Clinical Research in Practice: The Journal of Team Hippocrates

Volume 8 | Issue 1 Article 6

2022

Corticosteroid wrist injections provide better symptomatic relief than nocturnal wrist splints for short term improvement of mild-to-moderate carpal tunnel syndrome

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Recommended Citation

BRACKEN C. Corticosteroid wrist injections provide better symptomatic relief than nocturnal wrist splints for short term improvement of mild-to-moderate carpal tunnel syndrome. Clin. Res. Prac. Apr 28 2022;8(1):eP2607. https://doi.org/10.22237/crp/1640995500

Clinical Research in Practice
The Journal of Team Hippocrates
VOL 8 ISS 1 / eP2607 / APRIL 28, 2022
https://doi.org/10.22237/crp/1640995500

Corticosteroid wrist injections provide better symptomatic relief than nocturnal wrist splints for short term improvement of mild-to-moderate carpal tunnel syndrome

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ABSTRACT A clinical decision report using:

Chesterton LS, Blagojevic-Bucknall M, Burton C, et al. The clinical and cost-effectiveness of corticosteroid injection versus night splints for carpal tunnel syndrome (INSTINCTS trial): an open-label, parallel group, randomised controlled trial. *Lancet*. 2018;392(10156):1423-1433. https://doi.org/10.1016/S0140-6736(18)31572-1

for a patient requiring short-term relief from carpal tunnel syndrome.

Keywords: *carpal tunnel syndrome, wrist injections, wrist splints*

Clinical-Social Context

Michael Anderson (pseudonym) is a 58-year-old male with no significant medical history who presented to his family medicine clinic for an annual wellness visit. During the visit, Mr. Anderson complained of bilateral, nocturnal hand pain and paresthesias in the median nerve distribution that limited his ability to sleep through the night. Mr. Anderson works as a local truck driver who spends most hours of his workday driving and loading boxes on-and-off the truck. While the hand pain from his Carpal Tunnel Syndrome (CTS) did not significantly limit his ability to perform his work tasks, the nocturnal pain caused significant insomnia and distress, with the patient complaining that he could not sleep at night. The resultant fatigue was a concern given his time spent behind the wheel, requiring the utmost attentiveness. Mr. Anderson wore bilateral wrist splints nightly, but his pain and paresthesias persisted, causing insomnia several nights per week. Mr. Anderson had adequate housing, stable employment, familial support, and access to quality healthcare; however, he was uninterested in pursuing surgical intervention as the recovery period would prevent him from working. Therefore, we sought to provide Mr. Anderson with the optimal, non-surgical treatment that would address his CTS symptoms and allow him to safely continue working.

Clinical Question

What is the most effective treatment option for CTS in patients requiring rapid symptom relief in order to maintain their livelihood, and who cannot afford a recovery period following surgery?

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ISSN: 2379-4550
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Clinical Research in Practice
The Journal of Team Hippocrates
VOL 8 ISS 1 / eP2607 / APRIL 28, 2022
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Research Article

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Description of Related Literature

Research of existing literature began with an UpToDate search on "Carpal Tunnel Syndrome Treatment." The mainstays of treatment options include wrist splinting, corticosteroid injections, and surgery.[2] Other nonsurgical options include oral glucocorticoids, physical and occupational therapy techniques, yoga, and platelet rich plasma injections.

Next, a PubMed search of the terms "carpal tunnel syndrome", "injection", and "splint" was performed. The initial search returned 136 results. Given the high-volume of studies, the query was further limited to include only clinical trials and randomized controlled trials; this yielded 23 unique studies. Given that Mr. Anderson was uninterested in surgical intervention, studies involving surgery were excluded. Additionally, studies that included treatments not offered at the clinic were also excluded.

Wang et al. studied the efficacy of combined ultrasound guided steroid injections and wrist splinting in improving CTS symptoms, functional status, and nerve function. Patients with CTS were randomly assigned to a treatment group of steroid injection plus wrist splint (n=26), or the control group of only steroid injections (n=26). They found that combined therapy with steroid injections and wrist splints was more effective than just steroid injections, leading to better outcomes in symptom severity, functional status, nerve conduction velocity, and nerve action potential amplitude.[3] This study was not chosen, as both the control and treatment groups involved steroid injections.

Salman Roghani et al. conducted a triple blind randomized controlled trial comparing different dosages of steroid injection versus saline injection in elderly patients with CTS. Patients were randomly assigned to one of three injection groups: 80 mg triamcinolone (n=32), 40 mg triamcinolone (n=32), or a control group of normal saline (n=30). All three groups showed improvement in their Boston Carpal Tunnel Questionnaire (BCTQ) scores at 2, 12, and 24-week follow-up visits.[4] The BCTQ is a validated, self-administered 19-question questionnaire that asks patients about symptom severity and functional status related to CTS; each response is measured on a scale of 1-5, with lower numbers indicating less severe symptoms.[5-6] This study was not chosen as it did not consider wrist splints as a treatment option.

So et al. conducted a randomized control trial comparing the efficacy of steroid injections versus nocturnal wrist splinting in patients with CTS. Twenty-five patients were randomly assigned to local steroid injection treatment, and twenty-five were assigned to nocturnal wrist splint treatment. The outcome measures included the BCTQ scores, patient satisfaction, and finger dexterity testing. After 4 weeks, there was no significant difference in BCTQ scores; however, patients in the steroid group reported higher satisfaction and improvement in the finger-dexterity test.[7] This study was not chosen for Mr. Anderson due to limited sample size.

Celiker et al. compared treatments of oral acetaminophen with nightly wrist splints (n=11) versus corticosteroid injections (n=12). They found improvement in both clinical and electromyographic parameters at eight weeks in both treatment groups.[8] This study was not chosen due to small sample size.

Atroshi et al. performed a randomized control trial comparing different doses of steroid injections versus placebo in patients with CTS who had previously failed wrist splinting. The study found greater improvement in CTS severity scores after 10 weeks in patients who received 80 mg methylprednisolone (n=37) or 40 mg methylprednisolone (n=37) in comparison to those who received the placebo (n=37).[9] This study was not chosen as it failed to compare injections to wrist splints.

Wu et al. compared electromyographic responses in participants with CTS for five different treatment groups: Vitamins B6 and B12; wrist splinting; steroid injections; vitamins B6 and B12 with wrist splinting; and steroid injections with wrist splinting. They found that patients in the steroid injection group and the steroid injection with wrist splinting group responded to treatment faster in the sensory and motor nerve conduction studies.[10] This study was not chosen due to limited sample size (n=61).

ISSN: 2379-4550
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Chesterton et al. conducted a randomized control trial to compare steroid wrist injection versus splinting in adults with CTS (INSTINCTS trial). Two-hundred and thirty-four participants were randomly assigned to one of two treatment groups: one receiving a single 20 mg methylprednisolone acetate injection (n=116), the other wearing nocturnal wrist splint (n=118). Of the 91% of participants who completed the BCTQ questionnaire at 6 weeks, the improvement in BCTQ score was significantly greater in the steroid injection group compared to the wrist splint group.[1] Given the adequate sample size, relevance to Mr. Anderson's clinical scenario, limited attrition rate, and that the study was carried out in the primary care setting, this study was selected to answer the clinical question.

According to the strength of recommendation taxonomy (SORT) criteria, the evidence supports a B level recommendation, based on fair quality patient-oriented evidence.[11]

Critical Appraisal

This research study was a randomized, open-label, parallel group-controlled trial comparing the two mainstays of conservative CTS treatment options: steroid injections and nocturnal wrist splints. An intention-to-treat analysis was used, and the randomization sequence was concealed to prevent selection bias. According to SORT criteria, the study provides Level 1 evidence.[11]

The study was funded by Arthritis Research UK; they had no role in study design, data collection, analysis, or interpretation, thereby preventing funding bias. The trial was registered prospectively to EudraCT, ClinicalTrials.gov, and Current Controlled Trials, and largely followed the study protocol.[12]

Patients with a new episode of idiopathic mild-to-moderate carpal tunnel syndrome (n=234) were recruited from a group of 25 general practitioners and community musculoskeletal clinics in England. Prospective participants were verbally introduced to the study and given an information pamphlet. Participants had to be 18 or older and be experiencing an episode of CTS lasting longer than 6 weeks, as diagnosed clinically by their general practitioner, physiotherapist, or occupational therapist based on symptoms, clinical history, and physical exam findings. Patients with severe CTS, as evidenced by constant pain, sensory loss, or thenar atrophy, were excluded from the study. Other exclusion criteria included recent corticosteroid injection or use of nocturnal splints in the preceding 6 months. The latter exclusion criterion somewhat limits the study's applicability to Mr. Anderson, as he was already wearing nocturnal wrist splints.

Prior to randomization, patients filled out the BCTQ to determine their baseline for symptom severity and functional status. Participants were then randomly assigned by site to one of the two treatment groups. Randomization was largely successful, with similar demographic characteristics and baseline BCTQ scores in both groups. However, a few group differences were present. More individuals in the injection group reported an acute onset of symptoms (28%) compared to the splint group (14%). Fewer individuals in the injection group were employed (50%) compared to the splint group (63%). In the injection and splint groups, only 6% and 3% of participants had previously tried nocturnal wrist splints, respectively, again limiting the applicability to Mr. Anderson.

At an initial appointment, participants were either given an injection or fit with wrist braces. The injection group (n=118) received a 20 mg injection of methyl-prednisolone between the proximal and distal wrist crease. The splint group (n=116) received a fitted brace to immobilize the wrist in a neutral or slightly extended position, and were instructed to wear nightly. Blinding participants to their treatment was not possible, which could have introduced a source of response bias. The primary outcome measures were follow-up BCTQ at 6 weeks and at 6 months. Secondary outcome measures included pain scores and degree of insomnia.

Of the 118 participants in the injection group, 2 self-withdrew, 109 completed the 6-week questionnaire (92%), and 96 completed the 6-month questionnaire (83%). Of the 116 participants in the wrist-splint group, 113 completed the 6-week questionnaire (93%), and 96 completed the 6-month questionnaire (83%). Given the similar response rates between groups at both 6 weeks and 6 months, attrition bias is unlikely.

At 6 weeks, the injection group showed a greater improvement in BCTQ scores (2.02 vs pretreatment baseline of 2.69) in comparison to the wrist splint group (2.29 vs pretreatment baseline of 2.65) that was statistically significant (p=0.0001), with a mean adjusted difference of 0.32. Secondary outcome measures including improvement in pain intensity (p=0.005) and insomnia

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(p=0.018) were also significantly greater in the injection group compared to the splint group at 6 weeks. At 6 months, there were no significant differences between groups in BCTQ score (p=0.499), pain intensity (p=0.055), and insomnia (p=0.755).

Strengths of the study include the relatively large sample size, as well as follow-up at both 6 weeks and 6 months.

Clinical Application

Mr. Anderson came to his annual wellness visit seeking relief of his nocturnal CTS symptoms that were causing insomnia. His occupation as a truck driver requires the utmost attentiveness, near-constant use of his hands, and would not allow for a long recuperation period. Therefore, he specifically wanted non-surgical, immediate relief. Though he had tried nocturnal wrist splints without significant relief, a decision on the best course of action had to be made.

The study fairly concludes that one-time corticosteroid wrist injections provide better rapid CTS symptom relief than nocturnal wrist splints, as evidenced by statistically significant improvement BCTQ score, pain score, and insomnia at 6 weeks. Mr. Anderson's frequent insomnia and resultant fatigue made rapid symptom relief, such as that provided by corticosteroid wrist injections, the priority. However, the study also shows that the long-term utility of steroid injections in the treatment of CTS symptoms is no different than that of nocturnal wrist splints; this limitation was communicated to Mr. Anderson. Another limitation of applying this study to Mr. Anderson's scenario is how few participants had already worn wrist splints, which he had. Furthermore, while Mr. Anderson had no thenar muscle atrophy, his insomnia could place him more appropriately into the severe CTS category specifically excluded in the study. Nonetheless, bilateral wrist injections of triamcinolone and lidocaine were offered to Mr. Anderson, and he agreed to undergo the treatment. Though the triamcinolone differs from the methyl-prednisolone used in the study, the drugs have similar potency.[13]

New Knowledge Related to Clinical Decision Science

Mr. Anderson complained of fatigue and insomnia secondary to CTS. In exploring his social history, we found that his occupation heavily relied on the use of his hands, and required a level of activity and attentiveness that required adequate sleep. Surgical intervention would have led to a long recovery period and inability to work that he could not afford. Further, inadequate treatment of his pain would have had negative impacts on his job performance, sleep quality, and perhaps even his safety on the road. This underscored the importance that any recommended treatment had to rapidly and effectively address his pain and improve his sleep.

Chesterton et al. showed that wrist injections led to a statistically significant improvement in BCTQ score, pain score, and insomnia at 6 weeks. Though the BCTQ scores were statistically significantly lower in the injection group, one can argue that a mean adjusted BCTQ difference of just 0.32 is not clinically meaningful. Additionally, the study suggests that continued nocturnal wrist splint use may have led to similar outcomes at 6 months. Nonetheless, the severity of his symptoms combined with the nature of his occupation warranted more immediate symptomatic relief, making wrist injections the better choice.

In the future, it is strongly recommended that pre- and post-treatment BCTQs are completed in the primary care office to assess treatment response. This would allow providers to monitor the overall symptom severity and functional limitations, while also focusing on the most bothersome symptoms and limitations. In Mr. Anderson's case, specific attention should be paid to the BCTQ items regarding symptoms at night, including severity of pain at night, awakenings due to pain, numbness or tingling at night, and awakenings due to numbness or tingling. Lack of improvement in these items could argue for treatment escalation.

Inadequate knowledge of our patient's social history may well have pushed us in the direction of the less-invasive treatment option, leading to prolonged negative impacts on his work performance and sleep quality. Clinical Decision Science and routine use of decision support tools like the BCTQ can support physicians in making the appropriate decisions for each unique patient, avoiding a one-size-fits-all approach.

ISSN: 2379-4550
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Conflict Of Interest Statement

The author declares no conflicts of interest.

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