Technical Note

Office-Based Needle Arthroscopy: A Standardized Diagnostic Approach to the Shoulder

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Abstract: In-office needle arthroscopy offers the potential advantage of reduced injury to intervention time, without the need for advanced imaging. It is particularly appropriate for those with contraindications to advanced imaging and also may reduce the risk of incorrect diagnoses in those situations in which imaging is associated with low sensitivity/specificity. The purpose of this article is to provide a standardized diagnostic approach to needle arthroscopy of the shoulder.

In-office needle arthroscopy is increasingly popular, but to the knowledge of the authors, a standardized approach for the diagnosis of shoulder pathology using this technology has not been described previously. The interest in doing so lies in the important advantages of in-office needle arthroscopy, over magnetic resonance imaging (MRI), as reported in the literature relating to diagnosis of knee pathology.[1] It is likely that these advantages also would be beneficial to those with shoulder-related symptoms because they include a reduced time from presentation to diagnosis and avoidance of the need for advanced imaging, particularly for those with contraindications to MRI/magnetic resonance arthrography (MRA), such as obesity, claustrophobia, pacemaker, and renal failure.

Reduced health care cost is also a potential advantage. MRI scans of the knee and shoulder have an average cost of $1047 in independent facilities and $1590 in hospital settings; these numbers increase by approximately $100 to $350 if MRA is used.[1] Office-based needle arthroscopy of the knee has been reported to provide average savings of $418 and $961 compared with independent facility- and hospital-based MRI use, respectively. Amin et al.[2] also just recently demonstrated that needle arthroscopy of the knee was more cost efficient with similar outcomes when compared with MRI for the diagnosis of meniscus pathology. It is anticipated that similar savings could be achieved in the diagnosis of shoulder pathology.

It is also likely that for diagnoses associated with a low sensitivity of MRI/MRA, such as SLAP tears and partial tears of the rotator cuff, that cost savings would be greater due to improved diagnostic accuracy achieved by direct visualization and avoidance of unnecessary diagnostic tests and/or incorrect treatment. In-office needle arthroscopy therefore offers an alternative diagnostic modality with potentially important advantages. The purpose of this article is to provide a standardized diagnostic approach to needle arthroscopy of the shoulder

Technique (With Video Illustration)

After informed consent from the patient is obtained, the office room is prepared for needle arthroscopy of the shoulder (Video 1). The disposable kit is prepared on a sterile field (Fig 1), including a 10-cc syringe of 1% lidocaine plain, Chlorhexadine scrub, the needle arthroscopy (Mi-Eye 2; Trice Medical, Malvern, PA) handpiece, a skin marker, 3 prefilled 30-cc syringes of sterile normal saline, and a band-aid. The patient is placed in either a seated or lateral decubitus position with sufficient room to allow easy accessibility to the

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Fig 1. Patient positioned in the seated position with the screen positioned where it can be easily seen by the physician and the patient, during needle arthroscopy of the right shoulder.

standard posterior shoulder portal location. An assistant is positioned in front of the patient toward the affected side. The display from the needle arthroscope is placed in easy sight for the physician and also the patient, should they wish to view the procedure (Fig 1). The patient will keep the affected shoulder in neutral position at the start of the procedure, but the arm should be kept free of obstruction to allow a full range of motion and facilitate optimum viewing of different structures.

The shoulder region and posterior portal site are sterilized with a Chlorhexadine sponge. The area around the shoulder is sterilized but the remainder of the arm remains unsterilized so that the assistant can manipulate the arm as needed. A standard posterior portal location is used. A 10-mL syringe with a 25-gauge needle is used to infiltrate 10 mL of a 50/50 mixture 1% lidocaine, 0.5% bupivacaine to the posterior portal site and surrounding capsule to anesthetize the area. Five to ten minutes are allowed for adequate local anesthesia to develop. Once this is achieved, 20 cc of normal saline is injected into the joint for pre-insufflation.

The needle arthroscope is connected to the viewing tablet in a sterilized manner and a 30-mL syringe of sterile saline is attached to the inflow port of the needle arthroscopy handpiece. The arthroscopy needle is then inserted into the shoulder joint from the posterior portal with a trajectory aimed at the coracoid process (Fig 2). Once the joint is entered, the needle sheath is removed to allow visualization for the optic scope. The arthroscope has a 0-degree viewing angle. Saline can be injected to the joint with the 30-mL saline syringe to distract the joint space and remove obstructing tissue blocking the arthroscope.

After insertion of the scope, a standard diagnostic arthroscopy is performed. Table 1 details the optimum arm positioning for visualization of various intra-articular structures.

The diagnostic procedure is started by first examining the intra-articular long-head of biceps tendon and its attachment at the superior labrum (Fig 3). The body of the tendon is checked for signs of fraying and

Fig 2. Needle arthroscope inserted into the standard posterior portal position of the right shoulder.

Table 1. Optimum Arm Positions for Viewing Structures

Structure	Optimum Arm Position
Long head of biceps tendon	Neutral, at rest
Glenoid/labrum	Neutral, at rest
Subscapularis	Gentle traction, arm in approximately 70° of flexion
Infraspinatus	Flexion, neutral rotation
Rotator interval	Gentle traction, arm in 45° of forward flexion

inflammation. The attachment of the tendon is examined to check the integrity of the superior labrum at its attachment to the glenoid. The rest of the labrum is then examined anteriorly and posteriorly for fraying or detachment from the glenoid (Fig 4).

Next, the rotator cuff tendons are inspected (Fig 5). Moving anteriorly to posteriorly, the subscapularis, supraspinatus, infraspinatus, and teres minor are visualized for signs of any pathology. To better visualize the rotator cuff, an assistant can gently forward elevate and externally and internally rotate the humeral head to better visualize the tendons. The humeral head is then checked for cartilage defects or bony abnormalities. The glenoid is checked for bony Bankart lesions or any other pathology. Any pathology discovered during the course of the procedure is documented.

After all of the structures have been thoroughly examined, an empty 30-mL syringe is placed into the inflow port of the handheld device to aspirate the saline that was injected into the joint during the procedure to aid with distraction and visualization. More or less saline can be used throughout the procedure as needed, but it is important to aspirate as much saline as possible

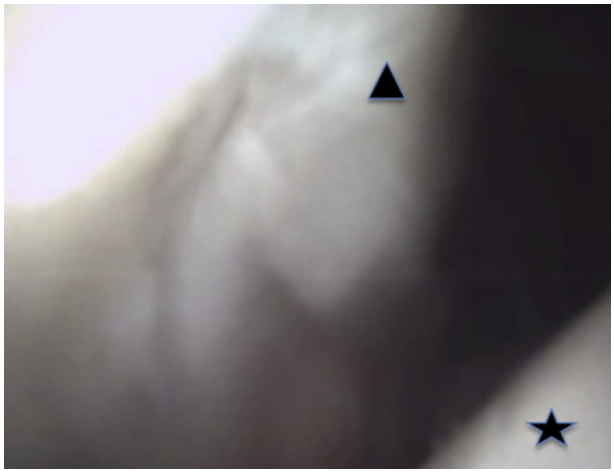

Fig 3. Intra-articular image from a posterior viewing portal with the patient in an upright position showing the superior glenoid/labrum of the right shoulder, where the biceps tendon would typically attach. This patient has had a previous biceps tenotomy. The star in the image identifies the humeral head, whereas the triangle identifies is the superior labrum.

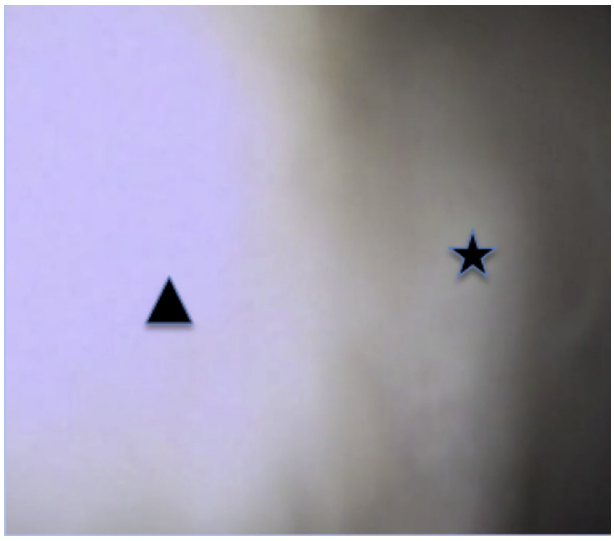

Fig 4. Intra-articular image of the right shoulder showing anteroinferior glenoid/labrum from a posterior viewing portal with the patient in the upright position. The star is located on the anteroinferior labrum, and the triangle identifies the glenoid.

out of the joint before removal of the device to minimize the patient's postprocedure discomfort (Table 2). The needle arthroscope is then removed from the joint and the needle site is covered with a compressive dressing followed by a normal band-aid. The patient is able to range the shoulder immediately as tolerated and is instructed to ice the area and take nonsteroidal anti-inflammatory drugs as needed.

Discussion

MRI is extensively used in the diagnosis of shoulder pathology. However, obtaining an MRI may lead to delayed treatment, extra appointments, and increased

Fig 5. Intra-articular image of the right shoulder showing the rotator cuff with partial articular sided tearing from a posterior viewing portal with the patient in an upright position. The star is on the rotator cuff fibers.

Table 2. Pearls and Pitfalls

Criteria	Pearls	Pitfalls
Patient comfort	Ensure patients are comfortably seated with positioning that allows easy access to the shoulder (Fig 1)	Vasovagal syncope is a recognized complication of peripheral injections including those around the shoulder. Before starting the procedure, ensure that adequate facilities are available to manage this if it occurs.
Bleeding	The risk of bleeding is increased in patients on anticoagulant and antiplatelet medication. One should consider the risk/benefit ratio of using alternative diagnostic modality such as MRI in these patients vs stopping medication temporarily. If visualization is impaired by bleeding, exchange of fluid can be performed to improve it, but if unsuccessful the procedure should be terminated.	It is important to be aware that in-office needle arthroscopy does not currently offer options for control of intra-articular bleeding
Infection	The procedure should not be undertaken if there is local or systemic infection	

MRI, magnetic resonance imaging.

costs and furthermore is associated with a low sensitivity for certain common pathologies (notably partial rotator cuff and SLAP tears). Furthermore, interpretation of MRI in patients following shoulder surgery can be difficult.[3,4] Spielman et al.[3] reported that only 10% of asymptomatic patients who had undergone a rotator cuff repair had normal MRI appearances. Undoubtedly, this can lead to uncertainty for both physicians and patients, and direct visualization in these scenarios, without the need for a surgical procedure, is clearly appealing. Office-based needle arthroscopy therefore has important potential advantages that include direct visualization, increased diagnostic accuracy, reduced time to diagnosis, and avoidance of surgical and anesthetic risks. Needle arthroscopy requires one appointment to use the technology, and the diagnosis for many shoulder conditions can be diagnosed at the first encounter. This saves the patient health care costs and time, as on average, as Xerogeanes et al.[5] compared MRI with office-based needle arthroscopy and a cost analysis determined that needle arthroscopy has the potential savings of $177 million per year in health care.

Office-based needle arthroscopy allows the patient to actively participate in the diagnostic process and helps them better understand their condition.[6] As the physician sees pathology, they can explain findings in real time to the patient and answer any questions that arise. Better understanding by the patient often brings peace of mind that the treatment plan moving forward is the correct one. Having seen the shoulder pathology present in the patient also allows the physician to more accurately prepare for any procedures in the future, thus shortening the surgery and reducing the amount of time the patient is under anesthesia.[6] Steroid injections also can be placed during the needle arthroscopy, allowing visualization by the physician and patient that the medication was successfully delivered into the joint.

Limitations of needle arthroscopy include lack of continuous irrigation during the procedure that may impair viewing of the arthroscope (Table 1).[7-9] Bleeding vessels are unable to be stopped without use of ablation and loose bodies cannot be removed without a grasper, both of which could hinder viewing capabilities. Other testing is necessary to look at specific osseous structures and anything that may be extra-articular in the shoulder.

The risks of in-office needle arthroscopy of the shoulder have not been well-studied but are likely to share a similar profile to injections around the shoulder joint. These risks include vasovagal syncope (0.8%-4% of shoulder injections) and rare complications such as infection and bleeding. In summary, needle arthroscopy offers an alternative modality for the diagnosis of shoulder pathology with important potential advantages

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