A Comparison between the Anterior and Posterior Approach to US-guided Shoulder Articular Injections for MR Arthrography

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Purpose: To assess the feasibility of ultrasound-guided shoulder joint injections by the anterior and posterior approaches for performing a MR arthrography.

Materials and Methods: Between April 2007 and June 2008, 28 patients underwent ultrasound-guided intra-articular contrast injections for a MR arthrography. This study was approached using the antegrade method. All injections were performed by one radiologist. The patient selection criteria for the anterior and posterior approaches were randomly for the anterior approach and alternatively for the posterior approach. Each approach included 13 cases and each were injected by the anterior or posterior approaches exclusively. The patients were classified into three groups as follows: 1) the successful intra-articular injection group, 2) the small leakage group, and 3) the injection failure group.

Results: Of the 15 patients that underwent the anterior approach, two were unsuccessful for the MR arthrography. Whereas, two other cases experienced small leakage. The two failed MR arthrography cases using the anterior approach were later injected using the posterior approach. The 15 patients subjected to the posterior approach to perform a MR arthrogram were successful in all cases, without any leakage.

Conclusion: The ultrasound-guided intra-articular injections were feasible with a high success rate by both the anterior and posterior approaches. However, better results were achieved from the posterior approach than the anterior approach in this study.

Index words: Arthrography
Injections, intra-articular
Shoulder joint
Magnetic resonance (MR)
best of our knowledge, a literature review of the studies using sonographic guidance using the anterior and posterior approach methods have not provided a comparative analysis between the two methods. This study evaluated the feasibility of shoulder MR arthrography by ultrasonographic guidance using the anterior and posterior approaches to compare the differences between the two methods antegrade.

Materials and Methods

Patients: Between April 2007 and June 2008, 28 patients underwent ultrasound-guided intra-articular contrast injections for MR arthrography. This study was approached by antegrade method. All injections were done by one radiologist. The patient selection criteria for the anterior and posterior approaches were randomly for the anterior approach and alternatively for the posterior approach. Each approach included 13 cases and each were injected by the anterior or posterior approaches exclusively. Two cases were approached by both anterior and posterior approaches. The patients were classified into three groups: 1) the successful intraarticular injection group, 2) the small leakage group, and 3) the injection failure group.

Technique

Patients were laid in the supine position on an examination table. For the anterior approach the patient’s shoulder was placed with the arm extended and slightly abducted with the palm of the hand facing upward. Axial slices in the anterior area of the shoulder were obtained to localize the coracoid process and the anteromedial portion of the humeral head, which is covered with articular cartilage under the musculotendinous junction of the subscapularis muscle. The needle tip was positioned at the lateral part of anterior glenoid labrum (Fig. 1).

For the posterior approach, the patient was sitting upright and the transducer was aligned in the long axis of the musculotendinous junction of the infraspinatus muscle, just inferior to the scapular spine, with the posterior glenoid rim and posterior glenohumeral joint line centered in the field of view. The needle tip was located between the posterior glenoid labrum and humeral head (Fig. 2).

The procedure was monitored by visualizing the needle tip and the fluid filling the joint cavity from start to finish by ultrasonography.

After skin antisepsis, a 23 gauge, 6 cm disposable needle was aseptically introduced. Using the 7-9 MHz linear transducer, the progress of the needle could be monitored by observing the needle tip piercing the joint capsule. Upon insertion, a mixture of 10 mL of gadopentetate dimeglumine (Magnevist; Schering, Berlin, Germany), 0.05 mL and 9.95 mL of normal saline was injected into the joint. If the needle is intra-articular, the mixture flows freely into the joint with little or no resis-

Fig. 1. A 49-year-old woman who underwent a MR arthrography using the anterior approach. The needle tip (arrow) is located below the subscapularis tendon and lateral to the anterior glenoid labrum. a=anterior p=posterior g=glenoid labrum h=humeral head c=coracoid process.

Fig. 2. A 65-year-old man who underwent a MR arthrography using the posterior approach. The needle tip (arrow) is located between the posterior glenoid labrum and the humeral head. a=anterior p=posterior g=glenoid labrum h=humeral head.
tance. If resistance was noted, the contrast medium was not injected, and the position of the needle is rechecked. After injection of the contrast medium, the needle was removed and MR arthrography of the shoulder joint was performed. The injection of the shoulder joints was performed by one expertise for the both approaches. Approximately 10 to 15 minutes are required to accomplish the joint injection, including the sonographic examination of the shoulder joint.

**Results**

MR arthrograms were achieved for all 28 patients using ultrasonography-guided fine needle glenohumeral joint injection. A total of 13 patients were injected by both the anterior and posterior approaches under US

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**Fig. 3.** A 65-year-old man who underwent a MR arthrography using the anterior approach. The arrow points to the needle tip which is difficult to differentiate between the articular cartilage from the anterior glenoid labrum and subscapularis muscle. 

A. anterior p = posterior g = glenoid labrum h = humeral head

B. A 65-year-old man who underwent a MR arthrography using the anterior approach. A small leakage of the contrast agent (arrow) is seen in the subscapularis muscle.

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**Fig. 4.** A 55-year-old man who underwent a MR arthrography using the anterior approach.

A. It is difficult to visualize the needle tip (arrow) between the articular cartilage and anterior glenoid labrum on ultrasonography. 

a = anterior p = posterior g = glenoid labrum h = humeral head

B. A 55-year-old man who underwent a MR arthrography using the anterior approach. The complete extravasation of the contrast agent (arrow) in the subscapularis muscle and no contrast agent is seen in the intra-articular space.
guidance, respectively. For the anterior approach method, two patients experienced small leakage after the injection, whereas two patients experienced injection failure and could not undergo a successful MR arthrogram (Figs. 3, 4). The two failed patients were later injected by the posterior approach and a MR arthrogram was successfully achieved. The other eleven patients were successfully injected for MR arthrography.

For the posterior approach method, the 15 patients, including the two failed patients that initially underwent the anterior approach, all successfully underwent a MR arthrogram without any leakage. No cases of infection and discomforting side effects were observed.

Discussion

A MR arthrography is a very sensitive technique for detecting abnormalities in the shoulder joint. The usual method for injecting contrast agent into the shoulder joint includes fluoroscopic guided or sonographic guided needle punctures. Certain disadvantages exist with sonographic control, including no visual feedback of the volume of the contrast material injected as well as the extra-articular extravasation which is easily seen during fluoroscopy. In addition to avoiding the use of iodized agents and ionizing radiation, sonographic guidance can help avoid injury to the adjacent neurovascular structures and the biceps tendon by the visualization of the needle at all times. With the ease of performing the sonographic guidance approach, sonographically guided shoulder joint injections make this a very useful method for performing a MR arthrography.

Sonography-guided needle placement for the injection of the shoulder has been described for both the anterior and posterior approaches [3-7]. The anterior approach is similar to the approach under fluoroscopy control. The patient is in the supine position and the entry site is in a central line between the coracoid and anteromedial humeral head when scanning axially. The entry site must be lateral to the coracoid to avoid major neurovascular structures including the cephalic vein, axillary artery, and brachial plexus. Using this approach, Valls and Melloni [4] reported successful and uncomplicated sonographic needle placement in 50 patients undergoing an arthrography. However, the needle was more difficult to visualize at the anterior glenoid labrum for the anterior approach, compared to the posterior approach, due to the indistinct differentiation between the subscapularis muscle. Moreover, two cases with minor leakage developed and two cases failed due to complete extravasation for the anterior approach.

For the posterior approach, the needle placement was performed with the patient sitting upright. The joint capsule was punctured along the medial border of the humeral head with an oblique needle path, which traverses the infraspinatus muscle and courses medially from a lateral direction to the glenohumeral joint. This approach avoids contact with the suprascapular nerve and circumflex scapular vessels that course medial to the glenoid rim. In addition, the posterior approach provides a more conspicuous relevant anatomic structures of the glenohumeral joint and the needle tip placement compared to the anterior approach. The joint space between the posterior glenoid labrum and humeral head is easily seen in the posterior approach. Hence, in this study, we found the the success rate for a MR arthrography to be greater for the posterior approach by US guidance.

In conclusion, our results suggest that sonographically-guided glenohumeral joint injection for a successful MR arthrography can be performed safely, accurately, and comfortably using the posterior approach.

References

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연구논의

방법


결과

일반적으로 MR 영상의 정확도는 15%에서 2%의 범위로, 이는 11%에서 2%의 범위로의 정확도를 보였다. 반면에 MR 영상의 정확도는 15%에서 2%의 범위로, 이는 11%에서 2%의 범위로의 정확도를 보였다.

결론

MR 영상의 정확도는 15%에서 2%의 범위로, 이는 11%에서 2%의 범위로의 정확도를 보았다. 반면에 MR 영상의 정확도는 15%에서 2%의 범위로, 이는 11%에서 2%의 범위로의 정확도를 보였다.