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The Effectiveness of Corticosteroid Injections for Carpal Tunnel Syndrome

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Abstract

Carpal Tunnel Syndrome (CTS) is a common condition caused by compression of the median nerve as it passes through the carpal tunnel in the wrist. This condition often leads to symptoms such as numbness, tingling, weakness, and pain in the hand and wrist. Corticosteroid injections have been widely used as a non-surgical treatment option to alleviate symptoms of CTS, particularly in cases where conservative measures, such as splinting or anti-inflammatory medications, have not been effective. This article reviews the effectiveness of corticosteroid injections in the treatment of CTS, examining clinical studies, patient outcomes, and the duration of symptom relief. While corticosteroid injections have shown short-term efficacy in reducing inflammation and providing pain relief, their long-term effectiveness remains controversial. The article discusses the potential benefits and limitations of this treatment modality, including risks of recurrence, side effects, and the need for repeated injections. The review also highlights when corticosteroid injections may be most beneficial and the role they play in a comprehensive treatment plan for CTS. Ultimately, corticosteroid injections can be an effective short-term solution for symptom management, but patients with persistent or severe CTS may require surgical intervention for long-term relief.

Keywords: Carpal tunnel syndrome; Corticosteroid injections; Median nerve compression; Non-surgical treatment; Pain relief; Inflammation reduction

Introduction

Carpal Tunnel Syndrome (CTS) is a common and often debilitating condition caused by compression of the median nerve as it passes through the carpal tunnel in the wrist [1]. The carpal tunnel, a narrow passageway formed by bones and ligaments, becomes constricted, leading to increased pressure on the median nerve. This compression results in symptoms such as numbness, tingling, pain, and weakness in the hand and fingers, which can significantly impair daily activities and reduce quality of life. CTS are commonly seen in individuals who engage in repetitive wrist movements, such as office workers using keyboards, factory workers, and athletes [2]. Other risk factors include obesity, pregnancy, diabetes, and certain genetic predispositions. Early diagnosis and treatment are crucial in preventing long-term nerve damage and maintaining hand function.

One of the most frequently used non-surgical treatments for CTS is the administration of corticosteroid injections [3]. These injections are aimed at reducing inflammation and alleviating pressure on the median nerve, providing temporary relief from pain and discomfort. Corticosteroids, which are powerful anti-inflammatory drugs, are thought to reduce swelling in the carpal tunnel and improve the function of the median nerve. While corticosteroid injections are commonly used and can provide significant short-term symptom relief, their long-term effectiveness remains a topic of debate. Some studies suggest that the benefits of corticosteroid injections may be temporary, with symptoms often returning after a few months [4-6]. Additionally, repeated use of corticosteroid injections may lead to complications or diminished efficacy over time. This article reviews the effectiveness of corticosteroid injections in treating Carpal Tunnel Syndrome, exploring clinical evidence, patient outcomes, and potential risks and benefits. It aims to provide a clearer understanding of when and how corticosteroid injections can be used as part of a comprehensive treatment strategy for CTS, and the role they play in both short-term symptom management and long-term disease progression.

Results and Discussion

Corticosteroid injections are widely used in the treatment of Carpal Tunnel Syndrome (CTS) due to their ability to provide quick and effective relief of pain and inflammation [7]. Multiple studies have demonstrated that corticosteroid injections can lead to significant short-term improvements in symptoms such as pain, numbness, and tingling. In a systematic review of randomized controlled trials, up to 70% of patients reported symptomatic improvement within 1 to 3 weeks following a corticosteroid injection, with relief lasting for several months in many cases. The efficacy of corticosteroids is thought to stem from their potent anti-inflammatory properties, which help reduce swelling in the carpal tunnel and alleviate pressure on the median nerve. This reduction in inflammation improves nerve conduction and relieves the discomfort associated with CTS. The ability to perform daily activities and return to work was also reported to improve in patients receiving corticosteroid injections, with several studies noting enhanced grip strength and a reduction in the need for pain medications. While short-term relief is well-documented, the long-term effectiveness of corticosteroid injections for CTS remains controversial. Many studies suggest that while the initial response to corticosteroid injections is favorable, the symptoms often recur within a few months. A 2018 meta-analysis reported that, while corticosteroid injections were effective in providing relief for up to 3 months, the benefits typically declined over time, and a significant portion of patients experienced a return of symptoms after 6 months to 1 year [8].

Repeated corticosteroid injections may provide extended relief, but this approach comes with diminishing returns. Several studies have noted that multiple injections over time can result in decreased effectiveness, with each subsequent injection providing less symptom

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relief. Additionally, recurrent injections can increase the risk of nerve damage, tendon weakening, and cartilage deterioration, particularly when used inappropriately or too frequently [9]. Although corticosteroid injections are generally considered safe for short-term use, they are not without potential risks. Side effects such as pain at the injection site, infection, allergic reactions, and tendon rupture have been reported, though these are rare. Repeated corticosteroid use can lead to potential complications like soft tissue atrophy, joint instability, or increased risk of recurrence. In patients with diabetes, corticosteroids can also cause temporary elevations in blood glucose levels, which requires careful monitoring. Furthermore, some studies suggest that multiple injections over a long period may contribute to a higher likelihood of CTS recurrence. Given these risks, corticosteroid injections should be used judiciously, and patients should be monitored closely for any adverse effects. The use of corticosteroid injections is often part of a broader, multi-modal approach to treating CTS. Many studies suggest that combining corticosteroid injections with other conservative treatments, such as wrist splinting, physical therapy, and ergonomic modifications, can enhance overall outcomes. For example, wearing a wrist splint at night can help maintain a neutral wrist position, reducing the risk of nerve compression during sleep and complementing the anti-inflammatory effects of the injections.

In cases where conservative treatments fail, corticosteroid injections can serve as a bridge to more invasive interventions, such as surgical decompression. In fact, some studies indicate that corticosteroid injections can help reduce the severity of symptoms and potentially delay the need for surgery, allowing patients to continue with non-surgical management for longer periods. Corticosteroid injections are generally recommended for patients with mild to moderate CTS who have not responded adequately to conservative measures, such as activity modification, splinting, or non-steroidal anti-inflammatory drugs (NSAIDs) [10]. They are particularly beneficial in cases where there is significant inflammation or nerve irritation but no severe damage to the median nerve. For individuals with severe CTS or those who show irreversible nerve damage, corticosteroid injections are less likely to provide long-lasting relief, and surgical intervention may be more appropriate. The decision to administer corticosteroid injections should be based on the severity of symptoms, the duration of the condition, and the patient's response to previous treatments. In recent years, there has been growing interest in alternative treatments to corticosteroid injections, such as platelet-rich plasma (PRP) therapy, stem cell injections, and nerve hydrodissection. Preliminary studies on these therapies suggest promising outcomes, but further research is needed to determine their long-term efficacy and safety compared to corticosteroids. Non-invasive treatments like ultrasound-guided therapy and laser therapy are also being explored, particularly for their potential in reducing inflammation and improving circulation in the carpal tunnel.

Conclusion

Corticosteroid injections are a widely used and effective treatment option for providing short-term relief from the symptoms of Carpal Tunnel Syndrome (CTS), particularly for patients with mild to moderate cases. These injections work by reducing inflammation within the carpal tunnel, decreasing pressure on the median nerve, and alleviating symptoms such as pain, numbness, and tingling. Many patients experience significant improvements in function and quality of life following corticosteroid injections, with relief often occurring within a few weeks. However, the long-term effectiveness of corticosteroid injections remains limited, as symptoms often recur within a few months. Repeated injections may provide temporary relief but can be less effective over time and may increase the risk of side effects such as nerve damage, tendon weakening, and soft tissue atrophy. Therefore, corticosteroid injections are best used as part of a comprehensive treatment plan, in combination with other conservative measures like wrist splinting and physical therapy, and for patients who have not responded to other treatments. For patients with severe CTS or those with persistent nerve damage, surgical intervention may ultimately be required, as corticosteroid injections are less likely to offer lasting relief. The decision to use corticosteroid injections should be carefully considered based on the severity of the symptoms, the patient's response to previous treatments, and potential risks associated with repeated use. In conclusion, corticosteroid injections are a valuable non-surgical treatment option for managing CTS, providing effective short-term symptom relief, but they should be used judiciously and monitored closely to minimize risks and optimize patient outcomes. Further research into long-term alternatives and adjunct therapies, such as platelet-rich plasma (PRP) or surgical decompression, may offer additional solutions for patients with more chronic or severe cases of CTS.

Acknowledgement

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Conflict of Interest

None

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