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Does chondrolysis occur after corticosteroid-analgesic injections? An analysis of patients treated for adhesive capsulitis of the shoulder

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Background: Clinical studies using continuous infusions of local anesthetics and basic science studies that model injections of local anesthetics have shown chondrotoxicity. However, clinical studies do not exist that have assessed for the risk of chondrolysis in nonarthritic joints exposed to single or intermittent corticosteroid or analgesic injections. Currently, there are no data available to guide the clinician on the safety of using these injections in clinical practice.

Materials and methods: A retrospective review of patients treated for adhesive capsulitis of the shoulder with at least 1 intra-articular injection of a corticosteroid and anesthetic was performed. The inclusion criteria were a diagnosis of adhesive capsulitis and a minimum 2-year follow-up. Prospective follow-up was performed to obtain patient-determined outcome scores, range of motion, and radiographs to determine the presence of chondrolysis.

Results: Fifty-six patients with a mean age of 52.5 ± 7.2 years were enrolled at a mean follow-up of 54 months. The mean number of injections performed was 1.5 ± 0.7 (range, 1-4). At final follow-up, the mean Western Ontario Osteoarthritis of the Shoulder score was 91.4% ± 14.2%; Disabilities of the Arm, Shoulder and Hand score, 6.7 ± 9.6; Shoulder Pain and Disability Index score, 7.4 ± 11.4; and Single Assessment Numeric Evaluation score, 92.7% ± 10.1%. The Shoulder Activity Score was 8.3 ± 4.7. Passive and active forward elevation, external rotation, internal rotation, and cross-body adduction showed no significant differences compared with the unaffected contralateral shoulder. There was no radiographic evidence of chondrolysis in any patient.

Conclusions: This study did not show chondrolysis in patients treated with an intra-articular corticosteroid and local anesthetic for adhesive capsulitis. The findings of this study do not support the cessation of using intra-articular analgesic-corticosteroid injections for the treatment of adhesive capsulitis.

Level of evidence: Level IV; Case Series; Treatment Study

Keywords: Chondrolysis; corticosteroid; analgesic; injection; adhesive capsulitis

Adhesive capsulitis, or frozen shoulder, is a common orthopedic condition that affects the shoulder.[25] It is characterized by the spontaneous onset of shoulder pain and global limitation of both active and passive shoulder motion.[41] Although

Institutional Review Board approval was obtained for this study (Protocol No. 2012.038).

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adhesive capsulitis has been thought of as a self-limiting disorder with spontaneous resolution,[40] multiple studies suggest that (1) the time to resolution can be quite prolonged (up to 2 years[25,32,40]) and (2) many patients have continued long-term shoulder disability after the active disease process has resolved.[10,32,42,45,79,92,94,99] Specifically, patients have been found to have limited range of motion without pain,[10,32] limited range of motion with pain symptoms,[42,92,94,99] weakness,[94] and persistent symptoms as determined by subjective patient outcome scores.[42,45]

Few patients are willing to wait up to 2 years for this painful condition to resolve spontaneously. Therefore, many patients undergo therapeutic interventions to provide them with faster and more complete pain relief and return of full range of motion. Treatments for adhesive capsulitis include physical therapy,[10,11,20,21,28,32,42,46,62,64,65,67,70,80,85,92,99,106] intra-articular corticosteroid injections,[10,11,20,21,41,55,61,62,64,65,67,69,80,81,83,85,106] subacromial space corticosteroid injections,[20,81,85,92,99] oral corticosteroids,[17,19,64] intra-articular sodium hyaluronate,[61] intra-articular botulinum toxin injections,[56] arthrographic distension,[18,46] suprascapular nerve blocks,[26,55] and surgical intervention including manipulation under anesthesia and open or arthroscopic capsular releases.[9,42,46,80,99]

In our treatment of patients with adhesive capsulitis, we have adapted an algorithm similar to that of Marx et al[67] combining physical therapy and an intra-articular injection of a corticosteroid (80 mg of methylprednisolone acetate) combined with a local anesthetic (1% lidocaine and/or either 0.5% or 0.25% bupivacaine). Multiple other studies have also used a mixture of a corticosteroid and local anesthetic injected intra-articularly for the treatment of adhesive capsulitis.[20,55,61,64,65,67,81,83,107] In addition, intra-articular injections of a local anesthetic or corticosteroid (or both) are universally accepted in the treatment of osteoarthritis and other disorders.[6,35,66,73]

Recently, there has been growing concern about the deleterious effects of local anesthetics on articular cartilage. There have been multiple clinical reports that have found an association of continuous intra-articular infusions of 0.5% or 0.25% bupivacaine or 1% lidocaine with chondrolysis after both knee and shoulder arthroscopy.[1,2,5,36,38,48,68,72,77,86,89,95,102] There are an increasing number of basic science studies that have shown that 0.5% and 0.25% bupivacaine, 1% and 2% lidocaine, and 0.5% ropivacaine are chondrotoxic in vitro.[15,23,24,31,37,43,44,57,76,96] In addition, basic science studies that specifically examined the in vitro effects of single injections of local anesthetics, corticosteroids, or the combination of the 2 showed significant chondrotoxicity.[8,14,22,29,30,35,90,96] Several other studies have suggested that the combination of a corticosteroid and local anesthetic may have a synergistic effect on chondrocyte death.[14,35,90] One study exists that suggested that 0.5% bupivacaine is toxic to synoviocytes, which may be an indirect cause of chondrolysis as well.[13]

The findings that analgesics can be chondrotoxic should be of concern to clinicians who currently use intra-articular injections for both arthritic and nonarthritic conditions. To date, there are few data available to guide the clinician regarding the safety of using isolated or intermittent corticosteroid-analgesic injections. At this point, it is unknown whether single or intermittent injection can cause chondrolysis. Anecdotally, it has been suggested that single or intermittent intra-articular injections of a corticosteroid or local anesthetic (or both) do not cause clinically apparent deleterious effects to the articular cartilage.[2,31,37] There have been clinical studies examining the radiographs of patients with osteoarthritis who received repeated corticosteroid injections that found that there were no detectable changes in the joint space.[7,78] However, to our knowledge, clinical studies do not exist that have assessed the risk of chondrolysis in nonarthritic joints with single or intermittent injections of a corticosteroid, local anesthetic, or the combination of the 2. It is essential to determine through clinical studies whether there are clinically or radiographically apparent deleterious effects of the intra-articular use of these injections to ensure that we are not iatrogenically harming our patients.[36,73,96]

The aim of this study was to determine whether there was radiographic or clinical evidence of chondrolysis with the use of an intra-articular corticosteroid and local anesthetic for the treatment of adhesive capsulitis. The hypothesis was that there would be no radiographic or clinical evidence of chondrolysis.

Materials and methods

In our treatment of patients with adhesive capsulitis, we have adapted a treatment algorithm similar to that of Marx et al.[67] Regardless of adhesive capsulitis stage,[69] on presentation, patients are offered a nonoperative treatment plan including an intra-articular injection of a corticosteroid (80 mg of methylprednisolone acetate) combined with a local anesthetic (1% lidocaine and/or either 0.5% or 0.25% bupivacaine). Patients then perform supervised outpatient physical therapy initially focusing on improving passive range of motion with progression to active range of motion, followed by strengthening, 2 to 3 times a week for 6 weeks. In addition, patients participate in a home program on the days they do not attend outpatient physical therapy. At 6 weeks, they return for evaluation to determine whether a repeat injection and further outpatient physical therapy are required. Further treatment is subjectively determined by both the senior physician and the patients based on the degree of pain relief and improvement in passive and active range of motion from the initial 6 weeks of treatment. Patients who require a repeat injection or further outpatient therapy return 12 weeks after presentation to determine whether further treatment is needed. At 12 weeks, if patients are not seeing a significant enough improvement in their symptoms, they are offered the opportunity to pursue an arthroscopic capsular release. Alternatively, patients can choose further nonoperative treatment with a repeat injection or further physical therapy (or both). If patients pursue further nonoperative treatment, they return to the senior