

## Conservative treatment of cubital tunnel syndrome: A systematic review

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### Abstract

Cubital tunnel syndrome (CuTS) is one of the most common compression neuropathies of the upper extremity. Conservative management of cubital tunnel syndrome is often considered first line therapy for mild or moderate symptoms; however, there is little evidence-based literature to guide physicians in this regard. As such, the objective of this study is to complete a comprehensive literature search of the conservative therapies available for treatment of CuTS. Additionally, we hope to assess the evidence for each therapy so that we can make evidence-based recommendations regarding the type and duration of optimal treatment. The databases MEDLINE, EMBASE, and CINAHL were search using a sensitive search strategy. Eligibility for studies included any studies or conference abstracts in which patients were treated conservatively for primary CuTS. Any form of non-operative treatment was acceptable. A data extraction form was developed to collect all information and outcomes of interest, including study design, level of evidence, number of patients, treatment modalities, follow-up time, patient reported outcomes, and electrophysiological markers. Qualitative and quantitative analysis was then completed based on the data extraction form. Given the heterogeneity of the included studies, results were summarized as best evidence available.

Our sensitive literature search produced 6484 studies. Initial screening based on title and abstract resulted in the selection of 40 studies that underwent full text review. From these 19 studies were included for analysis in our systematic review. There were 3 level I studies, 4 level II studies, 3 level III studies, and 9 level IV studies. In total this included 844 patients. The most commonly reported outcomes included subjective patient reported outcomes and nerve conduction studies. The most common treatment modalities, from most to least common, included education and activity modification,

splinting, steroid/lidocaine injection, nerve mobilization/gliding, pulsed ultrasound, laser therapy, non-steroidal anti-inflammatory drugs, and physiotherapy. The most common duration of therapy was 3 months with a median follow-up time of 3 months. There was moderate strength evidence to recommend the use of education/activity modification or splinting in mild or moderate CuTS.

There is a paucity of literature and high-quality studies regarding the conservative management of CuTS. Regardless, there appears to be a role for non-operative management in CuTS, although further studies are needed to delineate this role further. In the cases of mild or moderate CuTS it is reasonable to trial education/activity modification or splinting as both appear to be equally effective.

### Introduction

Cubital tunnel syndrome is one of the most common compression neuropathies of the upper extremity, second only to carpal tunnel syndrome.<sup>1</sup> This condition affects an estimated 2-6% of the population.<sup>2</sup> Optimal management for CuTS is still controversial because surgical outcomes are variable and generally worse, when compared to surgical outcomes of carpal tunnel release. Recent studies have shown that surgery for CuTS is effective in improving symptoms in only 70% of patients, as compared carpal tunnel release, which has a success rate of greater than 90%.<sup>1,3</sup> Despite this discrepancy, the number of surgical procedures for CuTS has nearly doubled in the last 20 years.<sup>4</sup> Based on these statistics, it appears that there are a growing number of discontent individuals receiving possibly unnecessary surgery. This has caused an increase in the number of surgeons considering conservative therapy for CuTS, especially for mild or moderate disease. Greater than 70% of hand surgeons surveyed preferred trialing conservative therapy for patients with intermittent symptoms and normal electrophysiological parameters; however, there is a critical lack of high quality literature on this topic.<sup>5</sup>

Strategies for conservative therapy of CuTS have focused on relieving pressure on the ulnar nerve, which is under the most stress in maximal elbow flexion. Elbow flexion splints are designed to limit elbow flexion to an arc of motion within which the ulnar nerve is under the least amount of tension. Unfortunately, these splints are often poorly tolerated for extended periods of time and patient compliance is variable. Patient education and activity modification

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are simple adjuncts that can also be utilized to avoid compromising elbow positions.<sup>6</sup> Increasing use of ultrasound has also led to interest in ultrasound guided steroid injection of the cubital tunnel. More recently, there has been a large influx of physiotherapy literature on the use of nerve gliding exercises and electric modalities, including pulse ultrasound and laser therapy. It's clear that there is an ever-increasing toolbox of alternative therapies available for physicians to choose from, making it difficult to provide evidence-based recommendations for patients.

There is a paucity of literature regarding non-operative management of CuTS. The objective of this study, therefore, is to complete a comprehensive literature search of the conservative therapies available for treatment of CuTS. Additionally, we hope to assess the evidence for each therapy so that we can make evidence-based recommendations regarding the type and duration of optimal treatment.

### Materials and Methods

A systematic literature search was completed by a single reviewer and is up to date

as of September 29, 2017. The databases MEDLINE, EMBASE, and CINAHL were searched using engine specific strategies unique to each database to maximize sensitivity (Appendix A). All search results were then compiled in a reference manager program, and duplicates were deleted. Studies were then screened based on title and abstract for eligibility. Studies that were thought to be eligible then underwent full text review, after which only primary articles, which met all of the inclusion and exclusion criteria, were included in the systematic review. Three reviewers independently selected the trials to be included from the compiled literature search.

Eligibility for studies included any studies or conference abstracts in which patients were treated conservatively for primary CuTS. Any form of non-operative treatment was acceptable. If a study had multiple published interim results, only the most recent study was included. Studies were excluded if they did not report patient outcomes or if it was unclear which group the outcomes belonged to. Exclusion criteria also included case reports, reviews, commentary pieces, rebuttals, and studies/abstracts that were not available in English.

A data extraction form was developed to collect all information and outcomes of interest, which included author, publication date, study design, level of evidence, number of patients, treatment modalities, follow-up time, patient reported outcomes, and electrophysiological markers. Qualitative and quantitative analysis was then completed based on the data extraction form. Given the heterogeneity of the included studies, results were summarized as best evidence available.

## Results

Our sensitive literature search produced 6484 studies. Initial screening based on title and abstract resulted in the selection of 80 articles. After duplicates were removed, 40 studies remained. These 40 studies underwent full text review. From these 20 studies were included for analysis in our systematic review (Figure 1).<sup>7-26</sup>

There were 3 level I studies, 4 level II studies, 3 level III studies, and 10 level IV studies. In total this included 877 patients. The average age of patients in the studies ranged from 41.2-59.1 years. The most commonly reported outcomes included subjective clinical and patient reported outcomes, nerve conduction studies, and electromyography. The most common treatment modalities, from most to least common,

included education and activity modification, splinting, steroid/lidocaine injection, nerve mobilization/gliding, pulsed ultrasound, laser therapy, NSAIDs, and strengthening physiotherapy. The most common duration of therapy was 3 months with a median follow-up time of 3 months.

Activity modification and education as a treatment modality was often paired with other treatments as an adjunct, and was used in 7 studies. Two studies looked at the effect of activity modification and education alone on the natural history of CuTS, and those studies showed that 44-66% of patients had resolution of their symptoms over a period of 1 year.<sup>16,19</sup> One RCT looked at the effect of education/activity modification compared to splinting and nerve gliding techniques. This study showed that there was no difference between all groups, with nearly 90% of patients showing clinical improvement at 6 months.<sup>9</sup> Splinting was used in 6 studies. Four of these studies used night splinting, and one did not specify. In the majority of these studies splinting was used in a multimodal fashion with other treatment modalities, displaying variable results. One prospective cohort study looked at the effect of splinting and activity modification

over a 3-month period. Patients in this study had significant improvement in DASH, SF-12, and grip strength. 82% of the patients became symptom free over a period of 2 years.<sup>13</sup> Steroid or local anesthetic injection was also used in 6 studies. Two of these studies were level I or II RCTs: one compared steroid injection with placebo, while the other compared steroid injection to splinting and steroid injection.<sup>8,22</sup> In the former, there was no difference between steroid injection and placebo, and the success rate for treatment was only 30%. Similarly, the second study showed no difference between injection vs. splinting and injection, albeit there were only 10 patients in this study. Three case series showed clinical improvement with steroid injection in 53-63% of patients over a time period of 6 week to 3 month period.<sup>15,25</sup> The remaining treatment modalities, including ultrasound, laser, nerve gliding, physiotherapy, and NSADIS, were only mentioned in 2 or less studies. One RCT compared ultrasound to laser therapy, which showed no difference between groups. Both groups had significant improvement from baseline parameters; however, there was no adequate control group in this RCT.<sup>17</sup>

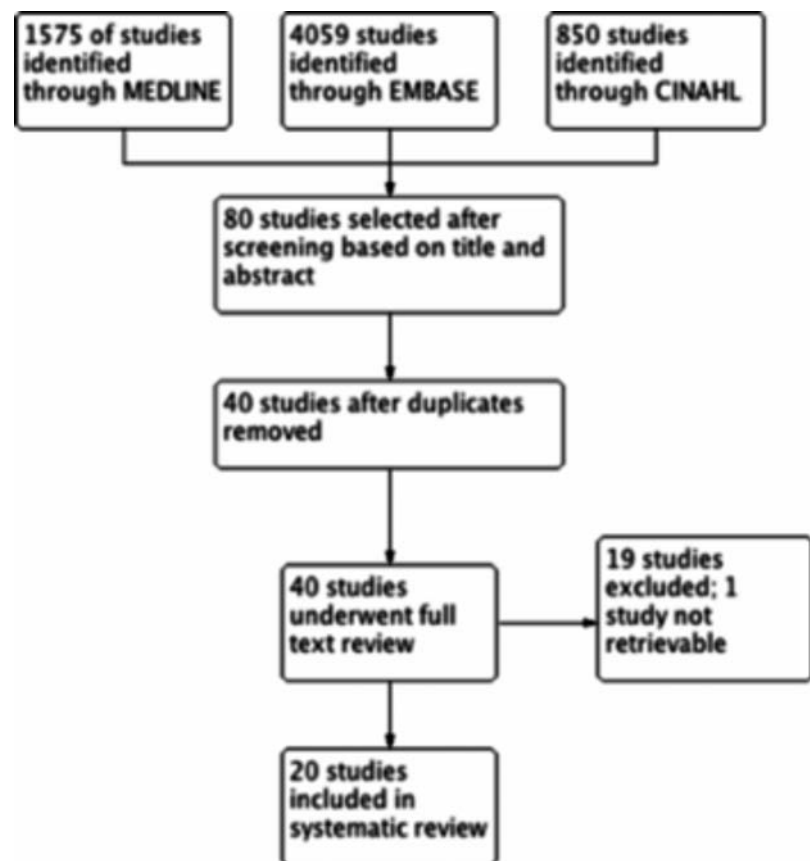


Figure 1. PRISMA flow diagram.

## Discussion

The objective of this study was to complete a comprehensive literature search to assess the evidence for conservative treatment of CuTS. The results of our study show that there is paucity of literature regarding non-operative treatment of CuTS. The optimal conservative management is still unclear; however, the current evidence suggests that activity modification/education and splinting may be effective for mild or moderate disease. Steroid injections had the effect of decreasing nerve cross sectional area in several studies, although the results were equivocal in many cases. There were not enough studies to draw conclusions about other treatments modalities including ultrasound, laser, or nerve mobilization techniques. No optimal length of therapy was determined based on this review. The most common length of therapy was 3 months and the shortest was 5 weeks. One of the larger case studies included in our review looked at the time to plateau after treatment of CuTS with education alone. The median time to symptom plateau after treatment was 11 months, with the earliest at 3 months.<sup>19</sup>

The major limitation of this review was the lack of high-quality studies and heterogeneity of the studies. Duration of therapy in each study often seemed arbitrary with soft end-points. The majority of studies were case series with low patient numbers. Control groups were often absent or not part of the study design. This made it particularly difficult to draw conclusions about the magnitude of effect regarding certain therapies. Nearly all of the studies demonstrated clinical improvement in patient symptoms over time; however, the absence of adequate controls made it impossible to delineate the natural history of the CuTS from the desired effect of the therapy. Additionally, follow-up times were relatively short. The majority of studies had a follow-up time of 2-6 months, and only three studies had follow-up over 1 year. One study was also unable to be retrieved, and as such, could not be included in our analysis. Nonetheless, strengths of this study include the fact that this is the only systematic review of this topic in the literature that we are currently aware of. It's also the only study that has strived to make evidenced based suggestions on the non-operative treatment of CuTS.

The data from this study could possibly direct future studies. Currently activity modification/education and splinting are the only conservative treatments for CuTS that show some efficacy in the literature.

Additionally, both treatments can be carried out easily, cheaply, and with low risk. The only issue with these treatments is that compliance would be difficult to monitor. One such subgroup of analysis that has not been carried out might include full time splinting versus night splinting, although compliance with full time splinting could be an issue. Physiotherapy and nerve gliding techniques are other treatments that can be considered; however current evidence for their use is weak, and both require increased time and cost compared to the latter treatments. It seems that the optimal treatment therapy last 6-12 weeks with adequate follow-up time of at least 3-6 months. Shah et al. 2013 demonstrated significant improvement in functional outcome at 3 months that were maintained at final follow-up 2 years later.<sup>13</sup> The need for pre and post treatment nerve conduction testing is contentious, especially for mild and moderate CuTS, because subjective patient outcomes do not always correlate with nerve conduction studies. Similarly, patient with mild clinical disease do not always have abnormal nerve conduction studies. Nonetheless, these studies would certainly aid in improving the quality and completeness of any associated study.

## Conclusions

There is a paucity of literature and high-quality studies regarding the conservative management of CuTS. Regardless, there appears to be a role for non-operative management in CuTS, although further studies are needed to delineate this role further. In the cases of mild or moderate CuTS it is reasonable to trial education/activity modification or splinting as both appear to be equally effective. We recommend a trial period of 6-12 weeks of treatment, although this should be determined on a patient specific basis.

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