



:  
 :  
 14, 15 ( , , ),  
 :  
 1.5 mm, 2.5 mm, 4.1 mm, 9.5 mm  
 < 0.05). 80% 가 2.5 mm 93% 93% 100% (p  
 3 (21%) 6 (43%)  
 :  
 2.5 mm, 3.5 mm 가, ,

(1).  
 (2-4) 1998 1 2000 12  
 MRA 70  
 14 MRA  
 가 (MRI) 100 ( 60%), 50 ( ( 75%), 140 (1)  
 (MRA) 가 MRA ( 80%) (1)  
 MRA (biceps tendon sleeve)  
 (5, 6).  
 33 68 ( 46 ) 가 7 MRA  
 2001 3 2 2001 6 11

1  
 2  
 3

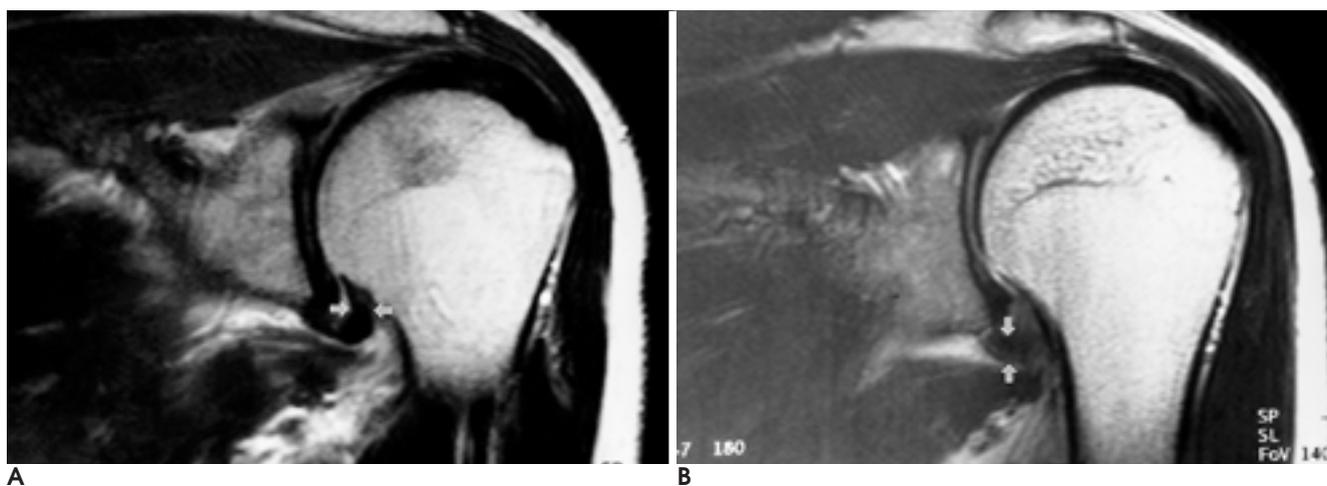
41, 15, 가 (Fig. 1A), (Fig. 1B) 가 (depth), (width), (length)  $V = 0.52 \text{ (Length} \times \text{Width} \times \text{Height(Depth))}$  (Fig. 2). T1, T2, 3 - 4 mm, 0.6 - 0.9 mm, 140 × 140, MRA, 가 t - test, p - value가 0.05 가

**Table.** Comparison of Patients with Adhesive Capsulitis and Control Subjects

Measurement	Adhesive Capsulitis (n = 14)	Control Subjects (n = 15)	P Value
Thickness of the capsule (mm)			
Lateral portion of the axillary pouch	4.5 ± 1.0 (3.3 - 6.6)	2.0 ± 0.7 (0.8 - 2.7)	< .05
Inferior portion of the axillary pouch	4.1 ± 1.0 (2.5 - 5.7)	1.5 ± 0.7 (0.6 - 2.8)	< .05
Axillary recess			
Depth (mm)	5.1 ± 1.7 (2.5 - 7.5)	8.2 ± 1.8 (6.0 - 12.5)	< .05
Width (mm)	2.5 ± 0.7 (1.7 - 4.5)	9.5 ± 2.4 (6.2 - 15.0)	< .05
Length (mm)	14.0 ± 3.0 (8.0 - 20.0)	20.8 ± 4.8 (12.0 - 28.0)	< .05
Volume (cm <sup>3</sup> )	0.10 ± 0.06 (0.04 - 0.28)	0.84 ± 0.33 (0.45 - 1.56)	< .05
Thickness of the CHL (mm)	3.5 ± 0.5 (3.0 - 5.0)	2.7 ± 0.4 (2.0 - 3.4)	< .05

Note.-Data are the mean ± SD.

\* Data in parentheses are ranges.



**Fig. 1.** Measurement site of joint capsule.

**A, B.** Coronal oblique T2-weighted fast spin-echo MR arthrograms of the shoulder in 40-year-old man (A) and 59-year-old man (B) show the low-signal regions equivalent to capsule (arrows in A and B). These areas were measured approximately perpendicular to cortical bone at its widest point adjacent to the axillary pouch in A and parallel to long axis of the axillary pouch at its widest point in B. Both A and B show thickened capsule and small axillary pouch.

3.3 - 6.6 mm ( 4.5 mm),  
 0.8 - 2.7 mm ( 2.0 mm)

mm ( 4.1 mm), 2.5 - 5.7  
 0.6 - 2.8 mm ( 1.5 mm)  
 ( $p < 0.05$ ).

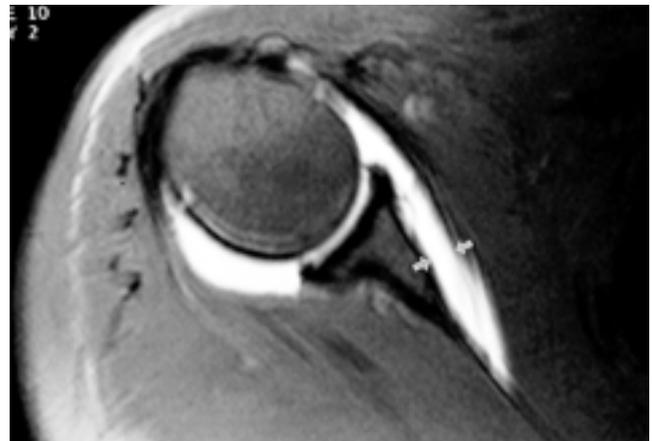
2.5 - 7.5 mm ( 5.1 mm),  
 6.0 - 12.5 mm ( 8.2 mm)  
 1.7 - 4.5 mm ( 2.5 mm), 6.2 -  
 15.0 mm ( 9.5 mm)  
 8 - 20 mm ( 14 mm), 12 - 28 mm ( 21 mm)  
 0.28 cm<sup>3</sup>( 0.10 cm<sup>3</sup>), 0.45 - 1.56 cm<sup>3</sup> ( $p < 0.05$ ).

3.0 - 5.0 mm ( 3.5 mm),  
 2.0 - 3.4 mm ( 2.7 mm) ( $p < 0.05$ )

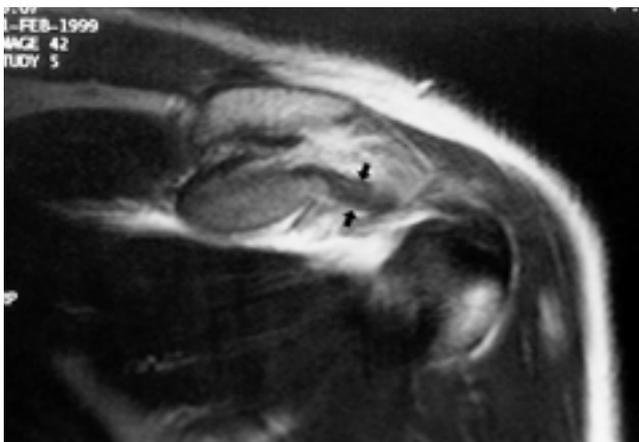
6 (43%) 3  
 (20%) (subscapula) (Fig. 3).  
 3 (21%)가 (Fig. 4)  
 가

mm  
 100% 40%  
 93% 80%  
 3.5 mm 가 93%,  
 가 100% .

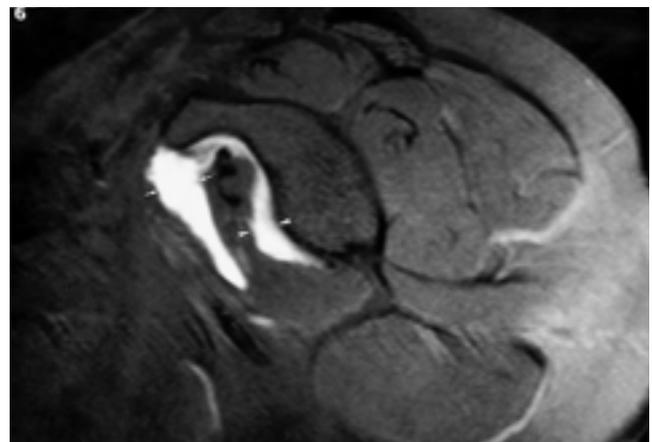
(synovium)  
 (7 - 9). MRA  
 가  
 가 MRI



**Fig. 3.** Extra-articular contrast extravasation. Axial fat suppressed T1-weighted MR arthrogram of the shoulder in 35-year-old woman shows extravasation of contrast material out of glenohumeral joint space (arrows).



**Fig. 2.** Measurement of the coracohumeral ligament thickness. Coronal oblique T2-weighted fast spin-echo MR arthrogram of the shoulder in 40-year-old man shows the low signal region equivalent to coracohumeral ligament (arrows). This area was measured perpendicular to the long axis of the ligament at its widest point.



**Fig. 4.** Contrast filling of the subcoracoid bursa. Sagittal oblique fat suppressed T1-weighted MR arthrogram of the shoulder in 56-year-old woman shows subcoracoid bursa (arrows) and glenohumeral joint space (arrowheads) filled by contrast material.



## Adhesive Capsulitis of the Shoulder: MR Arthrography<sup>1</sup>

Hyun Jeong Kim, M.D., Tae Il Han, M.D., Kwang Won Lee, M.D.<sup>2</sup>, Soon Tae Kwon, M.D.<sup>3</sup>,  
Youn Seon Choi, M.D., Dae Hong Kim, M.D., Hyun Young Han, M.D., Mun Kab Song, M.D.

<sup>1</sup>Department of Diagnostic Radiology, Eulji University School of Medicine

<sup>2</sup>Department of Orthopedic Surgery, Eulji University School of Medicine

<sup>3</sup>Department of Diagnostic Radiology, Chungnam National University College of Medicine

**Purpose:** Adhesive capsulitis is a clinical syndrome involving pain and decreased joint motion caused by thickening and contraction of the joint capsule. The purpose of this study is to describe the MR arthrographic findings of this syndrome.

**Materials and Methods:** Twenty-nine sets of MR arthrographic images were included in the study. Fourteen patients had adhesive capsulitis diagnosed by physical examination and arthrography, and their MR arthrographic findings were compared with those of 15 subjects in the control group. The images were retrospectively reviewed with specific attention to the thickness of the joint capsule, volume of the axillary pouch (length, width, height(depth)), thickness of the coracohumeral ligament, presence of extra-articular contrast extravasation, and contrast filling of the subcoracoid bursa.

**Results:** Mean capsular thickness measured at the inferior portion of the axillary pouch was 4.1 mm in patients with adhesive capsulitis and 1.5 mm in the control group. The mean width of the axillary pouch was 2.5 mm in patients and 9.5 mm in controls. In patients, the capsule was significantly thicker and the axillary pouch significantly narrower than in controls ( $p < 0.05$ ). Capsule thickness greater than 2.5 mm at the inferior portion of the axillary pouch (sensitivity 93%, specificity 80%) and a pouch narrower than 3.5 mm (sensitivity 93%, specificity 100%) were useful criteria for the diagnosis of adhesive capsulitis. In patients with this condition, extra-articular contrast extravasation was noted in six patients (43%) and contrast filling of the subcoracoid bursa in three (21%).

**Conclusion:** The MR arthrographic findings of adhesive capsulitis are capsular thickening, a low-volume axillary pouch, extra-articular contrast extravasation, and contrast filling of the subcoracoid bursa. Capsule thickness greater than 2.5 mm at the inferior portion of the axillary pouch and a pouch width of less than 3.5 mm are useful diagnostic imaging characteristics.

**Index words :** Magnetic resonance(MR), arthrography  
Shoulder, arthrography  
Shoulder, MR

Address reprint requests to : Tae Il Han, M.D., Department of Diagnostic Radiology, Eulji University school of Medicine.  
24-14, Mok-dong, Jung-gu, Taejon 301-070, Korea.  
Tel. 82-42-259-1396 Fax. 82-42-259-1125