785 ± 0.65	Highly significant

Discussion

In this prospective short longitudinal case-controlled randomized study of patients with moderate CTS, we intend to investigate the short-term efficacy of topical steroid application over the carpal tunnel and the possible presence of a dose-response relationship first at 30 days of treatment.

Several studies that evaluate local injection of steroid on patients with CTS have showed variable effects but no specific study about topical application of steroid over the skin was found which gives the strength of this study as a new trial for non- invasive treatment of CTS that implicated a reduction of inflammatory reaction of the tunnel non-invasively. However, many studies about the efficacy of local injection were accomplished with good result with a high degree of similarity.

Ly-Pen et al found a significant result regarding the use of local steroid injection along with topical NSAID application [(24)].

Marshall S. et al has a remarkable finding in this field about the efficacy of local injection of steroid to the carpal tunnel as an alternative non- surgical treatment of carpal tunnel syndrome [(25)], but yet no data has been obtained about topical application of steroid as a new modality of treatment.

In this study, by a comparison of Placebo group results before and after 30 days 5.27 ± 0.69 and 5.46 ± 0.71 with Treated group result (n=20, 5.67 ±0.76 and 4.785 ± 0.65), there was a significant decrease in distal latency in EMG study. This suggests a good penetration ratio through the skin that reaches to the carpal tunnel which leadto a suppression of inflammation implicated in the existence of the sign and symptoms of CTS.

Similar suggestions are supposed to be related for the other finding include SNAPs velocity (Placebo group n=10, 36.8 ± 6.4 and 36.6 ± 5.4 versus treated group n=20, 37.2 ± 4.0 and 45. ± 6.8 before and after 30 days respectively). In this situation, this significant increase in SNAPs velocity is an important indicator for improvement in alleviating the severity of.

Finally, the amplitude difference between both sides of the same patient is another sufficient indicator of the regression of inflammation that predispose for neuro-logical manifestation of the CTS. As we compare the results of this test (placebo group n=10, 53.5 and 54.1 versus treated group n=20, 58.6 5.2 and 50.7 before and after 30 days respectively).

Conclusions

1- Topical steroid application over the carpal tunnel was of great value in minimizing the symptoms of CTS clinically and by EMG and NCS tests.

2- no side effects was observed after the treatment which makes it promising modality of therapy for CTS.

Recommendations

Further studies required to evaluate the long term efficacy of the proposed drug in a larger sample size.

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