

Technical Innovation

MR Arthrography of the Shoulder: Fluoroscopically Guided Technique Using a Posterior Approach

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MR arthrography is the preferred imaging technique for the investigation of patients with shoulder instability [1, 2]. MR arthrography reliably shows subtle lesions of the labroligamentous complex, providing information essential to the surgeon concerning the surgery or arthroscopic repair. Most patients presenting with shoulder instability have anterior instability; in these cases, evaluation of the anterior joint structures is required. Contrast material that is inadvertently injected into the extracapsular soft tissues during a conventional anterior approach may cause interpretative difficulties. Intraarticular injection of contrast material using the traditional anterior approach is generally performed under fluoroscopic guidance, although palpation-directed, sonographic, and MR imaging-guided methods have also been described [3–5]. Most of these methods have used an anterior or anterosuperior approach to the shoulder. In our department, we prefer to use a posterior approach for patients with suspected anterior instability. This method is well tolerated by the patient and avoids the interpretative difficulties that may be associated with anterior extracapsular contrast extravasation. A recent study using cadaveric specimens has confirmed that anterior shoulder injection can result in penetration of the anterior stabilizing structures [6]. To our knowledge, there have been no previous clinical studies describing the method, benefits, and

safety of the fluoroscopically guided intra-articular injection of contrast material into the glenohumeral joint using a posterior approach, although one report describes using the posterior approach for a sonographically guided method of needle placement [7].

Materials and Methods

Over a 3-year period, 140 MR arthrograms of the glenohumeral joint were obtained from 140 patients; 132 of these patients described anterior instability, and the contrast media was introduced using a posterior approach. The remaining eight patients described posterior instability, and an anterior approach was used.

Verbal consent was obtained from each patient who was placed in the prone position on the fluoroscopy table with the arm under investigation held by the patient's side midway between supination and pronation so that the shoulder was in a neutral position. A pad was placed under the patient's torso to raise the side under investigation (Fig. 1). Fluoroscopy was used to ensure that the glenohumeral joint was seen tangentially.

A radiopaque marker was used to locate a site over the inferomedial quadrant of the humeral head; the skin at this entry site was then marked.

After skin preparation, the patient's shoulder was draped, and the injection site and the soft tissues were infiltrated with a local anesthetic (lignocaine 1%; Braun, Melsungen, Germany).

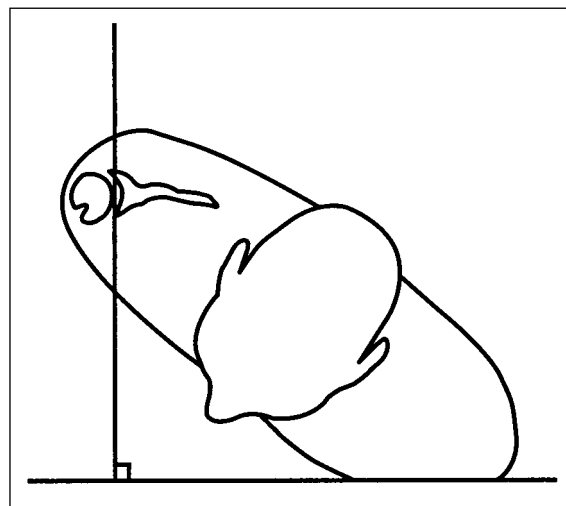


Fig. 1.—Drawing shows patient in prone position for posterior approach to fluoroscopically guided arthrography of shoulder.

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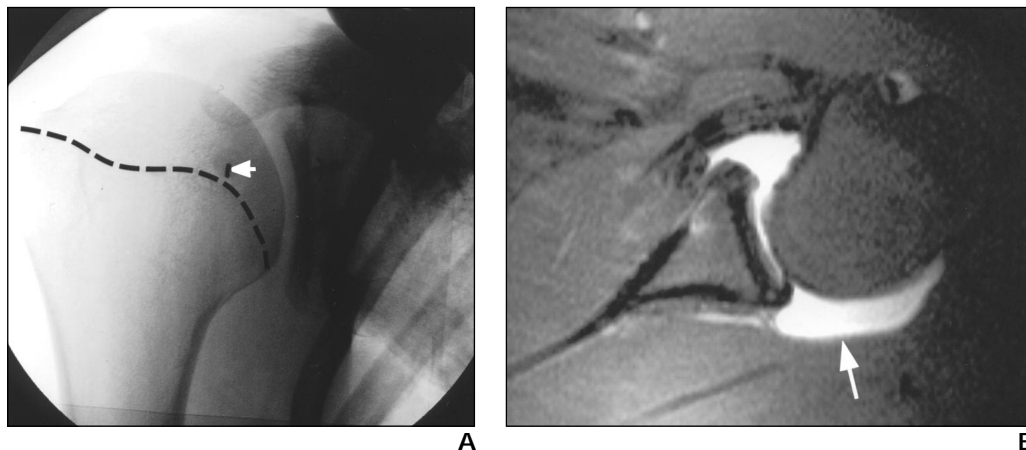


Fig. 2.—20-year-old man who had previous surgery for shoulder instability. **A**, Image obtained during fluoroscopy shows glenohumeral joint is viewed tangentially, and needle (arrow) is advanced parallel to X-ray beam onto inferomedial quadrant of humeral head within boundary of anatomic neck (interrupted line). **B**, Axial T1-weighted fat-saturated image after intraarticular injection shows attachment of posterior capsule and increased latitude available for needle placement (arrow).

A 21-gauge spinal needle was advanced vertically under fluoroscopic guidance to the cartilage of the humeral head (Fig. 2A). The infusate comprised 0.1 mL of dimeglumine gadopentetate (Magnevist; Schering, Berlin, Germany; 469.01 mg/mL), 10 mL of saline, and 10 mL of iopamidol 300 mg/mL. Once the correct needle position was confirmed by fluoroscopy, between 15 and 20 mL of the infusate was injected to provide capsular distension (Fig. 2B).

MR imaging was performed within 15 min of the injection. If a delay is anticipated, the concentration of gadolinium can be increased.

Results

Correct needle placement was achieved in all cases, and the procedure was well tolerated by all patients with no immediate complications.

Discussion

MR arthrography enhances the sensitivity of MR imaging in the investigation of the unstable shoulder [1, 2]. Although both direct and indirect methods of arthrography may be used, direct arthrography has the benefit of capsular distension, and the separation of intraarticular structures better reveals the labroligamentous complex.

The intraarticular use of gadolinium has not been approved by the Food and Drug Administration but can be used after local agreement. Gadolinium has proved to be a useful intraarticular

contrast agent, and, to our knowledge, no serious complications from its use have been reported [8].

The posterior approach is widely used by orthopedic surgeons during arthroscopy of the shoulder. Risks associated with the posterior arthroscopic approach have been described as injury to the suprascapular nerve and circumflex scapular vessels when the portal is placed too medially and injury to the axillary nerve and posterior humeral circumflex artery when the portal access is placed too inferiorly or laterally [9]. To our knowledge, no such injury has been reported as a complication of arthrography. This may, in part, be due to the considerably smaller size of the needle used for arthrography compared with the instruments used for arthroscopy. The safety of the posterior approach is supported by our experience with 132 posterior injections and no complications.

Tailoring the site of injection according to the suspected pattern of instability (posterior approach for anterior instability and vice versa) avoids injury to anterior stabilizing structures under investigation [6].

The injection of contrast material using the posterior approach to the shoulder is particularly useful in patients suspected of having anterior instability because the approach avoids the potential for interpretive difficulties, a consequence of anterior extracapsular contrast ex-

travasation, and decreases the apprehension of the patient during needle placement.

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