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A PROSPECTIVE RANDOMIZED, DOUBLE-BLIND, CONTROLLED TRIAL OF NERVE HYDRODISSECTION FOR CARPAL TUNNEL SYNDROME

Nandyala Sreekar[1]& Kompella Sri Surya Gopinath[2*]

[1]Assistant Professor, Department of General Surgery, Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry – 605502, India.
[2]Assistant Professor, Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry – 605502, India.

ABSTRACT
The authors propose to inject objects between the median nerve and the transverse carpal ligament, as well as the lower tendons, to break the central nerve attachment and reduce symptoms. After complete knee arthroplasty, the same procedure was used to treat carpal tunnel syndrome, lateral femoral cutaneous neuropathy and infrapatellar saphenous neuralgia with positive effects. All test results were performed by one investigator who was unaware of the assignment or medical information. Pre-intervention testing and post-intervention testing were performed at 1, 2, 3, and 6 months. Data from the upper hand were used to measure outcomes in patients who underwent both side effects. The results revealed that both groups had improved signal strength, performance status level and cross-sectional area in all follow-up tests (p0.05) compared to baseline. In a 2-year follow-up study, 25 percent and 47.6 percent of untreated people with Carpal Tunnel Syndrome experienced electrophysiological development and symptomatic recovery, respectively. Neurological hydrodissection may be evaluated in the future compared with established care procedures, such as isolation, physical therapy, and corticosteroid injection, and its effect on patients with Carpal Tunnel Syndrome adherence after surgery or failed surgery can be investigated.

Key words: Tunnel syndrome, corticosteroid, comparison.

INTRODUCTION

Carpal tunnel syndrome is the most common form of localized entrapment neuropathy [1]. Although the specific aetiology is unknown, intracarpal tunnel pressure with high pressure of the central nervous system, progressive ischemia, and mechanical choking that disrupts nerve transmission and kills the central nervous system are all thought to be possible causes [2]. The treatment options for Carpal Tunnel Syndrome range from maintenance to surgical intervention, depending on the severity of the illness. Although conservative therapies benefit most people with Carpal Tunnel Syndrome moderate to moderate, Cochrane reviews have shown that such therapies have short-term or limited effectiveness. [3]. Depletion of surgery, on the other hand, is recommended for patients with severe Carpal Tunnel Syndrome or those who have failed to respond to conservative treatment [4]. As a result, during the pre-surgical stages of Carpal Tunnel Syndrome, innovative intervention is required. Hydrodissection is a minimally invasive surgical treatment in which fluid is injected into structural locations to promote adhesion lysis and dissection. [5]. In persons with Carpal Tunnel Syndrome, Smith et al. [6] developed the notion of nerve hydrodissection and documented the use of ultrasound-guided lidocaine injections and corticosteroids. To separate the attachment of the median nerve and reduce symptoms, the authors recommend injecting objects between the median nerve and the transverse carpal ligament, as well as the lower tendons.

*Corresponding Author: - **Kompella Sri Surya Gopinath**

After complete knee arthroplasty, carpal tunnel syndrome [7], lateral femoral cutaneous neuropathy [8], and infrapatellar saphenous neuralgia [9] were successfully treated in the same way. Ultrasound-guided plasma injections of plasma-rich or dextrose have lately been utilised to aid with nerve hydrodissection, and therapeutic advantages in entrapment neuropathy have been seen in some trials. Nerve hydrodissection also helps to avoid nerve injection by accident. The theory behind nerve hydrodissection treatment is that separating the compressed nerve from adjacent soft tissues reduces the likelihood of adhesion and chronic injury by 10-13 times.

Because there are now only a few high-risk and well-designed trials that give good supporting evidence [10], the efficacy and duration of nerve hydrodissection treatment will still be demonstrated. The goal of this research is to see if nerve hydrodissection can help with moderate to moderate Carpal Tunnel Syndrome.

AIMS AND OBJECTIVES:

To perform controlled trial of nerve hydrodissection for carpal tunnel syndrome.

METHODS

Design of the research

Between January 2014 and April 2015, planned, regulated, dual experiments were conducted. In outpatient clinics in the Physical Medicine and Rehabilitation departments and neurology at one medical centre, 40 patients with moderate Carpal Tunnel Syndrome were assessed for eligibility, and 34 were recruited in the study. The institutional review board examined and approved the research process. All patients completed informed permission papers and were randomly assigned to one of two groups in a 1: 1 ratio in a sealed envelope by a randomly selected researcher. To generate random numbers, computerised randomization was utilised (Microsoft Excel). The intervention group had one session of nerve hydrodissection and 5 cc of normal saline under ultrasound supervision. Patients in the control group received a 5-cc saline injection guided by ultrasonography. Both tumours were assigned to the same group when individuals were identified with bilateral Carpal Tunnel Syndrome. No additional prescription Carpal Tunnel Syndrome treatment is allowed from 2 weeks before the injection to 6 months following the injection, with the exception of acetaminophen for pain management. A record of nurses' research on whether or not additional therapies were being employed.

Subjects to research

Patients were aged 20 to 80 years old and had a medical diagnostic of mild to severe Carpal Tunnel Syndrome with at least 3 months of symptoms. The following were the signs and symptoms of Carpal Tunnel Syndrome: (1) Hand paresthesia / night-related dyssthesia, postural, or excessive use, strong handshake relief; (2) central nervous system pain or numbness; (3) Decreased strength and atrophy of the naar muscles; (4) Good Phalen Guidance and / or Tinel Sign. If a patient met condition 1 and one or more of procedures [2–4], they were diagnosed with Carpal Tunnel Syndrome: (1) Carpal tunnel reduction surgery or corticosteroid injection; (2) Carpal Tunnel Syndrome begins during pregnancy, systemic disease, or hypothyroidism; (3) Medical history of polyneuropathy or inflammatory arthritis; (4) Coupling brachial plexopathy or thoracic outlet syndrome.

Based on electrophysiological studies, Carpal Tunnel Syndrome was classified as a median, or severe solid. Only participants with moderate Carpal Tunnel Syndrome were included in the study.

Intra-carpal and subcutaneous injections guided by ultrasound

As in the previous study 11, the ultrasound-guided injection was performed by the same physician using ultrasonography with a 10- to 18-MHz linear array transducer. The median nerve was located near the carpal tunnel's entry in the scaphoid-pisiform level. To extract the median nerve from the transverse carpal ligament, 3 mL of normal saline was introduced to the in-plane ulnar channel intervention. Separate the median nerve from the flexor thighs using 2 mL of normal saline. The control group got 5 mL of normal saline injected into the lower carpal area outside of the carpal tunnel in the same direction as the intervention group and at the same time. Poor folks try to keep their gaze away from them.

Measuring the outcome

Those result evaluations were conducted by a single examiner with no prior knowledge of the assignment or therapy. Pre- and post-intervention evaluations were performed at 1, 2, 3, and 6 months. The findings of patients who had bilateral injections were calculated using data from their dominant hand.

OUTCOMES

The Boston Carpal Tunnel Syndrome Survey is a two-part survey based on the diagnosis of Carpal Tunnel Syndrome in patients. The intensity of the symptoms and the degree of functional status were assessed using 11 questions and 8 items, respectively. Both subscales are scored on a scale of one to five, with higher scores indicating greater disability. It has been proven that the Chi version of the Boston carpal tunnel syndrome survey is accurate and dependable. The scale of the sign weight and the performance scale divided by the points of each item were used in the subsequent analysis. The small clinically significant differences in symptom severity and functional status were 0.8 and 0.5 points, respectively.

The median nerve's cross-sectional area

Inflammation of the central nervous system is measured at the scaphoid-pisiform level with an electronic calliper, and the opposite area of the central nerve provides a reliable matrix for post-injection follow-up [10].

Electrophysiological investigation

As previously stated, antidromic SNCV and DML of the median nerve were investigated. The upper active and reference electrodes were inserted into the 2nd and 3rd proximal interphalangeal joints, respectively, to test for SNCV, and the median nerve was regenerated 14 cm from the active electrode.

Analyze the data

Wilcoxon's signed-level test was used to analyze group data at various locations during the research study. A Mann-Whitney U test was used to examine if there were any distinctions. The mathematical tests were judged to be significant when they had two tails, and the significance level was established at p0.05. Bonferroni corrections were applied in group comparisons on several points during the inquiry. To avoid type I errors, Bonferroni adjusted values of p0.01 were tested for significance. Unless otherwise stated, all data is presented as a standard definition error.

RESULTS:

Table 1: Intervention and Control Group Variations

INTERVENTION GROUP N=17				**CONTROL GROUP N=17**		
	MEAN	**MEAN DIFFERENCE**	**P VALUE**	**MEAN**	**MEAN DIFFERENCE**	**P VALUE**
SSS BASELINE	2.2			2.3	-0.3	
MONTH 1	1.6	-0.6	0.001	2.2	-0.3	0.004
MONTH 2	1.4	-0.7	<0.001	1.8	-0.5	0.003
MONTH 3	1.3	-0.8	<0.001	1.8	-0.5	<0.001
MONTH 6	1.6	-0.6	0.016	2.0	-0.3	0.231
FSS BASELINE	2.2			2.2	-	
MONTH 1	1.8	-0.2	0.012	2.1	-0.3	0.077
MONTH 2	1.7	-0.3	0.002	2.0	-0.1	0.046
MONTH 3	1.6	-0.5	0.001	1.8	-0.2	0.004
MONTH 6	1.6	-0.5	<0.001	2.1	-0.1	0.081

Compared to baseline, both groups showed SSS, FSS and CSA improved in all follow-up tests ($p<0.05$). Even if the DML progressed all the time, the differences between the two groups were not statistically significant at any given time. At three and six months, improvement in the SNCV intervention group was statistically significant (Table 1).

Significant improvements in the intervention group were identified in months 2 and 3 of the SSS and all CSA period points ($p<0.01$) compared with the control group in both SSS and CSA (Table 1).

DISCUSSION:

When compared to the control group, the intervention program showed a substantial reduction in symptoms as well as a decrease in the cross-sectional area of the median nerve at 3 and 6 months after the injection. According to the findings, pathological edoema and inflammation-induced thickened flexor tenosynovium are the main sources of elevated pressure in the carpal tunnel, which contributes to median nerve mobility restriction in the tunnel. Furthermore, it has been demonstrated that severe compression and regeneration of subsynovial connective tissue causes deformation of the "hourglass" nerve architecture, which lowers median nerve visitation and increases traction neuropathy. Nerve function can be disrupted as a result of this. Carpal Tunnel Syndrome symptoms have been demonstrated to be relieved by separating the median nerve from subsynovial connective tissue and tendons within the carpal tunnel. Previously demonstrated that hydrodissection paired with normal saline, performed under ultrasound supervision, can minimise nerve gliding within the carpal tunnel in cadaveric wrists.

Although the specific process of nerve hydrodissection in Carpal Tunnel Syndrome has yet to be identified, it's possible that the injection will free up enough space for the trapped nerve to slide more freely, alleviating median nerve 29 compression. According to certain studies, surgery may also aid in the restoration of normal median nerve mobility within the carpal tunnel, as well as improved blood flow and nerve conduction [10]. The length of time that patients benefit from nerve hydrodissection will also be fascinating to determine, since

this appears to be dependent on the amount of injectate used, the technique of guiding used, and the severity of neuro entrapment based on clinical observation. Also discovered that, despite the injectate being nearly entirely absorbed 1 hour after injection, the therapeutic duration of nerve hydrodissection lasted for an extended period of time. Furthermore, discovered the effect of hydrodissection is not entirely reliant on the persistence of a fluid bolus, which may have provided lubrication in the first place. Additional research is needed to better understand the mechanism of nerve hydrodissection.

The therapeutic benefits could have been caused by injection-related placebo effects and spontaneous Carpal Tunnel Syndrome remission, according to our findings. Unfortunately, distinguishing between the separate contributions of the placebo effect and nerve hydrodissection is difficult at this moment since the minimum amount of injectate required to have a significant effect on nerve hydrodissection is unknown. Using ultrasound guidance, discovered 5-cc normal saline perineural injection in patients with mild-to-moderate Carpal Tunnel Syndrome could alleviate symptoms six months after the injection compared to the baseline in patients diagnosed with the condition. Also reported that clinical improvement was observed in 33 percent of patients 12 weeks after receiving a 2 cc normal saline injection using an ultrasound-guided perineural injection, In spite of this, the placebo effect associated with an injection was greater than the placebo effect associated with a non-interventional treatment. have demonstrated that patients with knee osteoarthritis get an almost 30% pain decrease from the placebo effect during the first few weeks after receiving an intra-articular injection. Furthermore, the likelihood of spontaneous remission in these previous investigations cannot be ruled out totally. Using a prospective trial design, discovered that individuals with untreated Carpal Tunnel Syndrome experienced between 27 percent and 34 percent symptomatic improvement after 10 to 15 months of follow-up after receiving treatment. Noted that 25 percent and 47.6% of untreated individuals with Carpal Tunnel Syndrome showed electrophysiological improvement and symptom recovery, respectively, in a 2-year follow-up study, We were unable to determine the potential for a placebo effect and automatic release in our study as we used the same injection procedure and volume injection in a randomized, double-blind controlled trial. Although both groups improved on most of the Boston carpal tunnel syndrome questionnaires during the initial follow-up period, we realized that intergroup differences in symptom severity did not come close to statistical significance until the second month of our study.

CONCLUSION:

The therapeutic effect of nerve hydrodissection has been demonstrated in this study in patients with severe encephalopathy to chronic doses. Prior to surgery, nerve hydrodissection has been shown to be helpful in patients with chronic torticollis. Ordinary salt is the only requirement for hydrodissection, which is a straightforward, slow-moving method. In addition, compared with a blind injection, hydrodissection under ultrasound guidance may reduce the risk of nerve damage. In addition, the accumulating effect of hydrodissection is predicted to appear after repeated injections, and hydrodissection may have potential benefits in terms of adherence after surgery in patients with complete sclerosis. Neurological hydrodissection may be evaluated in the future when compared with established care procedures, such as isolation, physical therapy, and corticosteroid injection, and its effect on patients with Carpal Tunnel Syndrome after adherence or failure can be investigated. Further research is needed to determine the effectiveness of this new approach in the treatment of various neuropathies.

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