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THE ROLE OF CORTICOSTEROID INJECTIONS IN SPORTS MEDICINE – ARTICLES REVIEW

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ABSTRACT

Research objectives: This article analyzes the use of corticosteroid injections in the treatment of various musculoskeletal injuries in athletes considering both benefits and risks. Efficacy of this kind of treatment was analyzed for most common injuries mentioned in the literature including: rotator cuff disorders, tendinopathy, carpal tunnel syndrome, tennis elbow, knee osteoarthritis, and femoroacetabular impingement (FAI) syndrome.

Methodology: For the purpose of this article, databases such as PubMed, PMC, Google Scholar, and Scopus were searched for relevant documents.

Results: Review of the literature shows differences between the outcomes in specific injuries, but most of them show effective short-term pain reduction with corticosteroid injections. It is important to draw extra attention to other forms of therapies such as physical therapy, which combined with steroid injections improve patient outcomes.

KEYWORDS

Corticosteroids, Musculoskeletal Injury, Tendonitis, Sports Medicine, Injection Therapy

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Introduction

Corticosteroid injections are a common medical treatment used to alleviate inflammation, pain, and discomfort caused by various conditions, such as arthritis, tendinitis, and other musculoskeletal disorders (Monseau & Singh Nizran, 2013; Olafsen, Herring, & Orchard, 2018; Yaftali & Weber, 2019). These injections provide a strong anti-inflammatory medicine straight into the affected area, providing targeted relief (Barnes, 1998). Corticosteroids can provide significant therapeutic benefits, but they also carry dangers and potentially serious side effects (MacMahon, Eustace, & Kavanagh, 2009). Understanding how corticosteroid injections work, when they are suggested, and what patients can expect throughout the procedure is critical for making informed healthcare decisions.

Methodology

For the purpose of writing this paper, we searched databases such as PubMed, PMC, Google Scholar, and Scopus for relevant documents. Articles were narrowed to English-only, considering humans, and preprints were excluded. Keywords such as corticosteroid, injection, injury, treatment, musculoskeletal, and sports were used for the search. The information was then summarized and written as an overview.

Molecular Actions of Steroids

Steroids have a wide range of structures, functions, and effects. Steroid molecules differ primarily because of alterations to the functional groups linked to their carbon rings. Mineralocorticoids, like aldosterone, regulate water and electrolyte physiology, while glucocorticoids, like cortisol, regulate inflammation and metabolism. There are numerous synthetically created ones in addition to those that are found in nature (MacMahon et al., 2009). Corticosteroids are commonly used since they are known anti-inflammatory medicines that provide medium-term alleviation of symptoms (Robinson, Keenan, & Conaghan, 2007; Ravaud et al., 1999). These medications mainly influence the activity of cytokines involved in inflammation (Barnes, 1998; Malemud, 2004; Schramm & Thorlacius, 2004). It results in the immune system's downregulation, suppressing cell-mediated immunity, reducing cellular accumulation at inflammatory locations, and lowering vascular responses (Barnes, 1998; Eymontt, Gordon, Schumacher, & Hansell, 1982). Corticosteroids can influence extracellular matrix synthesis, collagen production and placement, development

of scars, and tenocyte proliferation and survival (Wong, Tang, Fu, Lee, & Chan, 2004). By preventing nociceptive transmission, corticosteroid injections typically reduce pain while also reducing inflammation and increasing joint mobility; additionally, smooth muscle cells' vasoconstrictor action lowers nitric oxide synthesis and may lessen discomfort (Olaussen, Holmedal, Lindbaek, Brage, & Solvang, 2013; Suzuki, Nakamura, Moriya, & Sasano, 2003).

Risks of Corticosteroid Injections

When it comes to musculoskeletal diseases, there are a number of documented contraindications to using corticosteroid injections. These could be organized into two groups: absolute contraindications and relative contraindications. The first group contains local or intraarticular sepsis; bacteremia, intraarticular fracture, and instability of the joint. The second group includes coagulopathy, severe juxtaarticular osteoporosis, and joint injections three times that year or within six weeks. The two primary issues are the development of sepsis in a joint during the procedure or the aggravation of pre-existing sepsis in a joint (MacMahon et al., 2009). The number of known side effects correlated with corticosteroid injections is presented as follows:

- Post-injection “flare”—the most common side effect which is a local increase in inflammation that appears within hours and can last for 2–3 days. If severe, this flare could be challenging to distinguish from sepsis.

- Atrophy of the local tissues (e.g., subcutaneous fat atrophy).
- Tendon rupture.
- Cartilage damage.
- Skin depigmentation.
- Muscle loss.
- Elevated blood glucose levels and flushing (MacMahon et al., 2009; Price, Sinclair, Heinrich, & Gibson, 1991).

Even though there are plenty of side effects, the low frequency of significant adverse events after corticosteroid injection suggests an acceptable risk. Usually injections are safe and physicians decide to administer corticosteroids, sometimes even periodically (Arnett et al., 2016; Coombes, Bisset, & Vicenzino, 2010; Marmura & Silberstein, 2014; Wipparman & Goerl, 2016). Additionally, the increased recurrence rate could be due to the drug use and aggressive rehabilitation associated with it (Schwartz, Watson, & Hutchinson, 2015).

Literature Review Results – Efficacy of Corticosteroid Injections for Common Sports Injuries

Rotator Cuff Disorders – A multicenter randomized controlled trial showed no long-term benefit from subacromial corticosteroid injections. Compliance with injection had no meaningful effect on the primary result. Except for the 8-week mark, when the injection led to improvements in shoulder pain, shoulder function, health-related quality of life, sleep disturbance, return to desired activities, and overall impression of treatment, there was no difference between corticosteroid injection and no injection for secondary outcome measures (Hopewell et al., 2021). Other research found patients with chronic subacromial bursitis who were treated with corticosteroid injection or with injections combined with physiotherapy performed better than those who received physiotherapy alone. However, the recurrence rate was lowest in the physiotherapy group. There was a significant statistical difference between groups in shoulder flexion and patient opinion of therapy impact. A comparison of time and group interactions indicated substantial statistical differences in pain score, external rotation, and patient perception of treatment outcome (Hsieh, Kuo, Huang, Liu, & Hsieh, 2023).

Article considering treatment of adhesive capsulitis of the shoulder concluded that injections of intra-articular corticosteroids reduce pain in the early stages of the disease. There was a noticeable decrease in shoulder pain after 6 and 12 weeks but not at 26 weeks (Redler & Dennis, 2019). In comparison, a retrospective longitudinal study on the topic showed that early injection improved adhesive capsulitis results in both short- and long-term follow-ups. They assume that if pain persists despite conservative treatment, injection in the early stages can assist in shortening the natural course of the disease (Ahn et al., 2018).

Meta-analysis compared the effects of treatment in rotator cuff disease, indicating that corticosteroid injections are more effective in the short term, whereas platelet-rich plasma is better for long-term rehabilitation. However, there was no difference in midterm efficacy between the two groups (Peng et al., 2023). Other research on injections of platelet-rich plasma and corticosteroids has shown conflicting findings (Chu & Rho, 2016). The Dutch Orthopaedic Association recommends considering injections for severe pain in subacromial pain syndrome throughout the first eight weeks, if feasible, under the supervision of

ultrasonography. They also do not advise utilizing corticosteroid injections as a stand-alone, long-term treatment (Diercks et al., 2014). Furthermore, there is disagreement over ultrasound-guided injections use in practice, as there was no discernible difference in accuracy between unguided and ultrasonography-guided subacromial injections (Rutten, Maresch, Jager, & Malefijt, 2007).

Tendinopathy – A systematic review concluded that non-corticosteroid injections may be more advantageous for the long-term management of lateral epicondylalgia, even though corticosteroid injections are beneficial in the short term and may be recommended for individuals who seek a quick improvement (Coombes et al., 2010; Olausson et al., 2015). However, due to differences in effect between sites of tendinopathy, the response to injection should not be generalized (Coombes et al., 2010). In comparison, lateral epicondylitis treated with extracorporeal shock wave therapy (ESWT) provided better outcomes in the following months than corticosteroid injections, so combining the injection with another long-acting treatment (such as ESWT) may increase the benefits for the patient (Tonks, Pai, & Murali, 2007; Yalvaç, Mesci, Geler Külcü, & Volkan Yurdakul, 2018; Çetin et al., 2024).

In the treatment of Achilles tendinopathy, corticosteroid injections in combination with exercise therapy produced better results than placebo injections and exercise therapy. This combination should be considered for the treatment of long-term Achilles tendinopathy. These results imply that corticosteroid injections are helpful when paired with exercise therapy (Johannsen et al., 2022). Steroid injections are recommended for patients with calcific tendinopathy of the shoulder when the goal of treatment is a short-term relief of symptoms. The question of whether this short-term benefit is balanced by increased recurrence rates and lower rates of recovery, as observed in prior trials, remains open (Bisset et al., 2006; Coombes et al., 2010).

In contrast, in patients with calcific rotator cuff tendinopathy of the shoulder, there was no benefit to ultrasound-guided lavage with a corticosteroid injection or sham lavage with a corticosteroid injection as compared to sham therapy (Moosmayer et al., 2023). For gluteal tendinopathy, exercise had a greater therapeutic success rate than corticosteroid injection in both the short and long term. In terms of pain intensity, exercise-based therapies and corticosteroid injections had comparable effects (Patricio Cordeiro, Rocha, & Scattone Silva, 2024). Other studies indicate that the effects of corticosteroid injections in gluteal tendinopathy are positive in the short term, but their benefits seem to decline after 3 and 6 months (Ladurner, Fitzpatrick, & O'Donnell, 2021; Mellor et al., 2018).

Carpal Tunnel Syndrome – There is growing evidence that local corticosteroid injections for carpal tunnel syndrome are an effective treatment. Injections can postpone the need for surgery for a year and offer comfort for more than a month. Surgical decompression should be an option for patients with severe carpal tunnel syndrome or whose symptoms have not subsided following four to six months of conservative treatment. After six months, another injection in the same wrist can be available. Another round of therapy or surgery should be suggested if symptoms return after two injections (Wipperman & Goerl, 2016).

Tennis Elbow – Given the high recurrence rates and counterintuitive reversal of the corticosteroid injection's notable short-term benefits after six weeks, it is suggested that this treatment needs to be used cautiously when treating tennis elbow. Because corticosteroids relieve pain quickly, people may become more active and overwork their afflicted elbow, which could explain the high recurrence rate. At 52 weeks, physiotherapy outperformed injection for all outcome measures, and wait-and-see outperformed corticosteroid injection on general improvement (Bisset et al., 2006).

Knee Osteoarthritis – Comparison of many injectable treatments in meta-analysis revealed that in terms of reducing pain and enhancing joint function, intra-articular injections of platelet-rich plasma and platelet-rich plasma + hyaluronic acid outperformed corticosteroids, hyaluronic acid, and a placebo after 3, 6, and 12 months of follow-up. However, no significant differences between corticosteroids, hyaluronic acid, and placebo were discovered (Qiao et al., 2023).

Femoroacetabular Impingement (FAI) Syndrome – The specific purpose of intra-articular steroid injections is still unknown, and there is little data to assist practitioners. Injections are typically used for one of four purposes: diagnostic, prognostic, therapeutic, or to buy time while the natural course of hip pain plays out. A prospective study performed at Rady Children's Hospital, USA, observed notable improvements in patients' success scores between one and two years following steroid injection. Results indicate that around

50% of individuals who require an injection will not proceed to surgery. Because of this, almost all patients with FAI syndrome have had a single steroid injection at the mentioned institution before undergoing surgery (Pennock, Bomar, Johnson, Randich, & Upasani, 2018).

Conclusions and Discussion

Corticosteroid injections are still widely used treatment for various musculoskeletal injuries. Most of the research papers show effective short-term pain reduction. A growing body of knowledge also drives our attention to alternative treatment in some of the conditions, which appears to have better outcomes than corticosteroid injections, especially in long-term. Corticosteroids alone are not generally a long-term solution, but rather in conjunction with other therapies such as physical therapy, pain management, or surgery if necessary. In conclusion, corticosteroid injections are an effective tool for treating inflammation and pain in a variety of conditions, but they must be used with caution due to potential side effects, particularly with prolonged use.

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