

## Carpal Tunnel Syndrome in Lactation: A Challenging Issue

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**Context:** Carpal tunnel syndrome (CTS) is a prevalent complaint during pregnancy and lactation. During lactation both environment and hormonal changes can contribute to worsening the symptoms. Some authors believe that CTS in lactation is a separate clinical entity which develops in pregnancy. Therefore, the specific conditions of these patients demand a special assessment of their treatment.

**Evidence Acquisition:** We searched Pubmed, Scopus and Google Scholar regardless of the articles' publication date. The search was performed using the terms "carpal tunnel syndrome", "median nerve entrapment" or "median nerve neuropathy" which were independently associated (by using "and" in the builder) with breastfeeding, lactation, nursing, postnatal, postpartum, puerperal, and puerperium. We restricted our search to the articles published in English or Persian. The abstracts of references were carefully reviewed and included, if related to CTS and lactation. Finally, the extracted data about therapeutic options available for mothers during breastfeeding were assigned to different areas such as surgical, medical, etc. Related articles were then discussed under the most appropriate topics.

**Results:** Usually, gradual resolution of the symptoms of CTS occurs after stopping breastfeeding. Reassurance and nursing advice on optimal positions for holding baby and breasts during breastfeeding is the first step of treatment. Intra-carpal steroid injection, diuretics and non-steroidal anti-inflammatory drugs might have some benefits, according to the few observational studies on lactating women with CTS. Splinting as a safe option that does not interfere with breastfeeding with good efficacy is suggested by all authors. Surgical intervention is spared for the patients experiencing severe symptoms for long periods, those with thenar muscles wasting or when conservative treatment fails.

**Conclusions:** Current evidence suggests that in addition to nursing advice regarding positioning during breastfeeding, similar treatment strategy for CTS in general population is suitable for lactating mothers. However, available studies suffer from many shortcomings and have not evaluated all therapeutic options in this field. Well-designed interventional studies with special focus on this issue are needed to provide evidence based recommendations.

**Keywords:** Carpal Tunnel Syndrome; Breast Feeding; Lactation; Postpartum Period

### 1. Context

Carpal tunnel syndrome (CTS) is the most common entrapment neuropathy which results from median nerve compression (1, 2). Carpal tunnel syndrome has a gender affinity and affects mainly middle-aged women. About 70 percent of CTS are attributable to females (3). The most typical symptoms are numbness and tingling in the distribution of median nerve. Other common manifestations include burning sensation, pain, as well as loss of grip strength and dexterity. Pain which is not very common can radiate proximally along the volar forearm and medial arm (4). Night time worsening of symptoms typically occurs which makes the patient awake with shaking of the hand or the entire arm which is called "flick" sign followed by rapid relief. Other symptoms can be exacerbated by forceful activities and extreme wrist positions (5). The gold standard test for CTS diagnosis is nerve conduction studies with false positive and false negative

results. Thus, the diagnosis of CTS is based on history, physical examination and results of electrophysiological studies (4). Carpal tunnel syndrome is a prevalent complaint during pregnancy (6, 7). Indeed, the prevalence of CTS in Iranian pregnant and non-pregnant women was estimated to be 3.4 and 2.3 percent, respectively (8). While most pregnant women experience symptom relief following delivery, a significant percentage may continue to have some complaints up to 3 years post-partum (4). In lactating mothers, these symptoms may be worsened due to alteration in environment (i.e. increased physical load on the mother's hands and repetitive need for flexion during breastfeeding) and hormonal changes (9). On the other hand, in some women symptoms of CTS begin in the puerperium and some authors believe that it is a separate clinical entity to that developing in pregnancy. In contrast to carpal tunnel syndrome of pregnancy, car-

pal tunnel syndrome of lactation is not associated with pre-eclampsia or peripheral edema (10).

In general, there are several therapeutic options for patients with CTS. Various factors such as the stage of the disease, the severity of the symptoms, or the patient's preference should be considered for CTS treatment (11). Non-surgical treatments are recommended for patients, as the first line, if they have mild to moderate CTS (11-14). Surgery is reserved for patients with severe CTS and those who have experienced failure of conservative treatment (12). Moreover, the same strategy is applied to lactating mothers with CTS (9). Therefore, the specific conditions of these patients demand special view about their treatment. The purpose of this review study was to evaluate the suggested and approved treatment for CTS during lactation.

## 2. Evidence Acquisition

A broad review of scientific databases was performed by the investigators who searched Pubmed, Scopus and Google Scholar regardless of the publication dates of the articles. The search was carried out using the terms "carpal tunnel syndrome", "median nerve entrapment" or "median nerve neuropathy" which were independently associated (by using "and" in the builder) with "breast-feeding", "lactation", "nursing", "postnatal", "postpartum", "puerperal", and "puerperium". The references obtained were then evaluated by two independent researchers (M.H.H, M.N.) to match our study goal. In fact, they carefully and independently reviewed the abstract of references retrieved from the aforementioned search and excluded those irrelevant to the aim of the study.

The articles comprised of clinical trials, case reports, editorials, reviews or even letters to the editors. In addition the references were not restricted to those related to electrophysiologic criteria for diagnosis of the disease. There was a language selection criterion where the searching of articles was confined to those published in English or Persian.

Finally, the extracted data were categorized in different areas such as surgical, physical, medical etc. and related articles were discussed under the most appropriate topics. Two of the authors (A.A., M.N.) appraised the data obtained according to the article type, study design, sample size, inclusion criteria and outcome assessment and the results were mentioned under each subtitle.

## 3. Results

### 3.1. Reassurance and Nursing Advice

Resolution of the symptoms of CTS during lactation has a clear relationship with the cessation of breastfeeding and in most women symptoms started to subside after they stopped breastfeeding. Thus, in mild cases the reassurance can be the only viable approach (9, 15).

Women suffering from CTS pain and discomfort during pregnancy and postpartum may be worried about their ability to successfully breastfeed. It is very important not to let CTS interfere with a new mother's postpartum goal to hold and breastfeed her infant. Lactation consultants can help lactating mothers via teaching them different positions and using assistive tools to achieve a relaxed state and avoid excessive flexed wrist and holding the baby and breasts optimally. The most common positions are: a) Side-lying position: Where mother should lie on her side while facing the baby who is supported by a blanket behind his/her back during breastfeeding, while holding the breast, with her wrist being in normal position. b) Football-hold position: This is another recommended posture in which the mother should be advised to sit in a comfortable upright position. A footstool could be placed under the mother's feet to enable her to hold the baby closer and lean against supporting pillows in order to secure breastfeeding. This enables her to hold the baby close to her breast. The baby should then be turned toward the mother's torso and placed on the mother's side arm during breastfeeding, which would be facilitated by placing a small size pillow behind the baby's neck. The hand on the same side of the active breast should be kept in a neutral wrist position while keeping the breast in "V" position by the second and third fingers. When a mother is somewhere that pillows are not available for support, an infant sling may be a viable option to support the baby at breast with a small supporting blanket roll behind the baby's neck. Assistive devices are available to help women be hands-free while breastfeeding (15).

### 3.2. Medical Treatments

There are several medical options for managing CTS during lactation. However, the claimed improvement by each therapeutic approach is different. In fact, intra-carpal steroid injection, diuretics and non-steroidal anti-inflammatory drugs (NSAIDs) have been evaluated and the reported percentage of the treated patients in different studies were 100, 83, and 75, respectively (9). In another study diuretics were prescribed for the lactating women which was effective in 82% of the cases, however, most women experienced only temporary relief of symptoms. Unlike diuretics, local steroid injections provided a lasting benefit in 63% of the patients (10). Studies investigating medical therapy for CTS during lactation are limited and have many shortcomings. They are just observational surveys with small sample sizes and poor methodologies. Current researches on lactating mothers with CTS have investigated the effectiveness of medications only by the patients' reports as subjective measures and do not include any objective outcome such as grip strength or hand function, stating no specific dosages for diuretics, NSAIDs or steroids. There is no indication about the exact site of steroid injection and the type of steroid (betamethasone (Diprophos), methylprednisolone (Depo-

Medrol) or triamcinolone, and the treatment side effects in mothers and babies.

High quality randomized controlled trials on women with CTS who did not breastfeed found no significant effect on symptom improvement by non-steroidal anti-inflammatory drugs or diuretics versus placebo at 4 weeks of follow up (16). Thus, compelling evidences in lactating mothers are needed in order to prescribe truly effective medications with the least side effects.

### 3.3. Surgical Intervention

In the recent literature, surgical treatment has been reported to provide a better outcome up to twelve months regarding symptoms and restoration of normal nerve conduction; but has higher complication risks than splinting and other conservative treatments. Because symptoms usually resolve with conservative measures, in lactating mothers resolution of the symptoms has a clear relationship with the cessation of breastfeeding. On the whole surgical intervention is similar in breastfeeding and other women and is not often recommended (16). In fact, it is spared for the patients experiencing severe symptoms for long periods, after failure of conservative treatment or those with thenar muscles wasting. The basic principle of surgery is to increase the volume of the carpal tunnel and release the pressure on the median nerve by dividing transverse carpal ligament. In general population with CTS, surgical treatments include:

1. Standard open carpal tunnel release.
2. Endoscopic carpal tunnel release.
3. Open carpal tunnel release with additional procedures such as internal neurolysis, epineurotomy or tenosynovectomy.
4. Open carpal tunnel release using various incision techniques.

Apart from early recovery and the ability to return to work (by endoscopic carpal tunnel release), no significant difference in terms of early and late complications and long term pain relief has been found between endoscopic and open carpal tunnel release (17). Wand studied 27 women who developed CTS in the puerperium of which only 7% referred for surgery (9). In another study carried out by Wand (10), the number of surgical decompressions for lactating mothers reported to be 2 (11%) out of 18 cases. Rapid relief of symptoms in 100% of patients has been reported following surgery (9, 10). In a study which was originally performed on pregnancy-induced CTS, with a watchful follow-up during lactation, the surgery warranted if the symptoms persisted more than 2 years after delivery (18). There has been no comparison between different surgical methods performed on breastfeeding mothers with CTS. Thus, there is yet no clear guideline concerning the exact time and optimal surgical methods or its complications for lactating mothers with CTS. In fact, similar to the other patients with CTS these complications may include skin irritation, wound hematoma, painful or hypertrophic scar, stiffness, and swelling or discomfort of the wrist. Generally, complica-

tions are mild and rare and some wound-related symptoms may even persist for 2 years (17). Because these complications may interfere with the process of breastfeeding, it is preferable to choose methods with the least complications and the shortest recovery time.

### 3.4. Splinting

Splinting could be mentioned as the first line treatment for CTS patients. Splinting may be most effective when it is used within three months of the start of symptoms. The optimal regimen for splint use depends on the patient's symptoms and preferences. Older literature proposed that compared with only nighttime use of the splint, its full-time use provides better improvement of symptoms and electrodiagnostic tests results; however, compliance with full-time use is more difficult (19). According to a systematic review, no evidence was found in favor of the effectiveness of a full-time splint use compared with night-time use in these patients in the short term. In General, there is limited evidence that the use of a wrist splint in neutral position is more effective than an extended wrist position at 20°. The pressure in the carpal tunnel is lowest in neutral wrist flexion extension range (16). Splinting is a safe option that does not interfere with breastfeeding. In a study on 18 lactating women, splints worn mainly at night, ranked as the second efficient treatment with 86% symptomatic relief (10). A postal survey on CTS in lactation, investigated 27 women, of whom 26% were advised by their family physician to wear splint. All of these patients claimed complete relief (9). However, it should be noted that this improvement was subjective and no objective measure was investigated. In another study by Courts, 48 women with CTS during pregnancy were advised to wear a wrist splint and continued wearing it for 1 month after delivery. Also, 26 women with no hand problem during pregnancy were investigated 1 month after delivery. The results obtained approved its benefit regarding complete relief of symptoms in 76% of the patients with significant functional improvement (20). The optimal regimen for time and duration of splint use in lactating mothers which clearly determines the best position is not known and needs to be established.

### 3.5. Alternative Treatment Methods

Many other therapeutic options are available for patients with carpal tunnel syndrome. Vitamin B6 (pyridoxine) had been used for years as an oral treatment for CTS, but no evidence was found in favor of its effectiveness in a systematic review.

Ultrasound as a physical agent modality can be used for pain relief. There is moderate evidence that ultrasound is more effective than placebo in the treatment of patients with CTS in the midterm and long term but not in the short term. The application of ultrasound with different intensities or frequencies has not been found to have different therapeutic effects. Laser therapy is another sug-

gested treatment approach, but there is no evidence for its effectiveness compared with placebo in patients with CTS in the short term. Iontophoresis has been used in some studies and no evidence supported dexamethasone iontophoresis effectiveness compared to placebo in CTS treatment. Phonophoresis has also similar scenario in CTS treatment. Moderate evidence supports the use of dynamic magnetic field stimulation therapy of the wrist for patients with CTS in the short term.

Limited evidence supports the addition of mobilization and manual therapy including carpal bone mobilization and nerve gliding techniques to splinting. There is little evidence supporting targeted massage protocol, focused on the areas of constriction, ischemia, and nerve entrapment of the affected upper extremity to be more effective than a general massage protocol that is relaxing massage to reduce tension of the back, neck, and upper extremities. In addition, self-massage therapy for 15 minutes once a week is more effective in reducing symptoms and signs of CTS compared to no treatment in the short term. Also, limited evidence suggests that heat wrap therapy (104°F; 40°C) is more effective for reducing pain, joint stiffness and grip strength than oral placebo in the short term.

Acupuncture as a relatively safe treatment approach might be used in lactating mothers. There is no evidence for the effectiveness of laser acupuncture compared with placebo, or the efficacy of acupuncture relative to oral steroids to treat general population with CTS in the short term. Moderate evidence for beneficial effect of cupping therapy has been indicated compared with heat pads at 7 days of follow-up.

Some injectable drugs other than corticosteroids, such as botulinum B toxin, were investigated in some studies for treatment of patients with CTS. There is no evidence supporting the effectiveness of botulinum B toxin compared with ibuprofen and wrist splint for CTS treatment in the midterm. Insulin as an additive to steroid injection has been indicated as an alternative treatment method. There is moderate evidence that in patients with non-insulin-dependent diabetes mellitus, corticosteroid plus insulin injections are more effective than steroid injections alone for CTS treatment in the short term (16).

All foregoing treatment options had been used for years in CTS patients but unfortunately none of them has been specifically investigated in lactating mothers. Thus, safety, efficacy and accepted dosages of them for breastfeeding mothers remain unknown. Since medications and surgical intervention might have unacceptable side effects for breastfeeding mothers, alternative approaches such as acupuncture, massage therapy, mobilization, nerve gliding techniques and physical modalities might prove to be more beneficial.

#### 4. Conclusions

Similar treatment strategies for CTS should be considered for the general population. However, with regard to

lactating mothers, randomized controlled trials investigating various therapeutic approaches are lacking. Conservative treatment including reassurance and nursing counseling, splinting and medical therapy are reported as the first line of treatments for breastfeeding mothers with CTS. Surgical intervention should be reserved for more severe cases and when conservative measures fail. Further well designed studies with especial focus on this issue are needed to provide evidence-based treatment strategies.

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#### Authors' Contributions

Study concept and design: Alireza Ashraf; acquisition of data: Mahshid Naseri and Mohammad Hashem Hashempur; analysis and interpretation of data: Mahshid Naseri and Mohammad Hashem Hashempur; drafting of the manuscript: Mahshid Naseri and Mohammad Hashem Hashempur; critical revision of the manuscript for important intellectual content: Alireza Ashraf and Mahshid Naseri; statistical analysis, administrative, technical, and material support: Alireza Ashraf; Study supervision: Alireza Ashraf.

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