

:
 : 20
 40 가 10 MHz 20 ,
 가 , ,
 : 14 (erosion) (degeneration) (cleft), (detachment),
 8 (tidemark), 가 (subchondral callus formation)
 . 1 가 ($p=0.446$).
 : 가
 ,
 .

가 가 .

가 (1 - 4).

가 가 가 가 가
 가가 가 가
 가 가
 가

가 1999 5 2000 2
 가

20 가 2 ,
 가 18 57 - 80 (67) .

2001 1 2 2001 4 6 40 (20)

HDI 5000(Advanced Technology Laboratories, Bothwell, Washington, U.S.A.) 10 MHz

가 7×5×4 cm

(hyperechoic line),

가

가

가

가

가

가

가

가

hema -
toxylin - eosin(HE)

1)

(cleft),

, 3)

가

40

(erosion),

(degeneration), 2)

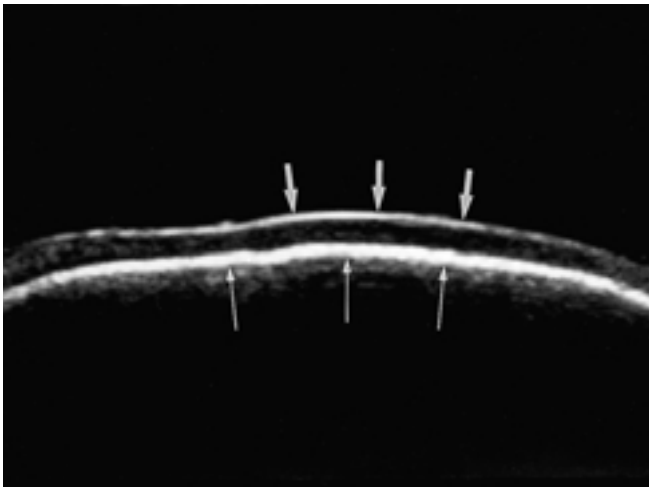
(tidemark)

paired t - test

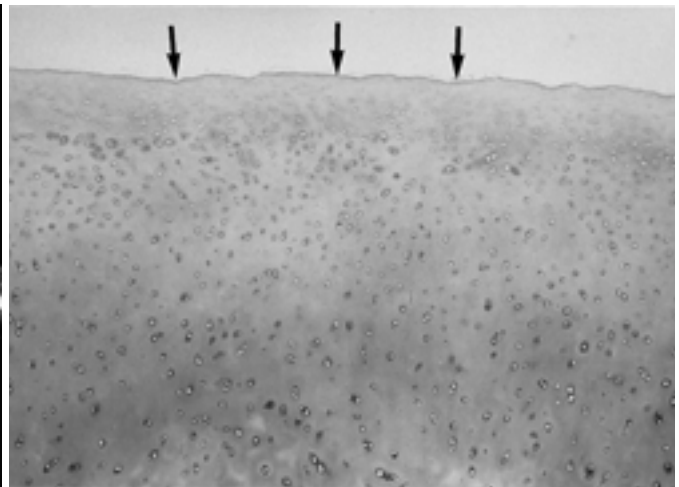
가

0.05

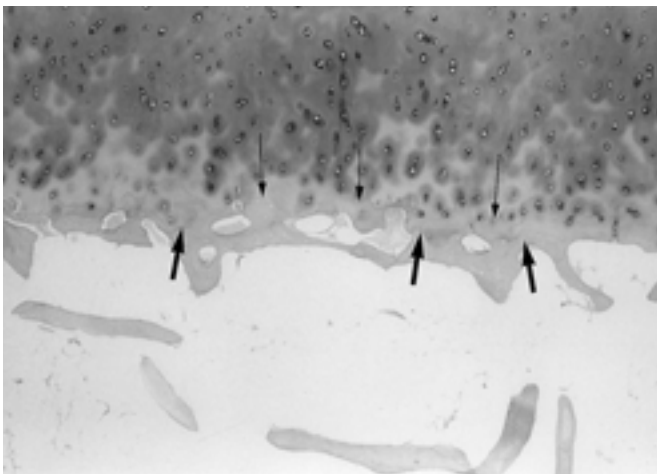
P -



A



B



C

Fig. 1. 'Normal' cartilage interfaces

A. Specimen sonogram shows a lateral condylar cartilage with smooth and thin hyperechoic lines at saline-cartilage interface and bone-cartilage interface.

B. Magnified view of histologic section (H&E stain; × 40) shows smooth cartilage surface with no focal abnormality.

C. Magnified view of histologic section (H&E stain; × 40) shows smooth and regular bone-cartilage junction.

40 17 -
23
17
(Table).

40 26
(Fig. 1), 14
(n = 8), (n = 2),
(n = 4) (Fig. 2, 3).
(detachment), (erosion) (cleft),
(degeneration)
(Table).

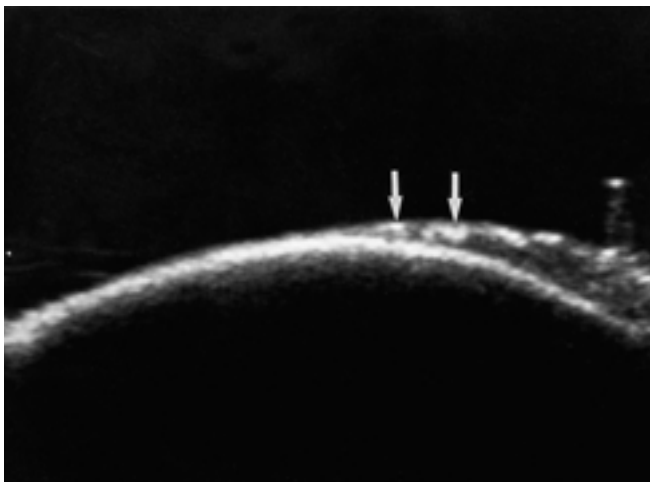
(Table).

Table. Sonographic Abnormalities on Hyperechoic Line at Cartilage Interfaces and Corresponding Pathologic Findings in 17 Cartilage Specimens

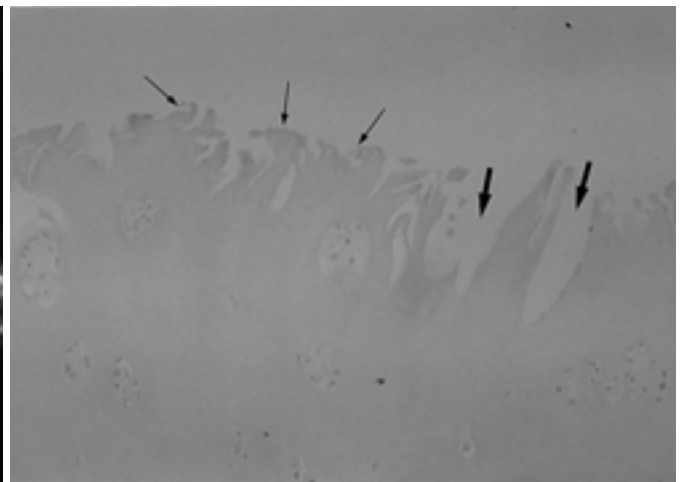
Specimen number	Saline-cartilage interface		Bone-cartilage interface	
	Dot	Loss	Irregular	Irregular
1	CL, DT, ER			
2		ER		
3	CL, DT, ER			
4			CL, DT, ER	ITM, Callus
5	CL, DG			ITM, Callus
6				Callus
7			CL, DT	
8				ITM
9	CL, ER			
10			DG, DT	ITM
11		ER		
12			CL	Callus
13			CL, DT	ITM
14			CL, DT	
15			CL, DT	
16				ITM
17			CL, DT, ER	

CL: cleft DG: degeneration DT: detachment ER: erosion
ITM: irregular tidemark

32 가
8
(fragmentation),
(downward displacement), 가 (subchondral
callus formation) (Fig. 4, 5).
40
(echo - texture)
가
가
가
가
가
가
(Fig. 6).



A



B

Fig. 2. 'Dot' lesions on cartilage surface

A. Specimen sonogram shows thinning and tapering of a cartilage and 'dot' lesions (arrows) at saline-cartilage interface.

B. Magnified view of corresponding histologic section (H&E stain; × 40) shows clefts (arrows) and erosions (thin arrows) on cartilage surface.

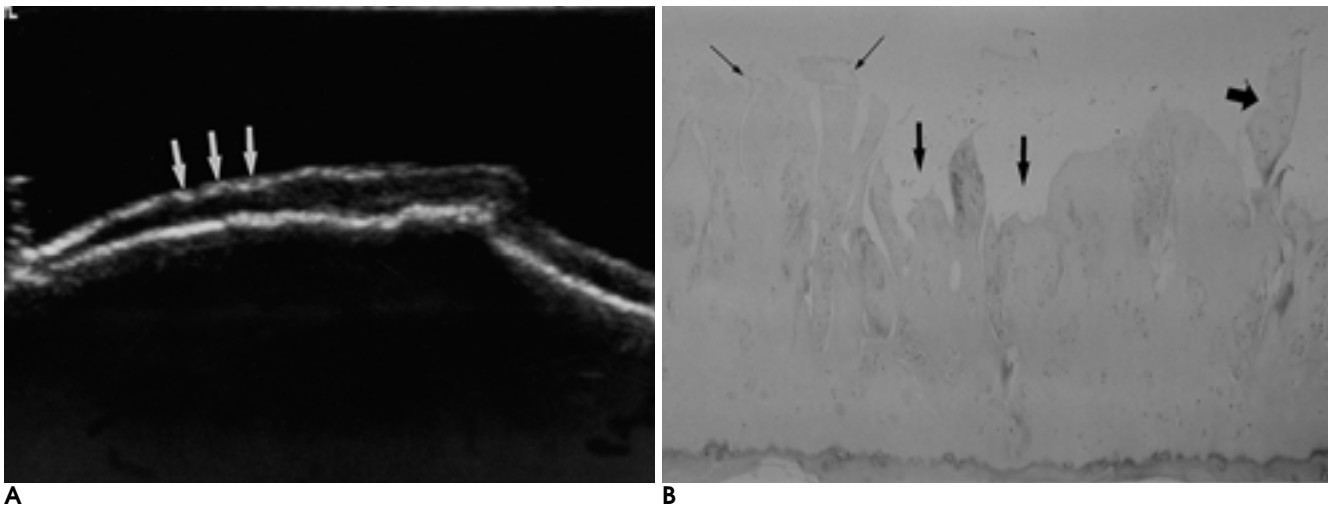


Fig. 3. Irregular cartilage surface

A. Specimen sonogram shows irregular line (arrows) of saline-cartilage interface.

B. Magnified view of corresponding histologic section (H & E stain; $\times 40$) shows clefts (arrows), detachment (thick arrow), and erosions (thin arrows) on cartilage surface.

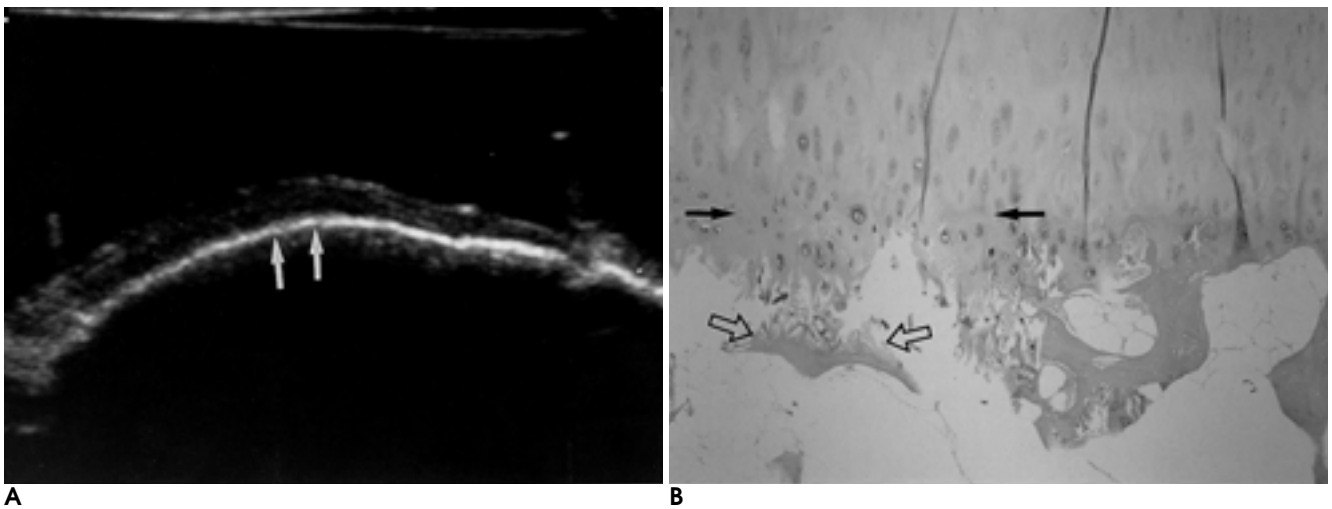


Fig. 4. Irregular subchondral hyperechoic line

A. Specimen sonogram shows irregularity of hyperechoic line (arrows) at bone-cartilage interface.

B. Magnified view of corresponding histologic section (H & E stain; $\times 40$) shows broadening and loss of tidemark (arrows) and osteochondral fragmentation (open arrows) at bone-cartilage interface.

가 2.37 ± 0.63 mm 2.32 ± 0.63 mm
($p=0.446$).

(6),

가 가

가 (2 - 5).

가,

가,

가

가

가

가

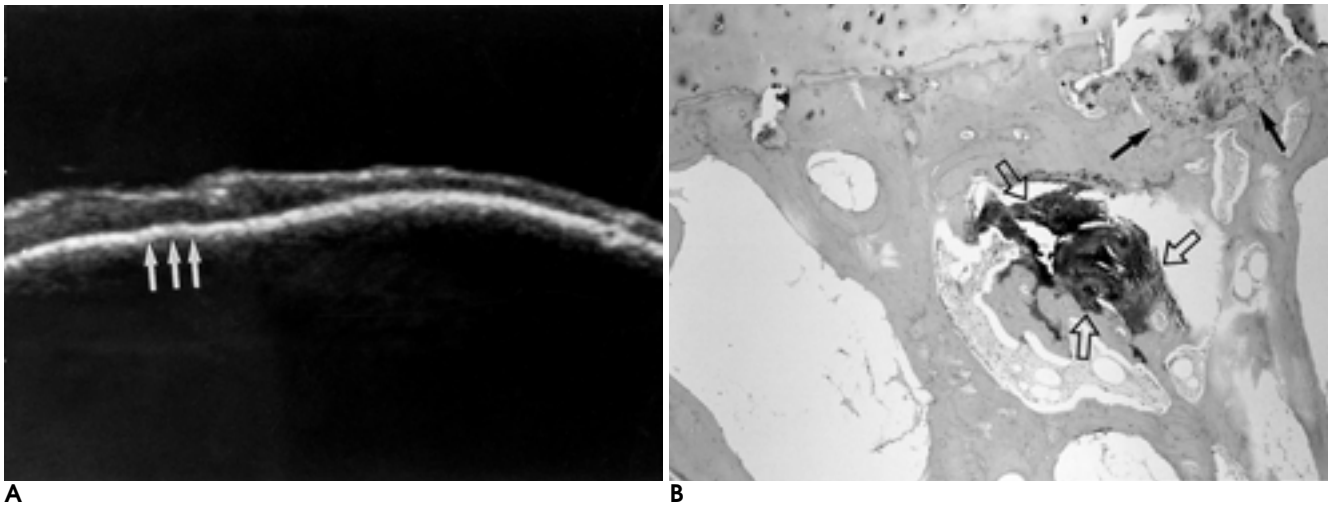


Fig. 5. Thick and irregular subchondral hyperechoic line

A. Specimen sonogram shows thick and irregular hyperechoic line (arrows) at bone-cartilage interface.

B. Magnified view of corresponding histologic section (H & E stain; × 40) shows downward displacement of cartilage (arrows) and prominent subchondral callus formation (open arrows).

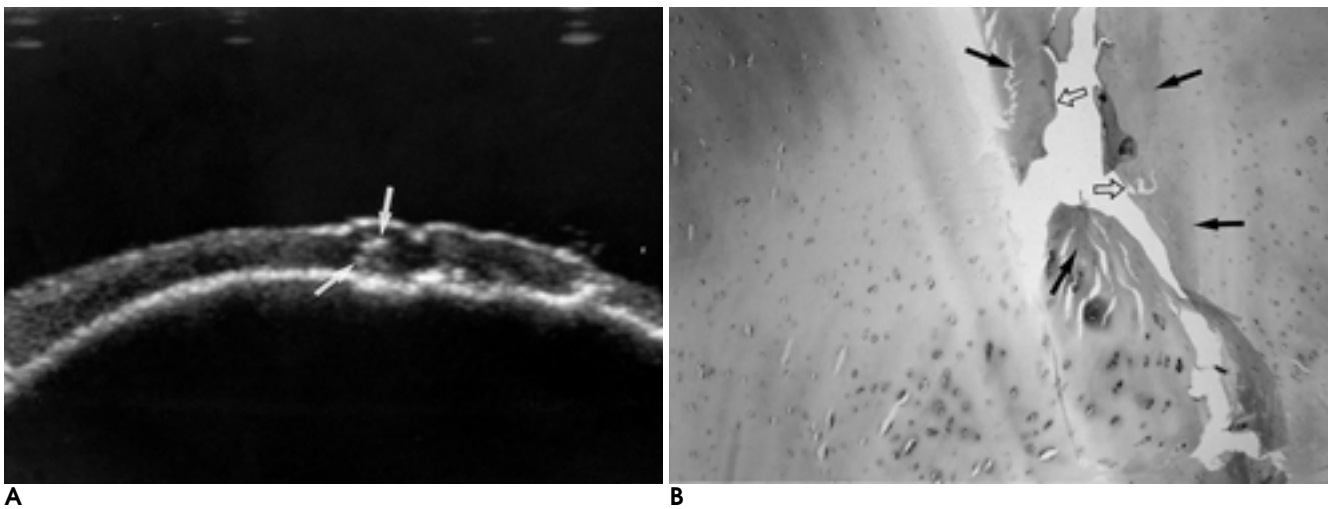


Fig. 6. 'Dot' lesions within cartilage

A. Specimen sonogram shows 'dot' lesions (arrows) within cartilage.

B. Magnified view of corresponding histologic section (H & E stain; × 40) shows cleft (open arrows) and degeneration (arrows) of the cartilage.

(7).

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가

(8),

가

가

(9).

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가

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,

,

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가

가

(6, 10, 11).

가

(deep zone)

(calcified zone)

가

가

가

가

(12).

가

가

가 가

(4,

5, 7).

(10),

가

가

(6).

가 가

가

가

가 가

가가

가

가

가

가

가

(13).

(5),

가

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Degenerative Changes of Femoral Articular Cartilage in the Knee: Comparative Study of Specimen Sonography and Pathology¹

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Purpose: To determine the sonographic findings of degenerative change in femoral articular cartilage of the knee by comparative study of specimen sonography and pathology.

Materials and Methods: We obtained 40 specimens of cartilage of the femur (20 medial and 20 lateral condylar) from 20 patients with osteoarthritis of the knee who had undergone total knee replacement. The specimens were placed in a saline-filled container and sonography was performed using a 10-MHz linear transducer. Sonographic abnormalities were evaluated at the cartilage surface, within the cartilage, and at the bone-cartilage interface, and were compared with the corresponding pathologic findings. In addition, cartilage thickness was measured at a representative portion of each femoral cartilage specimen and was compared with the thickness determined by sonography.

Results: 'Dot' lesions, irregularity or loss of the hyperechoic line, were demonstrated by sonography at the saline-cartilage interface of 14 cartilages. Pathologic examination showed that these findings corresponded to cleft, detachment, erosion, and degeneration. Irregularities in the hyperechoic line at the bone-cartilage interface were revealed by sonography in eight cartilages and were related to irregularity or loss of tidemark, downward displacement of the cartilage, and subchondral callus formation. Dot lesions, corresponding to cleft and degeneration, were noted within one cartilage. Cartilage thickness measured on specimen and by sonography showed no significant difference ($p=0.446$).

Conclusion: Specimen sonography suggested that articular cartilage underwent degenerative histopathological change. Cartilage thickness measured by sonography exactly reflected real thickness.

Index words : Cartilage
Specimens
Arthritis, degenerative
Knee, US

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