

가
62
4
26
($p < .0001$).
가
($p > .05$),
($p = .003$),
($p > .05$).
($p > .05$).
가

(1 - 4). 가 63% - 95%
(glenoid labrum), (11, 12).
(5).
(capsular mechanism)
(6 - 10). (13 - 16).
(5). 가 가 (17),
(5). 가 가

(19) 62 (43)
44:18, 18 74 (45)

XP 128 Sequoia 512 (Acuson, Mountain View, CA, U.S.A.) 7 - 15 MHz
가

가 (2, 11, 12).
(12-3), (3-6),
(9-12), (6-9)
(11).
(posterior transverse approach)
(9, 11, 12),
(12, 18),
90. , 90.
(12).
가

22 - gauge
(Iopamiro, Ilsung, Seoul, Korea)
1 ml
Gadolinium - DTPA
(Magnevist: Schering AG, Germany, 469.01 mg/ml) 0.15 ml
30 ml 1:1,000
0.45 ml 가
6 ml 30 ml (15 ml)
2

1.5 Tesla (Magnetom Vision; Siemens, Erlangen, Germany)
T1 ,
, T2
3 - 4 mm, 0.6 - 0.9 mm, 140 × 140 mm, matrix number 170 - 192 × 256

(visibility)
Hammar
(12) 4
“ 0 ” , “ 3 ”
“ 1 ”
“ 2 ”
(11),
(hypoechoic zone)가 2 mm
(12). 가 “ 0 ”
(questionable)
(12),
(6, 12).
가
12
(19),
26
4
240 (41.2) ,

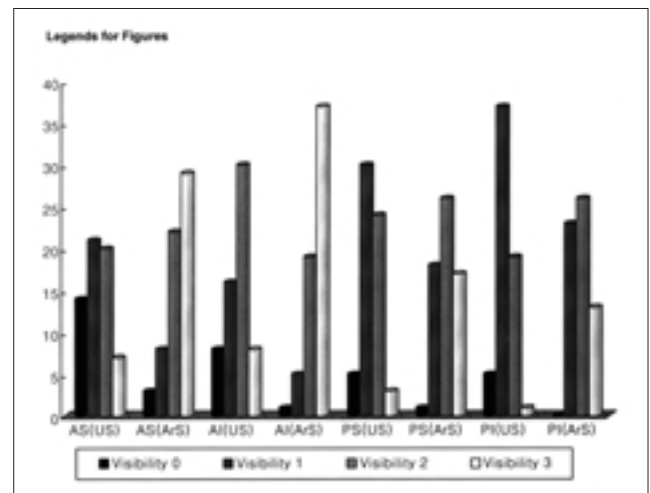


Fig. 1. Bar graph shows the numbers of patient according to the score of visibility for 4 individual labral quadrants on each conventional ultrasonography and arthrosonography. In all quadrants of labrum, arthrosonography includes a lot of patients on higher score of visibility than that of the conventional ultrasonography.

Note; AS: anterosuperior labral quadrant, AI: anteroinferior labral quadrant, PS: posterosuperior labral quadrant, PI: posteroinferior labral quadrant.

US: conventional ultrasonography, ArS: arthrosonography.

14 (12 , 2
) , 1 , , , (McNemar test)
7 , 3 , 1 ,
, 26 10 ,
2 , 6 , ,
1 , 1 (p < .0001).
18 10 2 2 " 0 "
(,) 8 16 248 32 , 5
(detached tear) , (Fig. 1, 2).
26 7 ,
6 , 가1 Table 1 ,
55.6%, 72.2%, 88.9%, 83.7%,
96.5%, 97.7% .
가1
(p > .05), (p = .003),
(Wilcoxon signed ranks test). 가 (p > .05).

Table 1. Sensitivity, Specificity, Predictive Values of Labral Tears in Conventional Ultrasonography, Arthrosonography, and MR Arthrography

Test	Sensitivity (%)	Specificity (%)	Positive predictive value (%)	Negative Predictive value (%)
Conventional US	55.6 (10 of 18)	83.7 (72 of 86)	41.7 (10 of 24)	90.0 (72 of 80)
Arthrosonography	72.2 (13 of 18)	96.5 (83 of 86)	81.3 (13 of 16)	94.4 (83 of 88)
MR arthrography	88.9 (16 of 18)	97.7 (84 of 86)	88.9 (16 of 18)	97.7 (84 of 86)

Note; Data in parentheses are the number of labral tears.

P values for the differences of the sensitivity and specificity for labral tears between conventional ultrasonography and arthrosonography were > .05 and .003, respectively. P values for differences of the sensitivity and specificity for labral tears between conventional ultrasonography and MR arthrography were .031 and .004, respectively. Differences of the sensitivity and specificity for labral tears between arthrosonography and MR arthrography were not significant (p > .05). P values were obtained by using the McNemar test.

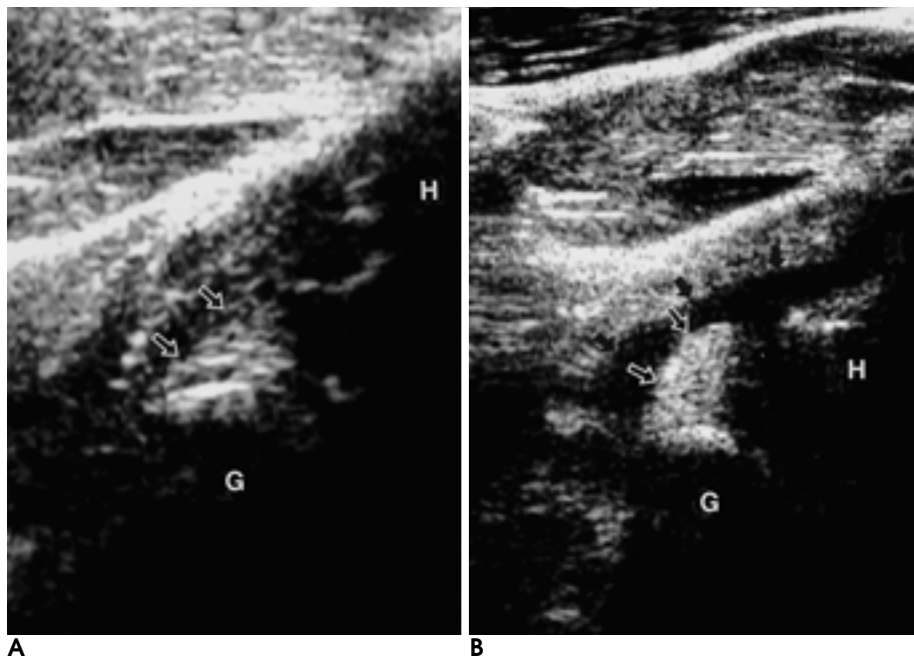


Fig. 2. 23-year-old man with left shoulder pain. Arthrosonographic effect for visualization of the glenoid labrum. G = glenoid, H = humerus.

A. Conventional ultrasonogram of the anteroinferior labrum obtained with anterior transverse approach shows an inhomogeneous echogenic labrum (open arrows) adjacent to the glenoid. The labrum is not clearly visualized. The visibility scored as " 1 ".

B. Arthrosonogram shows the triangular shaped, homogenous echogenic labrum (open arrows) with prominent expansion of the joint capsule (black arrows). The score of the visibility has been improved to " 3 ".

가

가

($p = .031$, $p = .004$).

2 mm

(11),

42.9% (3/7),

(5),

71.4% (5/7), 100% (7/7),

100% (19/19), 100%

(5)

(Fig. 3).

(19/19), 100% (19/19)

3

가

“0”

2

($p > .05$) (Fig. 4).

1

5

2

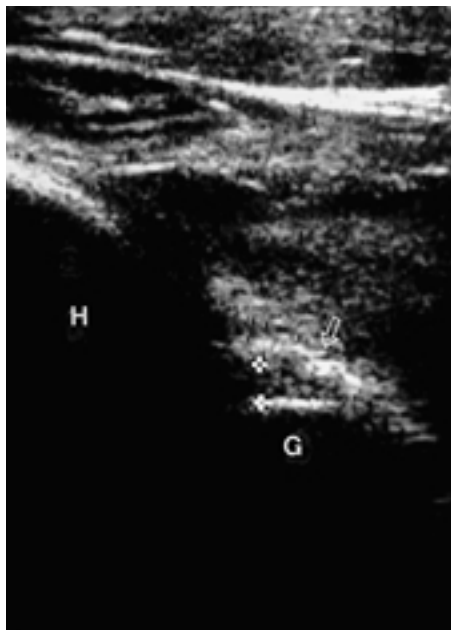
2 가

, 3

(2)

(1)

100% (7/7), 100% (7/7),



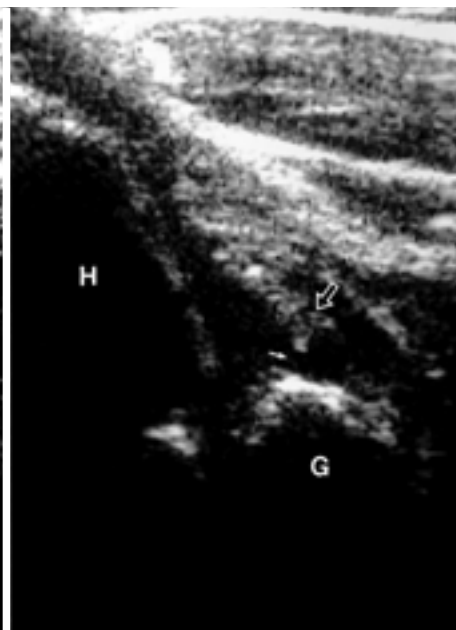
A



B



C



D

Fig. 3. 28-year-old man with shoulder instability. Labral tear of the anteroinferior and anterosuperior labral quadrants. G = glenoid, H = humerus.

A. Conventional ultrasonogram obtained with abduction in supine position shows a labral tear with 2.9 mm hypoechoic zone (between crosshairs) at the base of the anteroinferior labral quadrant (open arrow).

B. Conventional ultrasonogram obtained with dropping of the arm and extension of the elbow at the edge of the bed in supine position shows a hypoechoic zone (arrow) less than 2 mm at the base of the anterosuperior labral quadrant (open arrow).

C. Arthrosonogram obtained with abduction and external rotation during dynamic study more definitely shows the labral tear of the anteroinferior labral quadrant (open arrow).

D. Arthrosonogram shows an infiltration of contrast material into a gap (small arrow) between the anterosuperior labrum (open arrow) and the bony glenoid.

100% (7/7), 94.7% (18/19), 94.7% (18/19),
 100% (19/19) .
 가 (p
 >.05) (Fig. 5). 1

(1, 4),

(12).

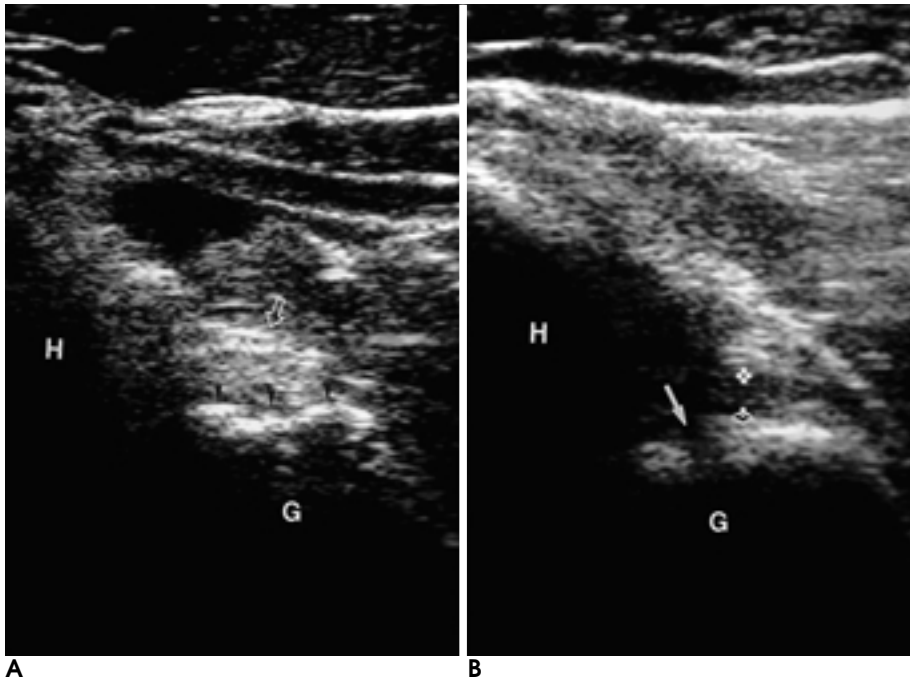


Fig. 4. 25-year-old man with instability. Fracture of the glenoid rim. G = glenoid, H = humerus.

A. Conventional ultrasonogram shows an irregularity (arrowheads) at the cortical structure of the anteroinferior part of the glenoid rim. The open arrow indicates the anteroinferior labrum.

B. Arthrosonogram demonstrates another focal discontinuity (arrow) of echogenic bony cortex at the lateral aspect of the glenoid rim and a labral tear (between crosshairs).

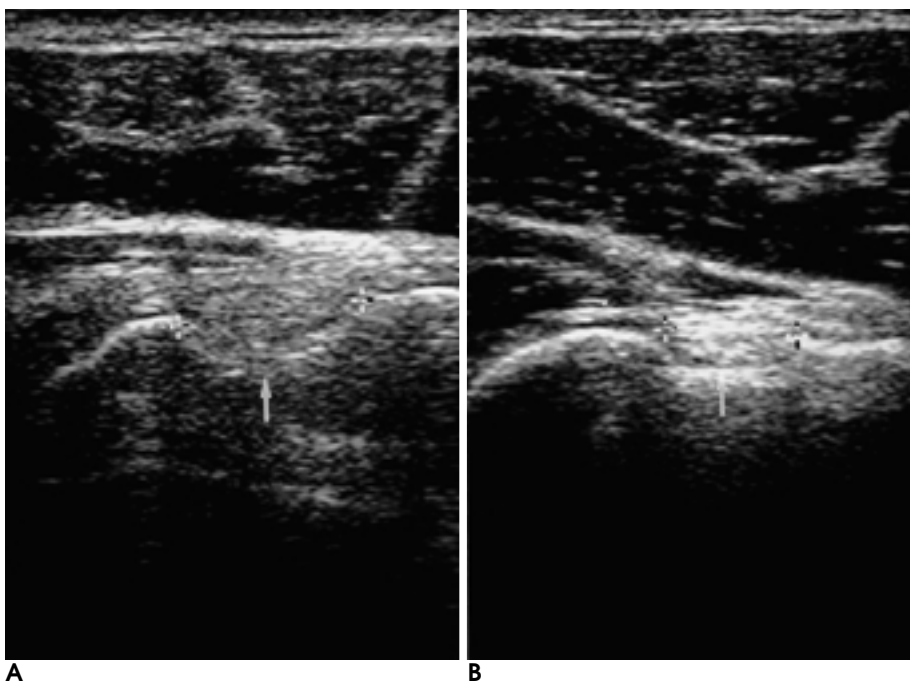


Fig. 5. 25-year-old man with instability. Fracture of the humeral head.

Conventional ultrasonogram (**A**) and arthrosonogram (**B**) show a focal defect (arrow) at the posterosuperior aspect of the humeral head.

: , 가

(5).

가

가

가

(10).

(17).

(15),

가

가

(18),

(15).

가 2 mm

가

가

1

5

가 , 5

6

(8, 10).

가 2 mm

(anteri -

55.6%,

72.2%,

or axillary approach)

88.9%

가

(12),

88% - 95%,

92% -

94%

(10, 12, 19, 20).

가

2

1

가

57%,

10 7 ,

56%

(11, 14),

10

8

가

3

2 ,

2

Taljanovic (11)

가 63%

Pschydrowsky (10)

26

97.7% ,

67% - 98%,

83.7%, 96.5%,

90 - 92%

(10, 11, 19, 20).

가

Palmer

(19)

57 7

42.9%, 71.4%, 100%,

가

가

100%

(12).

가

94.7%, 94.7%, 100%

100%,

가 (6, 12).

가

가

- 75

grams. *Radiology* 1995;197:819-825

20.

가

2001;45:61-67

21. Drakeford MK, Quinn MJ, Simpson SL, Pettine KA. A comparative study of ultrasonography and arthrography in evaluation of the rotator cuff. *Clin Orthop* 1990;253:118-122

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Arthrosonography of the Shoulder Joint for Evaluation of the Glenoid Labrum, Glenoid Rim and Humeral Head : Comparison with Conventional Ultrasonography and MR Arthrography¹

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Purpose: To compare the diagnostic role of arthrosonography, conventional ultrasonography and MR arthrography in the assessment of glenoid labral tear, glenoid rim fracture and humeral head fracture of the shoulder joint.

Materials and Methods: The findings of arthrosonography, conventional ultrasonography and MR arthrography were prospectively evaluated in 62 consecutive patients with chronic pain or a history of recurrent dislocation of the shoulder joint. The glenoid labrum was arbitrarily divided into four quadrants: anterosuperior, anteroinferior, posterosuperior, and posteroinferior, and for each, visibility at arthrosonography and conventional ultrasonography was subjectively scored as one of four grades. By means of statistical analysis, the two techniques were then compared. Twenty-six patients subsequently underwent arthroscopy, and the presence or absence of labral tear, glenoid rim fracture and humeral head fracture was determined. The sensitivity and specificity of each modality were separately calculated for each of the three types of shoulder joint injury, and observed differences in these findings were statistically analysed.

Results: For all individual quadrants of the labrum, visibility at arthrosonography was higher than at conventional ultrasonography ($p < .0001$). For the detection of labral tear, the sensitivity of arthrosonography was not significantly higher than that of conventional ultrasonography ($p > .05$), though its specificity was significantly higher ($p = .003$). In this respect, there was no significant difference in sensitivity or specificity between arthrosonography and MR arthrography ($p > .05$). For the detection of glenoid rim and humeral head fracture, there were no statistical differences in sensitivity and specificity between the three imaging modalities ($p > .05$).

Conclusion: Compared with conventional ultrasonography, arthrosonography provides higher visibility of the labrum, thus improving the capacity of ultrasonography to detect labral tear. Arthrosonography could therefore be useful in the diagnosis of labral tear, glenoid rim fracture and humeral head fracture, and may thus partially replace MR arthrography.

Index words : Shoulder, US

Shoulder, arthrography

Ultrasound (US), comparative studies

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