

Injection Therapies for Rotator Cuff Disease



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KEYWORDS

- Injection • Therapy • Rotator cuff • Calcific tendinitis • Corticosteroid • Prolotherapy
- Platelet-rich plasma • Stem cell

KEY POINTS

- Numerous injection therapies have been used for the treatment of rotator cuff disease, including corticosteroid, prolotherapy, platelet-rich plasma, stem cells, and ultrasound-guided barbotage for calcific tendinitis.
- Although the cornerstone of injection therapy consists of administration of corticosteroids, its efficacy remains debatable in terms of pain relief, improvement in range of motion, and return of shoulder function.
- Existing evidence on prolotherapy, platelet-rich plasma, and stem cell injection therapies for the treatment of rotator cuff disease remains limited.
- Ultimately, improved understanding of the underlying structural and compositional deficiencies of the injured rotator cuff tissue is needed to identify the biological needs that can potentially be targeted with injection therapies.

INTRODUCTION

Shoulder pain is common among the general population, with a reported prevalence of 6.9% to 34.0%,¹ and comprises the third leading musculoskeletal complaint behind back and neck complaints as reasons for physician consultation.² Rotator cuff disease accounts for a large proportion of shoulder complaints, especially with increasing age.^{3–5} Depending on the patients' precise pathologic conditions, age, activity level, symptoms, level of dysfunction, and findings on physical examination and imaging, a wide variety of treatment modalities have been described for rotator cuff disease. Nonoperative modalities include activity modification, nonsteroidal antiinflammatory drugs (NSAIDs), physical therapy, and various injection therapies. Operative management is generally reserved for select patients or when nonoperative modalities have been exhausted.

Historically, the injection therapy of choice was corticosteroids; however, more recently numerous other injectable therapies have been

used for rotator cuff disease, including platelet-rich plasma (PRP), stem cells, and prolotherapy. The purpose of this review is to summarize the current evidence for each type of injection therapy reported in the relevant literature. Although injection therapies are also frequently used in other shoulder conditions, such as adhesive capsulitis (frozen shoulder) and osteoarthritis, these conditions are not discussed in this review.

INDICATIONS

Injections can be used for both diagnostic and therapeutic purposes in rotator cuff disease. For patients presenting with shoulder pain, history and physical examination alone is frequently diagnostic. However, when patients present with shoulder weakness and are unable to participate in a thorough examination because of pain, a subacromial injection consisting of local anesthetic with or without corticosteroids will aid in differentiating between weakness caused by impingement (with improvement in strength

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after injection) or true rotator cuff tear (no change in strength after injection). From a therapeutic standpoint, injections for symptom relief are generally offered for patients with significant symptoms unrelieved by a trial of NSAIDs. The diagnoses in which injection therapies are frequently used are subacromial impingement, degenerative rotator cuff tendinopathy, and calcific tendinitis.

Subacromial impingement is a common diagnosis that represents a spectrum of severity from bursitis to rotator cuff tendinopathy to full-thickness tears, which comprise the 3 Neer stages of the impingement process.⁶ The subacromial space refers to the area between the coracoacromial arch and the humeral head where the supraspinatus tendon and biceps lie.³ The pathology in subacromial impingement originates from compression of the rotator cuff against the lateral acromion most prominently during the arc of shoulder abduction leading to bursitis and cuff inflammation.⁷ Predisposing structural factors to subacromial impingement include a type III or hooked acromion,^{8,9} acromial spurs as a result of ossification of the coracoacromial ligament insertion,¹⁰ and acromioclavicular joint arthritis.¹¹ When symptoms are consistent with subacromial impingement and there is absence of acute injury or radiographic findings, patients may be indicated for a subacromial injection.³ Alternatively, intrinsic rotator cuff tendinopathy leading to thickening of the rotator cuff is also thought to contribute to subacromial impingement and can itself be a cause of shoulder pain. Intrinsic causes of rotator cuff tendinopathy include diminished vascular supply, age-related degeneration, and tensile forces leading to mechanical failure.⁶

Calcific tendinitis is another common rotator cuff condition that should be discussed as a separate entity from subacromial impingement and degenerative rotator cuff tendinopathy. The term *calcific tendinitis* refers to calcium deposition, predominately in the form of hydroxyapatite in the rotator cuff tendons, most frequently the supraspinatus.^{12,13} Calcific tendinitis is reported to occur in 2.5% to 7.5% of healthy shoulders, preferentially affecting women and patients in the fifth decade of life.¹⁴ Symptomatically, patients may have a range of presentations from subacute to acute shoulder pain depending on the stage of the disease and the body's immune response to the calcific deposits and, rarely, fevers due to rupture of calcifications into local tissue. Calcific tendinitis is thought to be a self-limited disease that is generally managed with physical therapy and NSAIDs; however, for severe cases, pain

and dysfunction can become significant, warranting more invasive treatment modalities, such as ultrasound-guided barbotage.¹⁵

CORTICOSTEROIDS

Corticosteroid injections are widely used in orthopedics and general practice and traditionally have been the cornerstone injection therapy in a variety of shoulder conditions.¹⁶ A survey showed that 96% of practitioners, including primary care physicians and physiatrists, think that subacromial corticosteroid injections are efficacious in managing rotator cuff tendinitis.¹⁷ Frequently used corticosteroids in the literature are methylprednisolone and triamcinolone, which are thought to have equivalent potency, followed by betamethasone and dexamethasone, which are proportionally more potent than both methylprednisolone and triamcinolone and, thus, are administered in smaller doses.^{16,18,19} Most of the literature on injection therapies for rotator cuff disease focuses on corticosteroids; however, although some studies have reported efficacy in reducing pain and improving function, there is little reproducible evidence.

Historical studies from the 1980s and 1990s reported conflicting results regarding the efficacy of subacromial steroid injection over NSAIDs with respect to improvement in pain, function, or range of motion (ROM), as reported in a 2003 Cochrane systematic review.¹⁹ Although several studies report a benefit of subacromial steroid injection over placebo at short-term time points (4–6 weeks), there was significant heterogeneity among populations and methodologies, precluding pooled analysis across various studies. Of note, a 1990 double-blinded randomized controlled trial (RCT) by Adebajo and colleagues²⁰ reported an improvement in visual analog scale (VAS) pain score of 3.6 points and an improvement active abduction of 45° versus control at the final follow-up in patients receiving triamcinolone versus placebo injection, both of which were statistically and clinically significant. A similar study by Petri and colleagues²¹ reported statistically significant improvements in pain scores as well as an improvement in active shoulder abduction of 28°. A 1996 double-blind RCT by Blair and colleagues²² corroborated this trend, reporting a 14° improvement in forward elevation compared with controls at 28 weeks. However, numerous other studies have reported no statistical differences in pain scores, ROM, or functional scores compared with placebo.^{23–26} A Cochrane

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