Injections of the subacromial bursa with local anesthetic and anti-inflammatory steroids are frequently used in the diagnosis and treatment of pain about the shoulder. Further surgical interventions and procedures are often influenced by the result of this injection. When anesthetic injections are placed, they are assumed to affect only the structure being injected. Relief of pain is then assumed to mean pathology at the site of injection and surgical interventions are aimed at this site. However, the proximity of the acromioclavicular joint, the subacromial bursa, the glenohumeral joint, and the rotator cuff musculature make it possible that an injection intended for one structure may actually be placed in or affect an adjacent structure. Cadaveric studies have demonstrated a significant incidence of misplacement of subacromial injections as well as involvement of structures in addition to the subacromial bursa. If injections in patients are as inaccurate as in the cadaver model then less confidence can be placed in the diagnostic value of these injections.

The goal of this study was to determine the anatomical accuracy of injections of the subacromial joint through magnetic resonance imaging (MRI) with a subacromial injection including contrast media.

**Methods**

Thirty orthopaedic surgery clinic patients determined to require injections of the subacromial bursa for diagnosis or treatment of suspected shoulder pathology were identified and consented for this Clinical Investigation Department (CID) approved study at National Naval Medical Center, Bethesda, Maryland. All patients were injected by one of two authors who were Orthopaedic chief residents. Fifteen patients were injected from a posterolateral approach and fifteen from a direct lateral approach to the subacromial bursa. All patients received a solution consisting of 8 cc 1% lidocaine, 2 cc 40 mg/ml Kenalog, and 0.05 cc of gadopentetate dimeglumine. All patients received a limited sequence MRI within 20 minutes of the injection. A senior musculoskeletal radiologist independently reviewed the images to determine location of the contrast solution. Specifically, comments were made on the presence or absence of contrast in the subacromial space, acromioclavicular joint, rotator cuff substance, and glenohumeral joint.

Each subject received a complete shoulder physical examination prior to injection. A standard shoulder assessment form was utilized recording prior procedures, range of motion, strength, stability, and provocative testing. Patients were also asked to rate their pain on a visual analog scale. After the injection, the physical examination was performed noting any changes in range of motion or provocative tests. Patients again were asked to rate their pain on a visual analog scale. The clinician was asked to assess their confidence that the injection was in the subacromial space.

A power analysis was performed to determine the sample size. Success was determined by radiographic evidence of contrast material within the subacromial space expressed as a percentage of total studies performed. Each study was scored to one of three categories: hits of the intended structure, misses of the intended structure, and hits of the intended structure with infiltration of adjacent structures. These all are then expressed as a percentage of the total number investigated.

**Results**

The mean patient age was 41 years (range 20-64). Confidence of subacromial injection was high, with 72% “certain”, 28% “pretty sure”, and no “not sure (may have missed)”. Although 83% of the injections reached the subacromial bursa, most of these infiltrated other structures with contrast. 33% of the injections had contrast dorsal to the acromioclavicular joint. Contrast was visualized within the deltoid, glenohumeral joint, and subcutaneous tissues. Despite several injections outside of the subacromial space, all patients reported at least some improvement of their symptoms.

**Discussion**

In our study, 83% of injections were successfully placed in the subacromial space. This corresponds with previously described studies with cadaveric injections. Despite a high success rate, nearly all of these injections had extension into adjacent structures including the deltoid, rotator cuff, glenohumeral joint, and soft tissue envelope around the acromioclavicular joint. Physician confidence of the injection was high even in those patients whom had injections outside the intended site. All patients reported some improvement of their symptoms, despite errant injections. This study confirms a previous cadaveric study with regards to a potential for false-negative and false-positive results. If the injection misses the intended site (false-negative), then the patient may have no improvement or sub-optimal improvement of symptoms. This could result in denied surgical interventions that may improve the symptoms. Since nearly all injections had infiltration of adjacent structures not intended by the clinician (false-positive), an inappropriate intervention may be performed failing to address the etiology of the symptoms.

This study clearly shows that subacromial injections may be used by clinicians as part of the diagnostic evaluation, but should not be assumed diagnostic alone. If an injection fails to support the working diagnosis, consideration should be made to additional studies such as imaging or a repeat injection. Consideration may be given to repeat injection with contrast and immediate MRI for evaluation. It is imperative to caution patients to the side effects of a steroid injection including fat atrophy and tendon damage as extravasations and errant injections occur.

**Reference**

2. Cofield RH. Tears of the rotator cuff. AAOS Instr Course Lect 1981;30:258-73