

# Ultrasonography of the Liver in Korean Native Goat

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## 한국재래산양에서 간장의 초음파검사법

김명철 · 김상근 · 조성환 · 신광순 · 류시윤  
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초록 : 본 연구의 목적은 초음파검사에 의하여 한국재래산양의 간장 및 담낭의 정상적인 구조와 크기를 알아보는 데 있다.

30두의 한국재래산양에서 간장, 문맥, 후대정맥 및 담낭의 크기, 위치 및 구조를 측정하였다. 30마리의 산양을 체중에 따라서 5-15Kg, 15-25Kg 및 25-35Kg군으로 분류하였다. 우측복벽의 제9늑간극으로부터 12늑간극까지에서 측정을 실시하였다. 각 늑간극에서의 간장의 크기, 후대정맥 및 문맥의 위치 및 직경을 관찰하였다.

본 연구에 있어서의 간장 크기 및 위치의 초음파 측정자료는 한국재래산양의 간장의 변화에 대한 진단에 있어서 기초자료로서 사용될 수 있다는 결론을 얻었다.

### Introduction

Ultrasonographic examinations of the liver were performed as a diagnostic procedures in dogs<sup>5,6,8-11,13</sup>, horses<sup>12</sup> and cows<sup>2</sup> but, to our knowledge, not in goat. Metabolic disorders lead to diffuse changes of liver structure and size, whereas abscesses and tumors usually induce focal changes. Hepatospecific enzyme tests

are generally unable to detect these differences. A complete ultrasonographic assessment of the liver should give detailed information about the size, position, and parenchymal pattern of the liver, and determine the location of major vessels. The purpose of the study reported here was to obtain fundamental data of normal ultrasonography for liver, caudal vena cava, portal vein and gall bladder in Korean native goat.

이 논문은 충남대학교의 1993년도 학술진흥장학재단 과제연구비에 의하여 연구되었음.

ultrasonographically. Hepatic and portal veins, caudal vena cava, and biliary system were examined. Actual measurements were made from a schematic cross-section image of the abdomen in the area of the eleventh ICS(Fig 1). Positions of the dorsal and ventral liver margins, caudal vena cava, portal vein, and dorsal and ventral margin of gall bladder were measured in relation to the midline of the back. The visible size of the liver in a given ICS was determined by subtracting the distance between dorsal margin

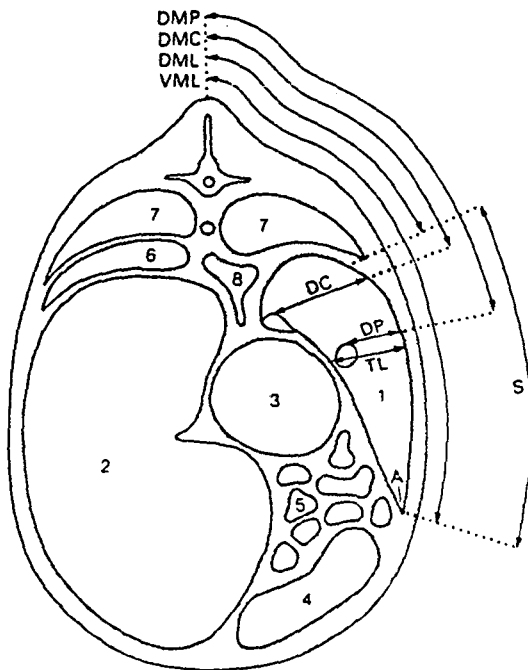


Fig 1. Schematic of the ultrasonographic measurements of the variables on a cross section of the abdominal cavity in Korean native goat, caudal view. 1:liver, 2:rumen, 3:omasum, 4:abomasum, 5:intestine, 6:spleen, 7:lung, 8:pancreas, DMP: dorsal vena cava, KML:dorsal margin of liver, VML:ventral margin of liver, S:size of liver, DC:depth of caudal vena cava, DP:depth of portal vein, A:angle of liver.

## Materials and methods

Ultrasonographic examinations were carried out on 30 clinically healthy Korean native goats between 3 months and 9 years old. Thirty goats were divided by 3 groups as 5-15 kg, 15-25 kg and 25-35 kg Group according to the body weights.

The ultrasonographic examinations were performed with a convex real-time scanner (Medison Co., Korea) on the right side of the abdomen while the goats were standing. Hair was clipped between shoulder and flank. After application of contact gel to the transducer, goats were examined ultrasonographically from caudal to cranial, beginning caudal to the last rib and ending at the seventh intercostal space (ICS).

The texture and position of diaphragmatic and visceral surfaces of the liver were scanned



Fig 2. Ultrasonogram of normal liver and caudal vena cava, obtained from the tenth intercostal space(ICS) about 7 cm distal to the midline of the back. 1:depth of caudal vena cava(3.2 cm), 2:diameter of caudal vana cava(1.3 cm), A:abdominal wall, L:liver tissue, C:caudal vena cava.

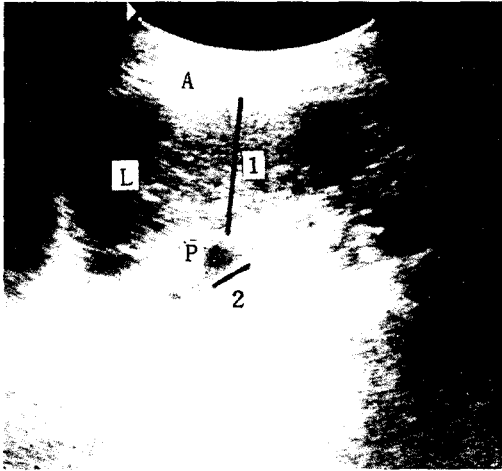


Fig 3. Ultrasonogram of normal liver and portal vein, obtained from the tenth ICS about 11 cm distal to the midline of the back. 1:depth fo portal vein (2.8 cm), 2: diameter of tportal vein (1.3 cm), A:abdominal wall, L:liver tissue, P:portal vein.

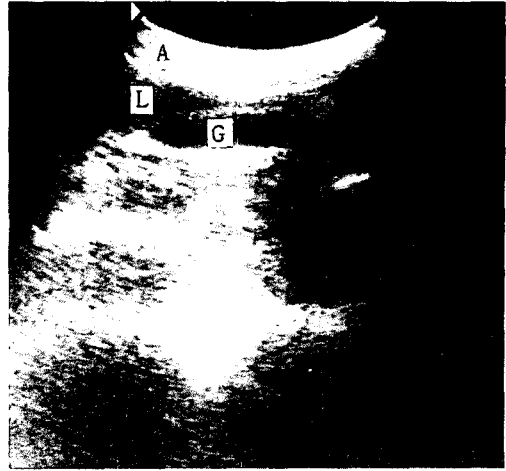


Fig 5. Ultrasonogram of the gall bladder. Transducer was placed in the ninth ICS about 21 cm distal to the midline of the back. The gallbladder was oval and appeared almost black with a bright margin. A:abdominal wall, L:liver tissue, G:gallbladder.

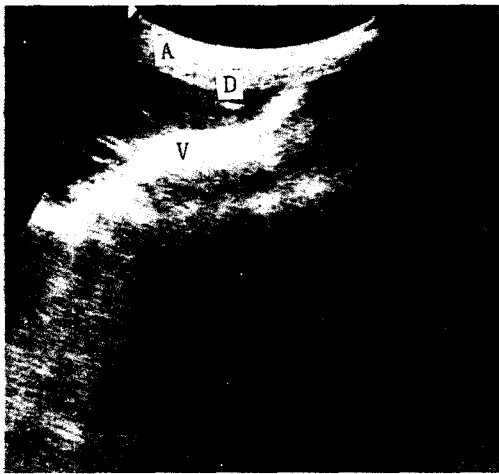


Fig 4. Ultrasonogram of the distal angle of liver. Transducer was placed in the tenth ICS about 20 cm distal to the midline of the back. A:abdominal wall, D:diaphragmatic surface of liver, V:visceral surface of liver.

and midline of the back from the distance between ventral liver margin and midline of the back. Thickness of the liver, and depth and diameter of acuadl vena cava and portal vein were measured(Fig 1, 2 and 3). The angle of the liver was determined by measuring the distal margin of the liver with a protractor(Fig 4). The staistical calculations were performed by F-test.A probability of psignificant.

## Results and discussion

Ultrasound have been used for the observation of tomography for heart<sup>1,7</sup>, liver<sup>2,5,6,8-13</sup> and kidney<sup>3,4</sup>, presence of luminal contents, motion of moving organ, morphology of neoplasm and its relationship with surrounding tissues, pregnant uterus, and differentiation of viability and sex of fetus.

Since intrahepatic anatomy can be readily

Table 1. Results of the ultrasonographic examination of the caudal vena cava and portal vein of Korean native goats (n=10)

Variables	Intercostal space	Mean±SD		
		5-15 kg	15-25 kg	25-35 kg
Caudal vena cava Dorsal margin*	12	5.6±1.45	5.8±0.32	6.5±0.31
	11	5.7±1.47	6.1±0.69	6.9±1.10*
	10	6.8±1.38	7.1±0.57	8.3±1.03*
	9	7.9±0.69	8.4±0.84	10.2±0.55**
Depth (cm)	12	2.5±0.25	2.9±0.65	3.4±0.36**
	11	2.2±0.24	3.0±0.50	3.7±0.34**
	10	2.4±0.33	3.1±0.57	3.9±0.28**
	9	2.5±0.50	2.9±0.79	3.9±0.27**
Diameter (cm)	12	1.1±0.01	1.3±0.29	1.4±0.26**
	11	1.1±0.16	1.4±0.23	1.4±0.21**
	10	1.0±0.19	1.3±0.15	1.4±0.21**
	9	1.0±0.09	1.1±0.11	1.4±0.19**
Portal vein Dorsal margin*	12	8.0±1.51	9.6±1.08	10.1±0.49**
	11	8.1±1.54	9.2±0.93	10.1±1.24*
	10	8.7±1.78	10.5±0.56	11.7±0.99**
	9	10.1±0.90	11.4±1.56	13.9±0.41**
Depth (cm)	12	2.1±0.10	2.8±0.14	3.3±0.49**
	11	2.1±0.27	2.7±0.63	3.1±0.67**
	10	2.0±0.26	2.8±0.29	3.2±0.41**
	9	2.5±0.86	2.5±0.60	3.4±0.35**
Diameter (cm)	12	1.1±0.15	1.4±0.03	1.4±0.25**
	11	1.1±0.22	1.2±0.27	1.3±0.13*
	10	1.0±0.12	1.3±0.29	1.4±0.24**
	9	1.0±0.17	0.9±0.20	1.2±0.38
Gall bladder Dorsal margin*	10	13.6±1.81	15.7±1.89	19.6±0.92**
	9	14.5±2.75	19.3±2.18	22.8±2.20**
Ventral margin*	10	15.7±1.52	20.3±1.26	23.2±2.88**
	9	16.2±1.67	22.5±3.57	26.0±2.36**

<sup>a</sup> ; centimeters distal to the midline of the back.

\*\* ; p<0.01, \* ; p<0.05.

Table 2. Results of the ultrasonographic examination of the liver of Korean native goats (n=10)

Variables	Intercostal space	Mean±SD		
		5-15 kg	15-25 kg	25-35 kg
Dorsal margin <sup>a</sup>	12	4.0±0.88	4.4±0.27	4.6±0.33*
	11	4.3±1.19	4.6±1.00	5.5±1.90
	10	5.7±1.15	6.2±1.18	6.9±0.78
	9	6.6±0.92	7.2±0.69	8.7±0.80**
Ventral margin <sup>a</sup>	12	10.5±4.75	13.2±1.65	16.1±2.29**
	11	13.4±1.73	16.2±1.23	18.4±2.07**
	10	15.7±1.97	19.9±1.66	22.5±2.29**
	9	14.6±5.20	21.4±2.54	21.8±7.48**
Size (cm)	12	6.5±2.54	8.8±0.83	11.5±1.71*
	11	7.1±1.52	11.3±1.16	13.7±1.93*
	10	10.0±1.76	13.7±1.48	15.6±1.59*
	9	4.3±3.51	14.2±2.15	13.1±4.65*
Thickness (cm)	12	3.3±0.25	4.3±0.71	4.8±0.45**
	11	3.1±0.58	4.1±0.80	4.9±0.43**
	10	3.1±0.65	4.5±1.36	4.8±0.26**
	9	3.3±0.76	4.1±1.29	4.9±0.12**
Angle (°)	12	34.6±3.16	33.3±2.36	40.3±2.27**
	11	33.9±4.08	31.5±4.73	40.2±3.31**
	10	33.3±3.54	30.3±1.59	38.0±6.20*
	9	30.6±5.19	30.3±5.68	35.6±4.69*

<sup>a</sup> : centimeters distal to the midline of the back.

\*\* ; p<0.01, \* ; p<0.05.

evaluated in a safe, noninvasive manner using ultrasonography, the technique can be routinely used to detect and characterize a wide variety of liver abnormalities in veterinary medicine.

The parenchymal pattern of the normal liver consisted of numerous weak echoes homogeneously distributed over the entire liver. Several vessels were seen in hepatic tissues that increased size toward the portal vein and caudal

vena cava. The lumen of these vessels was anechoic, and thus appeared black. The liver appeared more echogenic(brighter) than the renal cortex. Mean and SD of the measurement are shown in Table 1 and 2.

The caudal vena cava(Fig. 2) was consistently positioned dorsal and medial to the portal vein. The portal vein(Fig. 3) was usually round or slightly oval on cross-sectional view whereas the

caudal vena cava was rectangular or drop-like.

Fig. 4 shows ultrasonogram of the distal angle of liver. Diaphragmatic surface and visceral surface of the liver at the distal margin revealed the angle. Fig. 5 shows ultrasonogram of the gall bladder. The gall bladder was easily recognized as a fluid-filled vesicle, which appeared a dark area with a bright margin.

### Conclusion

This study was carried to get detailed information about the normal size and texture of the liver in Korean native goat by means of ultrasonographic examinations.

Structure, location, and shape of the liver, portal vein, caudal vena cava and gallbladder were examined ultrasonographically in 30 goats. Thirty goats were divided by 3 groups as 5-15 kg, 15-25 kg and 25-35 kg Group according to the body weights. Examinations were performed on the right side of the abdomen in the ninth through twelfth intercostal spaces. In each intercostal space, the dimension of the liver, the location and diameter of the caudal vena cava and portal vein were determined.

The ultrasonographic values of liver size and localization in this study can be used as reference for the diagnosis of changes in the liver of Korean native goat.

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