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*Short Communication*

# Evaluating the effectiveness of local dexamethasone injection in pregnant women with carpal tunnel syndrome

*Ali Reza Moghtaderi[1], Neda Moghtaderi[2], Amir Loghmani[3],*

## Abstract

**BACKGROUND:** Most of the medical treatments for carpal tunnel syndrome (CTS) have focused on suppressing the inflammatory process. An injection of dexamethasone acetate might provide the necessary cellular and humoral mediators to induce a healing cascade. Dexamethasone is a water-soluble steroid which is safe to be used in the third trimester, especially as a local treatment. The aim of this study was to evaluate the effectiveness of 4 mg dexamethasone acetate injection to treat carpal tunnel syndrome in pregnancy period.

**METHODS:** Twenty pregnant women with CTS were recruited using strict inclusion and exclusion criteria. All the patients had been injected with 4 mg of dexamethasone acetate and 0.5 ml lidocaine 1% under the carpal tunnel. Pain intensity (based on visual analog scale or VAS) and electro physiologic parameters of median nerve (transcarpal median sensory nerve conduction velocity (SNCV), distal motor latency (DML) and distal sensory latency (DSL) were recorded before and 3 weeks after the injection.

**RESULTS:** The average pain scores before and 3 weeks after the dexamethasone acetate injection was 8.70 ± 0.92 and 4.30 ± 0.76 respectively ($p < 0.005$). In addition, transcarpal SNCV of median nerve was 33.7 ± 6.3 m/s and 24.5 ± 6.8 m/s ($p = 0.001$); DML of median nerve was 5.16 ± 1.04 ms and 4.70 ± 0.53 ms ($p = 0.001$) and DSL of median nerve was 4.84 ± 0.77 ms and 4.2 ± 0.6 ms ($p = 0.001$), respectively.

**CONCLUSIONS:** After dexamethasone acetate injection, pain intensity and electrophysiological parameters were significantly improved. This study offered encouraging results for an alternative minimally invasive treatment for CTS in pregnant women.

**KEYWORDS:** Dexamethasone acetate injection, Carpal tunnel syndrome, Pain intensity, Electro physiologic parameters.

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Carpal tunnel syndrome (CTS) is a frequent complication of pregnancy, with a prevalence reported as high as 62%.[1] CTS commonly presents during the third trimester, but can occur during the first trimester.[2] The most typical symptoms are numbness and tingling in the thumb, index finger, middle finger, and radial half of the ring finger.[3,4] Diagnosis is made based on history, physical exam, and electrophysiological evaluation.[4] Treatment of CTS includes rest for the involved extremity, analgesics, wrist support and local injection of corticosteroids. In cases where the patient does not respond well to the conservative treatment or there are progressive symptoms such as severe atrophy of thenar muscles and an impaired conduction velocity of median nerve, surgical treatment would be considered.[5] One of the treatment that may be applied is dexamethasone acetate injection into wrist joint that may be effective in reducing the symptoms. Previous studies have offered encouraging results for treating refractory lateral epicondylitis and recurrent temporomandibular joint dislocation with dexamethasone acetate injection.[6,7] Niempoog et al examined dex-

1- Assistant Professor of Physical Medicine and Rehabilitation, Isfahan University of Medical Sciences, Isfahan, Iran.
2- Resident, Department of Obstetrics and Gynecology, Isfahan University of Medical Sciences, Isfahan, Iran.
3- Resident, Department of Preventive and Community Medicine, Isfahan University of Medical Sciences, Isfahan, Iran.
Corresponding Author: Amir Loghmani
E-mail: a_loghmani@resident.mui.ac.ir

amethasone acetate injections for the treatment of carpal tunnel syndrome in pregnancy and their results showed that this treatment was effective in controlling symptoms of carpal tunnel syndrome.[8] The outcome was assessed using some physical symptoms of carpal tunnel syndrome and Boston Symptom Severity Scale. This study did not consider electro diagnosis test for diagnosis of carpal tunnel syndrome and also assessing the effectiveness of treatment by steroid injection.

This study tried to analyze steroid injection as a treatment and assess its effectiveness using electro diagnosis test in patients with CTS who were waiting for a surgical operation or were not willing to undertake it.

## Methods

sThis was a self-controlled clinical trial study which was done in Al-Zahra Hospital, Isfahan, Iran. Twenty pregnant patients in the third trimester referred to electromyography clinics in Isfahan University of Medical Sciences for evaluation of CTS who were selected using simple sampling method. Diagnosis was made clinically based on the presence of sings and symptoms of CTS and confirmed electrophysiologically as well. The subjects had at least one of the following electrophysiologic findings:

1. Prolonged distal latency of motor median nerve recorded from abductor pollicis brevis muscle (> 4.2 ms)
2. Prolonged peak latency of antidromic median sensory nerve action potential recorded from the third digit (> 3.6 ms)
3. Prolonged peak latency of median compound nerve action potential at palm-wrist section with an 8 cm distance (>2.2 ms)
4. Reduction of nerve conduction velocity of the median nerve as recorded from the wrist (< 41 m/s).[9]

Furthermore, in the singed extremity, electromyographic examination was made on muscles innervated by roots $C_5$ to T1. In addition, examination of the radial, ulnar and median nerves was undertaken to exclude subjects such as polyneuropathy, radiculopathy and other entrapment neuropathies. Other excluding criteria included diabetes, thyroid disease, uremia and vascular collagen disease such as rheumatoid arthritis and trauma to the wrist. Electrophysiologic excluding criteria included:

1. Severe cases of disease, including proximal sensory latency if more than 5.5 m/s, distal motor latency of more than 6.5 m/s, median compound nerve action potential of more than 4 m/s and transcarpal median sensory nerve conduction velocity of less than 25 m/s.[10]
2. Prolonged distal sensory latency of the ulnar nerve (< 4.1 m/s).[11]
3. Electrophysiologic examination was made by a specialist using Medelec TECA premiere plus VEOS electromyography (U.K.). All the tests in questions were conducted at the same surface skin temperature of hand at 32.5°C. All the stages and the methods of the study were explained for the patients and a written informed consent was taken. For evaluation of the severity of pain, the visual analog scale (VAS) was used.

Four mg dexamethasone acetate was mixed with 0.5 ml lidocaine 1% and injected into the carpal tunnel by a needle #23, 4 cm long, at an angle of 30° relative to the skin from the medial side of palmaris longus tendon, at the distal crease of the wrist. If the patient felt paresthesia during the injection in the median nerve route, the needle was dragged back and then injection was made with a little change in the needle's position. The severity of the pain in each patient (based on VAS) before and 3 weeks after injection was recorded. All the statistical analysis, including age, sex and severity of the pain were analyzed using Software $SPSS_{18}$. Friedman test and Mann-Whitney test alo were used for analysis of the data.

## Results

All the twenty pregnant patients consented to participate and recruited in the study. The mean age of all the participants was 30 (SD: 4.1) years with a range of 27 to 53 years.

Using visual analog scale (VAS), the average pain score before dexamethasone acetate

injection was 8.70 ± 0.92 and 3 weeks after the injection it was 4.30 ± 0.76. This difference was statistically significant ($p < 0.005$).

Besides, there was a statistically significant difference in electro diagnosis results before and after the intervention. Transcarpal SNCV of median nerve was 33.7 ± 6.3 m/s and it reached to 24.5 ± 6.8 m/s after the 3 weeks ($p = 0.001$). Moreover, DML of median nerve was 5.16 ± 1.04 ms before the intervention and it was 4.70 ± 0.53 ms ($p = 0.001$). Furthermore, DSL of median nerve showed a statistical significant improvement from 4.48 ± 0.77 ms to 4.2 ±0.6 ms ($p = 0.001$).

None of the patients experienced any significant complications or pain exacerbation.

## Discussion

According to the findings, after the injection of dexamethasone, the severity of pain was significantly reduced. The electrophysiological parameters of nerve conduction velocity and sensory and motor median nerve latency improved somehow as well. No special complication occurred in the patients. It seemed that the dexamethasone acetate could lead to improve regenerative process by commencing the inflammatory-reparative process.[12]

Some studies have mentioned that the improvement caused by corticosteroid injection into the wrist, was made through bleeding at the side of injection; however, the histological evidence have not yet supported this claim. These studies showed that blood injection into the connective tissue activated specific mediators and mitogenic agents.[13] Among them, one can mention the platelet-derived growth factor and chemotactic polypeptides that would lead to induction of fibroblast for angiogenesis. Also, the mediators may activate the ligament inflammation repairing cascade.[14]

It is not clear whether the inflammatory response made, is caused by dexamethasone acetate or local stimulation of blood metabolites or by cell mediated factors in the blood.[15] Hide brand et al, injected platelet driven growth factor into the ruptured medial collateral ligaments of 122 rabbits. The findings showed a faster and more stable improvement in the test group compared to the control group. Therefore, the fibroblastic hyperplasia and vascular formation hypothesis should be more taken into account.[16]

In this study, the severity of pain in patients (80%) significantly reduced. The importance of this fact for patients, who waited for the surgical operation or were not willing to undertake it, was not negligible. However buffered platelet-rich plasma injection resulted in significant reduction in VAS in 60% of the patients in the treatment group in comparison with only 6% in the control group.[17] Theoretically, soft tissue damage may cause fibrosis but since injection does not cause extensive tissue damage, the chance for fibrosis would be very low and so far we have not seen any report of such a complication. In brief it seems that dexamethasone acetate injection has fewer complications than other corticosteroids injection. Generally, this study showed that injection of dexamethasone acetate in carpal tunnel region could be used as an alternative method for treatment of carpal tunnel syndrome in pregnancy, with the least complications.

## Conflict of Interests

Authors have no conflict of interests.

## Authors' Contributions

ARM was the main investigator, designed the study, and wrote the paper. NM helped in designing the study and patient recruitment, AL contributed to the design of study, analysis of the data and helped in writing the final manuscript.All authors have read and approved the content of the manuscript.

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