

: (radiofrequency thermal ablation)가

: 15 50 15
가
가
A : 70°C (n=5), B : 80°C (n=5),
C : 90°C (n=5), 1

: A, B, C 42.7%, 41.7%, 42.9% ($p>.05$).
15 10 9 70°C 80°C , B C
5.4 mm 9.8 mm . A

(coagulation necrosis)

:

(percutaneous sclerotherapy) (6-8).
가

(1, 가
2). 가

(catheter) (sclerosing agent) 가

32 - 100% 가
가

(1, 3-5).

가

100°C

가

15

2001 1 22

2001 5 9

50

(460KHz) 4 가 15
(RITA Medical System Inc.,
Mountainview, CA)
(side arm)가 가

1) A : 70°C (n=5); 2) B : 80°C (n=5); 3) C : 90°C (n=5)

(ground pad)
가
가
가 21 50 cc
30%

가
2
1
10 MHz (ATL, HDI 5000;
Advanced Technology Laboratories, Bothell, WA)

One - way ANOVA Test
Chi - Square Test

15
70°C
, B C 10 9 80°C
(Fig. 1).
Table 1 가
(±
) 42.7 ± 9.2%, 41.7 ± 9.6%, 42.9 ± 14.7%
(p>.05).
A C 가 (Table 2).
가 가 가

| Table 1. Duration Reaching to Target Temperature | | | |
|--|------|-----|------|
| Group * | A | B | C |
| Mean Volume (ml) | 70.6 | 79 | 63 |
| Mean Time [†] | 4.2 | 9.2 | 12.7 |
| SD [§] | 1.3 | 2.2 | 7.4 |

* Group A:70°C; B:80°C; C:90°C
† Time: minutes
§ SD: Standard Deviation

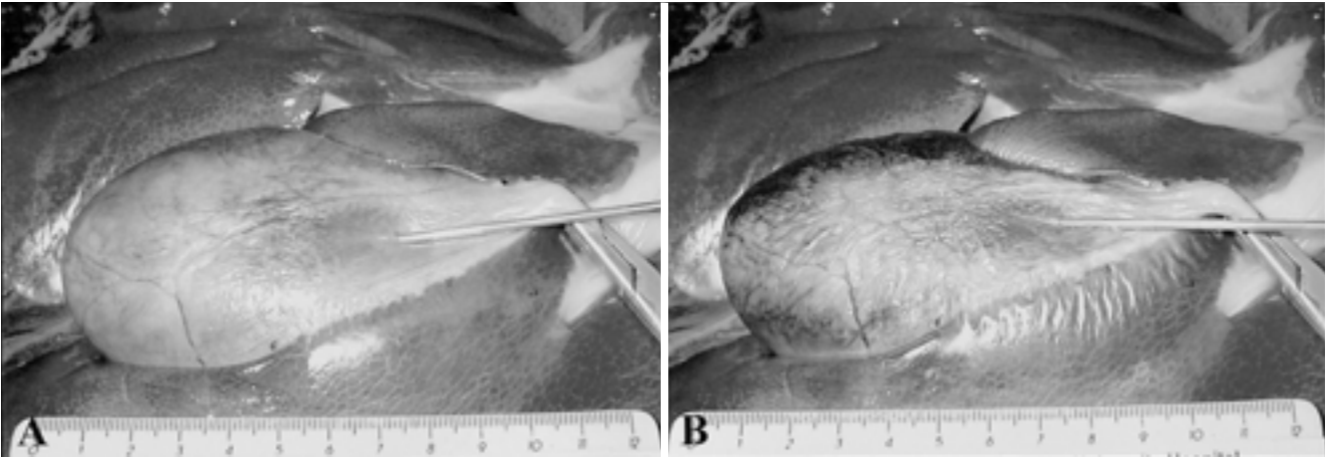


Fig. 1. Gross change of the gall bladder and hepatic capsule according to the temperature.
A. Transparency and elasticity of the gall bladder wall is lost at about 70°C.
B. Hepatic capsule around the gall bladder fossa shows moderate retraction at about 80°C.

11.1% 가 가

 $(p<.05)$.

B C
5.4 mm 9.8 mm A

(Fig. 2).

가 ,
50% 가

Table 2. Mean Thickness Change of Gallbladder Wall

| Group * | A | B | C |
|-----------------|-------------------|------|------|
| Before RFA(mm) | 1.24 | 1.38 | 1.24 |
| After RFA(mm) | 1.68 | 1.56 | 1.68 |
| SD [†] | 0.6 | 0.2 | 0.2 |
| % change | 35.5 [§] | 13 | 35.5 |

* Group A:70°C; B:80°C; C:90°C

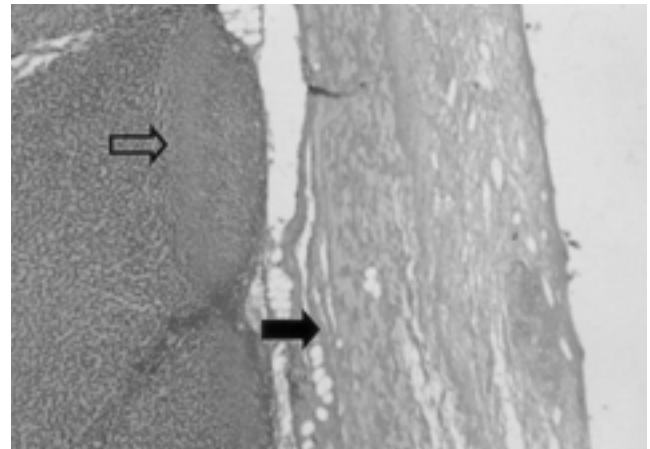
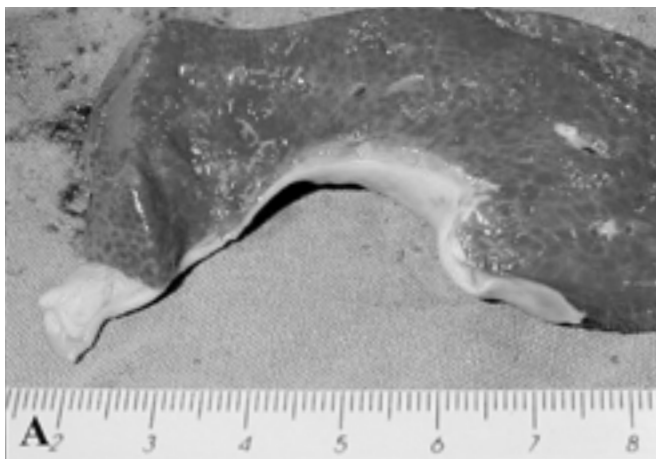
[†] SD: Standard Deviation of thickness change in each group[§] One specimen showed marked wall edema, which may contribute to this result.

70°C A

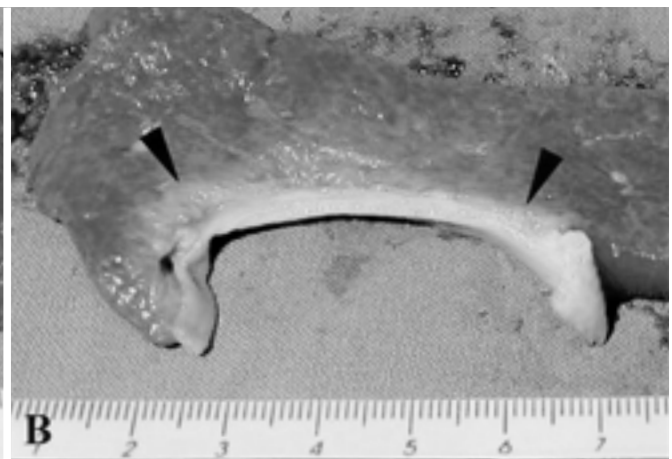
B

C

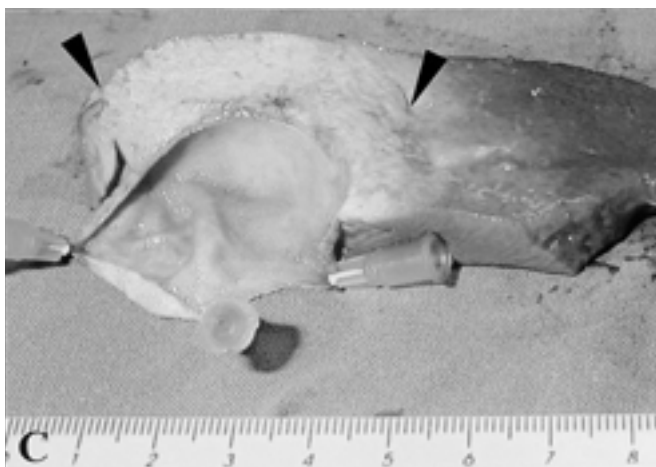
(Fig. 3).

**Fig. 3.** Photomicrograph show complete coagulation necrosis of the gallbladder wall (arrow) and adjacent hepatic tissue (open arrow). Group B at 80°C (Hematoxylin-Eosin $\times 40$).

A



B



C

Fig. 2. Gross change of the hepatic parenchyma around the gallbladder fossa**A.** There is no gross change of the hepatic parenchyma at 70°C.**B.** Mild discoloration of the hepatic parenchyma is noted around the gall bladder fossa at 80°C (arrow heads).**C.** Marked discoloration of the parenchyma is seen at 90°C (arrow heads).

:

가

가

50 - 60.

C

가

(absolute alcohol, 5% morrhuate sodium, sodium tetra -
cyl sulfate, tetracycline, methyl cyanoacrylate alcohol
with trifluoroacetic acid, sodium carbonate, hot con -
trast medium)

(23). Coleman

가

(9 - 15).

(16, 17).

가 가

가

(reactive fibrosis)가

(18).

가

Coleman

(catheter)

(19).

가

가

가

가

Aagaard

54°C

35

25%

가 (24).

. Becker (cystic duct) (heat
probe) 95%

가

10

90°C

가

3% sodium tetradecyl - sulfate (STS)

가

(20 - 22). , Coleman

가

(boiling contrast medi -

가

um)

50

가

13 11

, Rokitanski - Aschoff sinus

가

Coleman McGahan

(23). McGahan

,

,

가

70°C A

54°C 30

11 9

(16, 17).

70°C

tation)

(ionic agi -
(frictional heat)

,

Heat sink effect

가

(osteoid ostemoa),

가 가
가 ,
가
가
70%
가
가 가
가
14
가
가 ; , 가
가
가

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Radiofrequency Thermal Ablation of Benign Cystic Lesion: An Experimental Pilot Study in a Porcine Gallbladder Model¹

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Purpose: To determine whether radiofrequency thermal ablation can be used to treat benign cystic lesions in a porcine gallbladder model.

Materials and Methods: This experimental study of radiofrequency thermal ablation involved the use of 15 ex-vivo porcine gallbladders and 15-G expandable needle electrodes. To investigate optimal temperature parameters, three groups of five were designated according to target temperature: Group A: 70°C; Group B: 80°C; Group C: 90°C. After the target temperature was reached, ablation lasted for one minute. Gallbladder width, height and length were measured before and after ablation, and the estimated volume reduction ratios of the three groups were compared. Whether adjacent liver parenchyma around the gallbladder fossa was ablated by heat conducted from hot bile was also determined, and the thickness of the ablated area of the liver was measured.

Results: The volume reduction ratio in Group A, B and C was 42.7%, 41.7% and 42.9%, respectively ($p > .05$). In all 15 cases, gallbladder walls lost their transparency and elasticity at about 70°C. In nine of ten cases in Groups B and C, the hepatic capsule around the gallbladder fossa was retracted at about 80°C. The mean thickness of liver parenchymal damage adjacent to the gallbladder was 5.4 mm in Group B and 9.8 mm in Group C. In Group A livers, only one case showed minimal gradual parenchymal change. Microscopically, all three groups showed complete coagulation necrosis of the wall.

Conclusion: On the basis of this feasibility study, radiofrequency thermal ablation is potentially suitable for the ultrasound-guided treatment of symptomatic cystic lesions including benign hepatic or renal cyst.

Index words : Radiofrequency ablation
Interventional procedures

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