



Impingement syndrome: Temporal outcomes of nonoperative treatment

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Hypothesis: We prospectively studied patients with impingement syndrome to look at outcomes of nonoperative treatment on a temporal basis.

Materials and methods: Temporal outcomes of 100 consecutive patients treated for impingement syndrome were prospectively evaluated. All patients began a standardized, nonoperative treatment protocol consisting of a subacromial steroid injection, followed by physical therapy.

Results: Data were available on 94 patients at the final two-year follow-up assessment. Overall, 74 of 94 patients did not require surgery. In that group, the average American Shoulder and Elbow Surgeons (ASES) outcome score increased from 56 to 95, with an average decrease in the pain score from 4.8 to 0.6. Improvement was demonstrated in patient shoulder outcome scores (ASES score) and visual analog pain scores between treatment initiation and the one-year follow-up assessment ($p < .0001$); no improvement was identified past one year. Of the non-surgical patients, 22 continued to have some shoulder pain.

Conclusion: Of patients with impingement syndrome treated nonoperatively, 79% did not require surgery after two-year follow-up. Predictors of patients going on to surgical intervention included the total number of subacromial steroid/lidocaine injections and patient response to the initial subacromial injection. Of the patients not undergoing surgery, 30% continued to have some shoulder pain.

Level of evidence: Level 1; Prospective prognosis study, >80% follow-up.

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Impingement syndrome is a common diagnosis seen by orthopedic surgeons and primary care physicians.¹² Clinically, patients with impingement syndrome report pain located in the region of their shoulder and lateral aspect of their upper arm. Although this shoulder pain may occur at rest, it is typically exacerbated with elevation of the arm overhead.⁷ Physical examination classically demonstrates reproduction of patients' shoulder pain by raising their arm

into the impingement arc (70° to 120° arm elevation).⁷ A number of provocative tests have been described, each representing variations of this maneuver.^{5,7,8} From an anatomic standpoint, impingement syndrome refers to the supraspinatus tendon impinging on the undersurface of the anterior acromion as the arm is raised overhead.^{4,6,7}

It is important to note that different pathologic entities may coexist in patients with impingement syndrome.^{2,7,9} As an example, patients with subacromial bursitis, rotator cuff tendinopathy, partial rotator cuff tears, and even small full-thickness tears may all initially present to the clinician with a diagnosis of impingement syndrome. Therefore,

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although impingement syndrome represents the supraspinatus tendon impinging under the acromion, it does not necessarily define the extent of the underlying pathologic shoulder disorder. It is only after obtaining more data from a thorough physical examination, imaging tests, or arthroscopy that a more specific pathologic diagnosis becomes clear.⁹

Regardless of the underlying pathology, most patients who present with impingement syndrome respond favorably to nonoperative treatment, with previous studies having demonstrated success rates of approximately 70%.^{1-3,10} The goal of this study was to assess patient outcomes over time in a cohort treated with a standardized, best-practice, nonoperative treatment program. We hypothesized that patients with a clinical diagnosis of impingement syndrome would demonstrate temporal improvement after a subacromial steroid injection and a standardized physical therapy program. We also hypothesized that poorer outcomes would be observed in patients who presented with a higher pain score, longer history of symptoms, larger number of comorbid medical conditions, and those requiring multiple subacromial steroid injections to control their symptoms.

Materials and methods

Data were collected prospectively on a cohort of 100 consecutive patients treated by a single surgeon for a diagnosis of impingement syndrome. Inclusion criteria were a diagnosis of impingement syndrome in patients between the age of 35 and 65 years. The diagnosis of impingement syndrome was determined from the history, physical examination, and response to a diagnostic subacromial injection. Specifically, patients reported a history of pain located in the lateral aspect of the shoulder and upper arm that was aggravated with overhead activities. Physical examination demonstrated reproduction of the shoulder pain with elevation of the affected shoulder into the impingement arc. All patients received a subacromial injection that included a local anesthetic and steroid. A positive response to the subacromial injection was defined as a 50% or greater reduction in pain during a repeat impingement test performed 10 minutes after the injection. Exclusion criteria included shoulder weakness that persisted after injection, significant coexisting shoulder pathology (ie, instability, acromioclavicular arthropathy, glenohumeral arthritis, adhesive capsulitis), cervical spine pathology, a history of shoulder injections, previous shoulder surgery, or involvement in a related worker's compensation claim or litigation.

All patients were treated with a standardized nonoperative treatment protocol that was deemed best practice from a literature review and surgeon experience. The nonoperative protocol consisted of a subacromial steroid injection, followed by a 4-week course of physical therapy. The subacromial injection was performed through a posterior approach, with the injectable solution consisting of a mixture of methylprednisolone acetate (volume, 1 mL; concentration, 40 mg/mL) and 1% lidocaine (volume, 4 mL; concentration, 10 mg/mL).

After the injection, all patients were given a prescription for a 4-week course of physical therapy with instructions for the

therapists to advance the patients to an exercise program at home. A standardized physical therapy program was used, with the therapists instructed to work within the patient's level of pain and with a gradual progression of exercises as tolerated. In particular, the therapists were instructed to address issues that included patient's posture, associated muscle spasm, overall shoulder mechanics, posterior capsular tightness, weakness of the rotator cuff, and periscapular musculature. All physical therapy facilities within the surrounding region were provided with the impingement syndrome physical therapy protocol.

At the initial assessment, data were collected on all patients' medical history as well as specific information pertaining to their shoulder pain, including onset, duration, and etiology. All patients also completed the validated American Shoulder and Elbow Surgeons (ASES) shoulder assessment form¹⁰ at the initial assessment as well as at the follow-up appointments at 6 weeks, 3 months, 6 months, 1 year, and 2 years. The final data point for the operative group was the last visit before surgery.

Also at the initial assessment, findings were recorded of a physical examination that evaluated shoulder motion, strength, and laxity. It also involved a number of tests to assess for alternative shoulder diagnosis to include labral tears, biceps tears, and acromioclavicular arthralgia. Patients were evaluated with radiographs of the affected shoulder. As part of the radiographic assessment, the acromion shape and morphology was recorded from the outlet radiograph as being flat, curved, or hooked. Further diagnostic testing with ultrasound scans, computed tomography (CT), or magnetic resonance imaging (MRI) was not routine at the initial evaluation. However, further imaging tests were performed in those who did not improve with nonoperative treatment.

During the course of the investigation, some patients required surgical treatment for the management of their shoulder pain and dysfunction. Surgical indications included failure to improve with a minimum of 3 months of nonoperative treatment. Surgery was also considered if additional diagnoses were identified during the treatment period (ie, rotator cuff tears) that were not appreciated by the treating physician at the initial assessment. Data for patients who underwent surgical management were collected at the time of the surgery. Those undergoing surgery were defined as having failed nonoperative treatment (negative outcome) for statistical purposes.

Statistical comparisons were made between those patients with a positive outcome and those with a negative outcome for their response to the nonoperative treatment protocol. Specifically, analyses were performed to determine if differences existed in age, sex, side affected, duration of symptoms before treatment, pain severity on presentation, number of coexisting medical conditions, number of injections, and acromial morphology. Continuous variables such as age were analyzed using 2-sided, 2-sample *t* tests; whereas, categorical variables such as coexisting medical conditions were analyzed with χ^2 tests.

A statistical evaluation was performed to assess patient outcomes for their pain response after the shoulder injection. Statistical analysis included descriptive statistics, 1-way analysis of variance (ANOVA) to assess the relationship between the VAS scores and ASES scores across time, and a logistic regression analysis to evaluate the relationship of the covariates to the outcome variable of surgery. All statistical analyses were done SAS 9.1 software (SAS Institute, Cary, NC). Statistical significance was set at a value of $P \leq .05$, with power set at 0.8.

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