

:

: 2 cm 31 (17 , 14)
(SH U 508A)

가

(sonic v10R)

: 100%, 35.7% 57% ,
47%, 88.2% 76% .
35% , 77% .
가 .

:

ultrasonography; (high - resolution gray - scale) (6).
가 가

(1). 가 (7).
가 (8 - 10)
가 (2 - 5). (11).

(5),
가

(T1) 가 (color box)

31 (; 30 , ; 1) 31

19 69 (; 40) , ,
0.4 - 0.9 cm 8 , 1.0 - 1.9 cm 23 .
5
31 , 31
17 (7 , 5 ,
1 , 1 , 1 , 2) ,
14 (8 , 2 , 1
1 , 1 , 1) .

Logiq 700(GE Medical Systems,
Milwaukee, U.S.A.) 12 MHz(9 - 13 MHz linear transduc-
er)

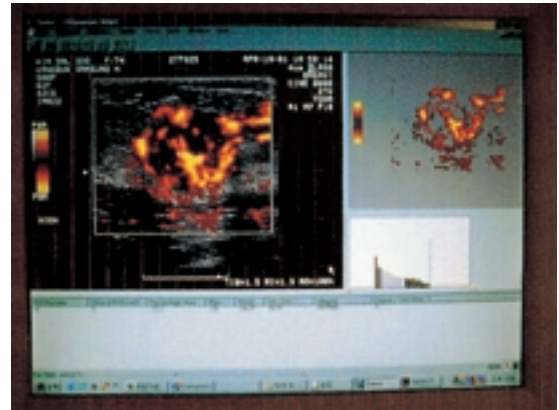


Fig. 2. Calculation of the amount of Doppler signals on the personal computer by using computer-assisted program (sonic v10R).

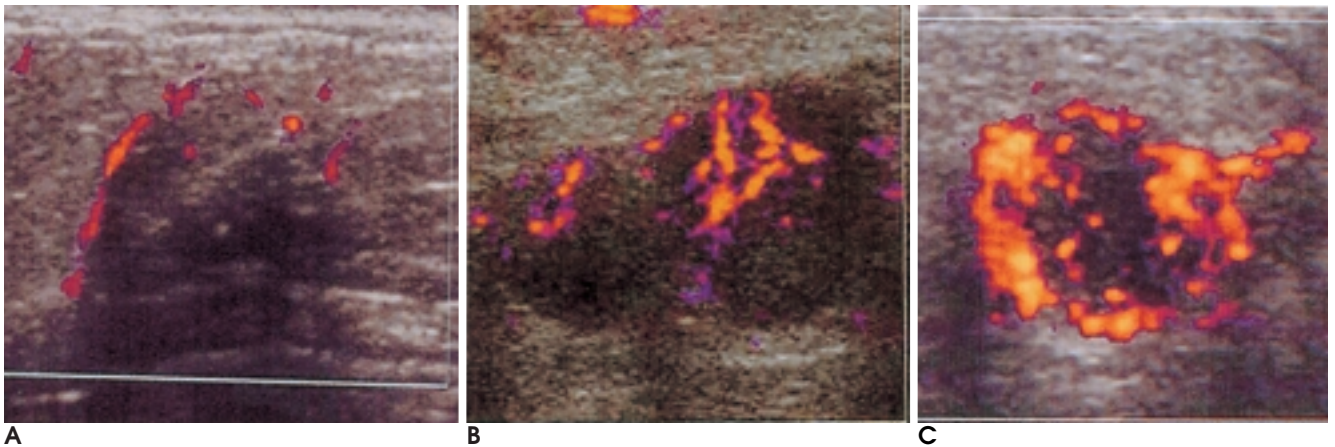


Fig. 1. Benign and malignant patterns of vascular Doppler signals on power Doppler ultrasonography.

Benign pattern is linear, smoothly tapered, peripheral distribution of vascular signals as seen on fibrocystic change (A). Malignant pattern is irregular, not tapered, penetrating from tumor margin as seen on metastatic adenocarcinoma (B) and also connected between vascular signals seen on invasive ductal carcinoma (C).

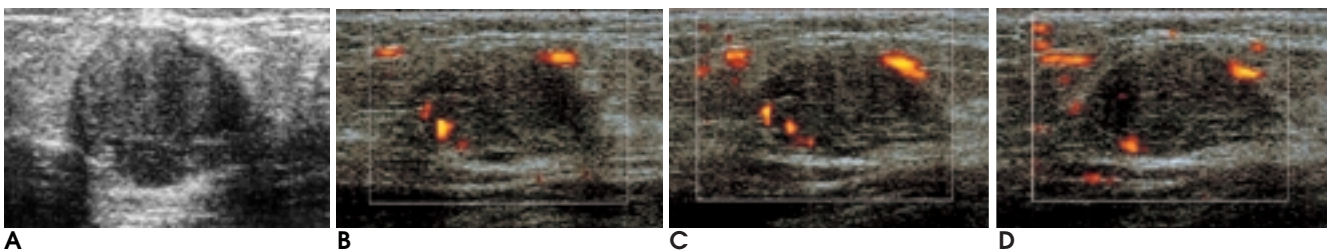


Fig. 3. A 40-years-old woman had a 1.0 cm sized benign lesion.

We assessed as benign on US (A), pre- (B) and post-contrast enhanced 1minute (C) and 3 minutes (D) power Doppler US. During the contrast enhancing study, there was no significant increase of Doppler signals, until 5 minutes later after injection, suggesting benign and confirmed as fibrocystic change.

가
SH U 508 A(Levovist; Shering, Berlin, Germany) 2.5 g 5 cc
18 gauge (antecubital) 2 cc
10
3 10 2
20
(Magnetic Optical Disket)

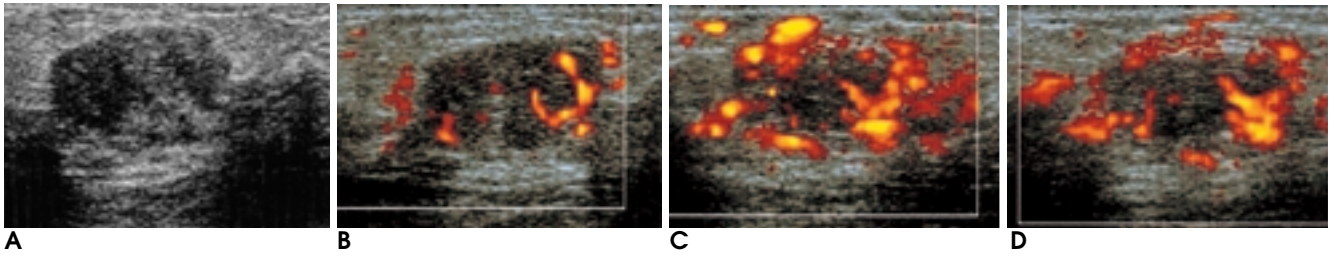


Fig. 4. A 20-year-old woman with a 1.6 cm sized Ductal carcinoma in situ. We assessed as malignant on US (A) and noncontrast PDUS (B). After contrast injection, on 1 minute (C) and 3 minutes (D) PDUS images, we assessed as malignant with high confidence. Contrast enhancement was helpful to ensure the diagnosis on US and non-contrast PDUS.

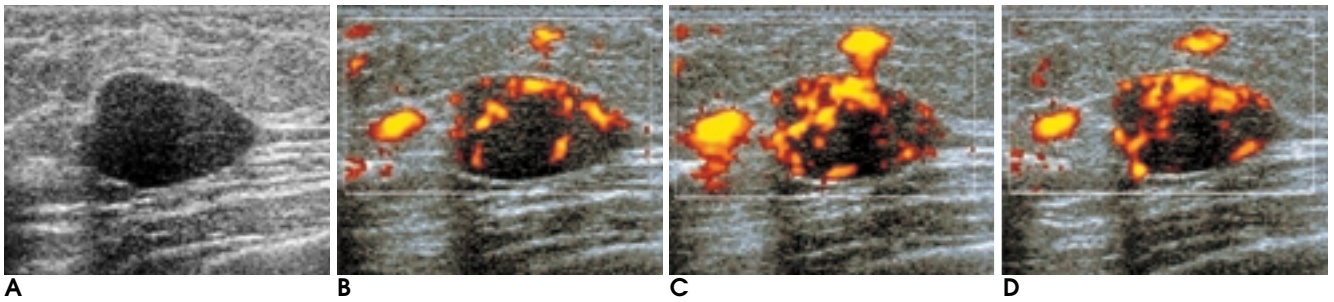


Fig. 5. A 44-year-old woman had a 1.4 cm sized Fibroadenoma. We assessed as benign on US (A), and assessed as malignant on noncontrast PDUS (B). After contrast injection on 30 seconds (C) and 4 minutes (D) PDUS images, we assessed as malignant with high confidence than noncontrast PDUS (B), but the pathology was benign.

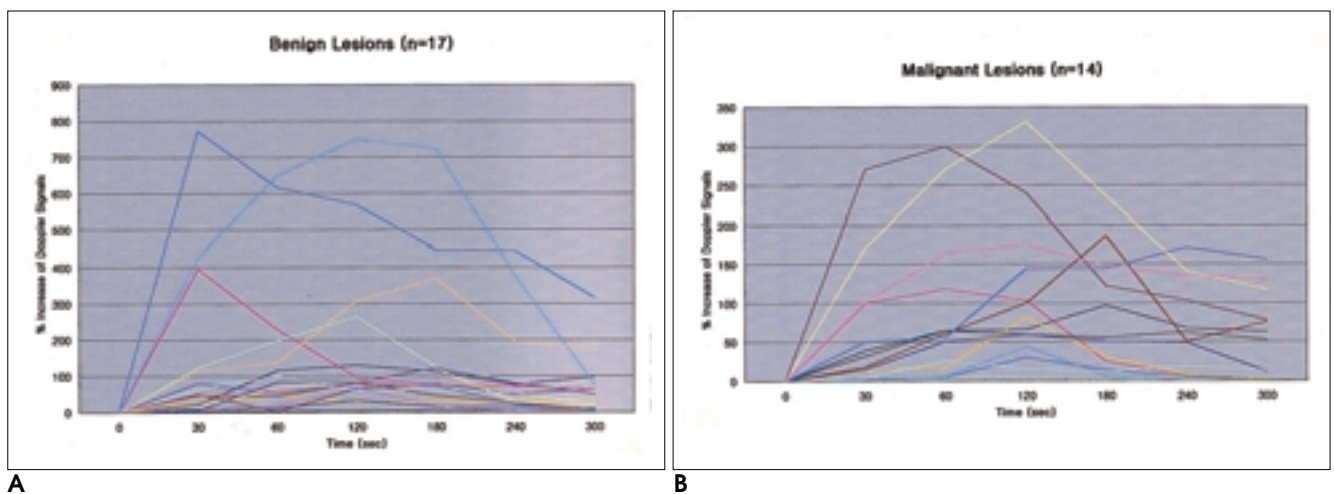


Fig. 6. Time to percent increase of Doppler signals on contrast enhanced power Doppler ultrasonography in benign (A) and malignant (B) lesions.

가 . 31 가 24 , 7 24 가 15 9 7 가 5 2 가 . 31 19 , 12 19 13 가 6 4 , 12 8 (Table 1) (Fig. 3-5). 100% 47% 35.7% 88.2 % 가 가 가 57%, 가 76% 가 (disordered or 가 (penetrating pattern) 35% (Fig. 1). 77% 가 31 13 가 .

가 6), 가 7 , 가 가 9 22

30 , 1 , 2 , 3 , 4 , 5 , (Color Pixel Density; CPD) sonic v10R(Seoul, Korea) (Fig. 2).

$$\text{가} \left(\frac{\text{CPD} - \text{CPD}}{\text{CPD} \times 100} = \text{CPD}(\%) \right) -$$

Epi info v. 6.04 (Centers for disease con-
trol & prevention, U.S.A, WHO, Zeneva, Switzer - land)
Fisher's exact test

31 8 , 23 가 , 8 23 가 14

Table 1. Assessment of 31 Small Breast Lesions at Ultrasonography, Pre- and Post-Contrast Enhanced Power Doppler Ultrasonography

	Malignant Lesions (n = 14)	Benign Lesions (n = 17)
Ultrasonography		
Malignant	14	9
Benign	0	8
Pre-contrast PDUS*		
Malignant	5	2
Benign	9	15
Post-contrast PDUS*		
Malignant	8	4
Benign	6	13

* PDUS; power Doppler ultrasonography

Table 2. The Effect on Diagnostic Confidence Level by performing Contrast-Enhanced Power Doppler Ultrasonography in addition to Gray-Scale US and Noncontrast Power Doppler Ultrasonography

Effect on Diagnostic Confidence Level	No. of Cases
Helpful	22
High confidence (+ +)	13
Improve the confidence (+)	9
Not helpful	9

가 (7, 10).

(9, 11).

6 (7 4 , 10 2)

10% 가 , 6 5 2

14 4 (3 , 1) 2 10%

가

2 cm

sonic v10R software

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The Diagnostic Value of Contrast Enhanced Power Doppler US on Small Breast Lesions¹

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Purpose: To evaluate the usefulness of contrast-enhanced power Doppler ultrasonography (PDUS) in differentiating small benign from small malignant breast lesions.

Materials and Methods: Thirty-one solid breast lesions (< 2 cm in size; 17 benign and 14 malignant) prospectively underwent US and PDUS before and after the injection of contrast agent (SH U 508A). Morphologic analysis involved independent assessment of the findings of US and the patterns of Doppler signals before and after contrast enhancement at PDUS, and sensitivity and specificity were thus evaluated. The diagnostic accuracy of US accompanied by PDUS was also determined before and after contrast enhancement. Hemodynamic analysis involved measurement of the time lapse between contrast injection at PDUS and observed change in Doppler signals. For this, a sonic VIOR computer-assisted program was used and the results were correlated with the pathologic findings.

Results: The sensitivities of US before and after contrast enhanced PDUS were 100%, 35.7%, and 57%, with specificities of 47%, 88.2% and 76%, respectively. The diagnostic accuracy of US was 35% with noncontrast PDUS, and 77% before and after contrast enhanced PDUS. The recorded time lapse between contrast injection at PDUS and observed change in Doppler signals did not correlate closely with the pathologic findings.

Conclusion: In that it improved visualization of the morphology of vascular Doppler signals, microbubble contrast-enhanced PDUS complemented US and PDUS in differentiating between small benign and small malignant breast lesions.

Index words : Breast neoplasms, diagnosis
Ultrasound (US), contrast media

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