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CORR Insights

CORR Insights®: Corticosteroid Injections Give Small and Transient Pain Relief in Rotator Cuff Tendinosis: A Meta-analysis

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Where Are We Now?

I commend the authors of the current study for reviewing a topic that I believe is not often discussed, but should be. The question of whether we should inject patients with cortisone is one that has the impact to change clinical practice. In the world of orthopedics, there are surgeons who inject everyone, only older patients, specific diagnoses, or nobody. Those surgeons who inject everyone have several beliefs including that cortisone is rather harmless, it is effective, and if it does not work, then there is always surgery. Those who avoid it entirely point to the potential risks, and instead lead patients towards less-studied alternatives for the rotator cuff such as platelet-rich plasma or stem cells. Still, others may limit their injections only to those who already have evidence of osteoarthritis, with the belief that the die has already been cast when it comes to the status of the cartilage.

The geography of patient demand may also play a role. For example, a surgeon in the Midwestern United States may see a farmer who only wants to visit the doctor once or twice a year for a knee injection and has no interest in an MRI or physical therapy. In southern California, a 49-year-old semiprofessional volleyball player may want an injection before an upcoming tournament since that has been the volleyball player's routine for years. Injection patterns also vary from the private practice to the academic setting, where financial considerations and reimbursements differ. In private practice, increased overhead and decreased reimbursement may force physicians to rely on cortisone injections as a source of revenue, which can be further bolstered with the use of ultrasound.

We know that cortisone injections have an effect on the health of cartilage—at least at the cellular level. There are time- and dose-dependent effects of corticosteroids on articular cartilage within the basic science and animal model literature [4]. These types of studies show that the beneficial effects of corticosteroids occur at lower doses and shorter culture durations. Increased cell growth and recovery from damage occurs around less than 2-mg to 3-mg per single dose or 8-mg to 12-mg per cumulative total dose. However, at higher doses and

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longer culture durations, corticosteroids are associated with gross cartilage damage and chondrotoxicity, occurring around greater than 3-mg per single dose or 18-mg to 24-mg per cumulative total dose [4].

More recent studies [1, 2] investigated the biomechanical effects of corticosteroid exposure on both uninjured and injured rotator cuff tendons in rats. Mikolyzk and colleagues [2] showed a maximal load decrease of 27% and a stiffness decrease of 32% in intact uninjured tendons after a single injection. The study by Maman and colleagues [1] demonstrated a noteworthy decrease in the strength of normal uninjured rat rotator cuff tendon 1 week after exposure to repeated corticosteroid injections. Maximum load decreased by 32% and stiffness by 50.5%. Although the effects seem to be more substantial for intact tendons, both studies found serious deleterious effects of corticosteroid injections on the biomechanical properties of injured rotator cuff tendons as well.

Where Do We Need To Go?

In order to fully understand the clinical implication of cortisone injections, we need to take our analysis of the detrimental effects on tendons and/or cartilage to the next level. While some physicians heed the warnings of basic science studies, others need more convincing. Histological evaluation after cortisone injection or MRI studies of human or animal models may hold the key to understanding the effects and potential dangers of cortisone. A long-term study connecting tendon deterioration and/or tearing as well as cartilage thinning and/or loss would certainly give pause to those physicians who injection cortisone regularly. On the other hand, if there is no clinical or animal model evidence of deterioration over the long-term, then perhaps the warnings are best left at the laboratory bench.

When specifically discussing the topic of cortisone injections for rotator cuff tendinosis, it should be clarified exactly what rotator cuff "tendinosis" means. Reviews of this topic may lump many aspects of rotator cuff pathology other than complete tears together. Yet, there may differences between "tendinosis" and "impingement". Tendinosis may refer simply to histological or imaging deterioration of the tendon, while impingement may refer to pain generated from an inflamed bursa or tendon that pinches underneath the acromion as the humeral head is elevated.

I propose that one might further distinguish between tendonitis with and tendonitis without impingement. Impingement would require positive impingement signs on examination such as the Neer and Hawkins tests, whereas tendonitis may simply be inflammation of the tendon, such as supraspinatus tendonitis on resisted abduction or the Jobe test.

With these distinctions, we may better be able to assess who will benefit from cortisone injections. In my practice, I see more patients with what I would describe as tendonitis with impingement, but there are a few patients who present with rotator cuff inflammation without impingement signs on exam. It is my view that these patients may benefit less from a cortisone injection. I am also quick to counsel patients that when treating impingement, the real long-term solution is physical therapy and that the injection is to help them perform the physical therapy.

How Do We Get There?

To better understand the deleterious effects of cortisone injections, one study option would be to longitudinally follow either human or animal models for a period of time in order to determine if there is evidence of deleterious effects such as tendon tears or degenerative joint disease. Of course, direct causation may be hard to connect in the human given the additional variables involved, but certainly it would be of considerable interest to

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the orthopaedic community. More immediate evidence may be found in histological analysis or imaging analysis such as MRI, observing water content, or ultrastructure via specific spin sequences. Currently, there are no well-studied MRI spin sequences looking at tendon ultrastructure, but there are some for cartilage ultrastructure [3]. Ultrasound may also offer insights into in-vivo tendon ultrastructure.

As in many longitudinal studies of this kind, long-term followup is difficult. If patients feel better, they often do not return. However, if we are looking at shorter-term followup, an MRI prior to injection and an MRI several weeks after an injection may be agreeable to the patient. Since most patients expect the first MRI, one additional MRI is unlikely to be considered a burden. Further, patients who present with rotator cuff tears can be retrospectively reviewed or prospectively followed as to how many injections and how often they had injections in the past. Finally, those patients presenting with partial rotator cuff tears can be followed with or without injections for symptom and tear progression.

Unfortunately, like many areas of orthopaedics, the risks and benefits of some procedures such as cortisone injections are anecdotal and not studied in the long-term. As orthopaedics continues to evolve, so should our self-reflection. With well-designed studies, we can potentially answer the questions of whether certain procedures we are doing are actually best for the patient.

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