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Diagnostic Value of Ultrasonographic Findings of Clonorchiasis

- Including Positive Infestation Rate of Nakdong River Basin in Korea -

Jong Deok, Kim, M.D.

Departement of Diagnostic Radiology and Institute of Rural Medicine, Inje University, School of Medicine

간흡충증 환자에서 복부초음파 검사의 진단적 가치

- 낙동강유역 환자의 감염율을 포함하여 -

김 종 덕

인제대학교 의과대학 방사선과학교실

= 국문초록 =

1989년 1월부터 1990년 2월까지 2년간 건강진단을 목적으로 본병원의 성인병예방센타를 방문했던 경상남북도 거주자 5,978명중 간흡충증 환자 528명을 대상으로 하여 낙동강유역 거주자와 나머지 지역 거주자의 감염율을 비교하였고, 같은 기간동안 본병원의 외래 또는 입원 환자 중 간흡충증으로 진단된 206명의 복부초음파 소견을 분석하여 다음과 같은 결과를 얻었다.

1) 낙동강유역 거주자의 감염율이 나머지 지역 거주자에서 보다 3.8배 높았으며, 남녀의 비가 2 : 1이었고, 30세에서 59세 사이가 86%를 차지하였다.

2) 간내담관의 미만성 확장 및 여러정도의 간내담관벽의 에코증가와 아울러 담낭내의 떠다니는 뚜렷한 에코소견들이 간흡충증의 특징적 초음파 소견이며, 이중 간내담관의 확장으로 인한 parallel channel sign은 활동성 감염증이거나 또는 후유증일 수 있지만 담낭내에 떠도는 에코소견은 활동성 감염증을 나타내는 소견이다.

Introduction

The geographic distribution of clonorchiasis is largely confined to the Orient, from Japan to Vietnam. The endemic areas include Japan, Southern Korea, the main land of China(except the northwest), Taiwan, and Northern Vietnam. In Korea, Nakdong river basin is the most prevalent area and the residents in this area who visited our Health Center were infested 2.8 times higher than that of the rest area residents of Kyungsang-do province(Nakdong river flows through Kyungsang-do province in north-to-south direction). Positivie rate in male was more than double that

of female and most of the patients was between 30 and 59 years of age(86%).

Retrospectively I analysed the ultrasonographic findings in 206 regular patients with clonorchiasis proved by demonstration of eggs in their stools. Diffuse dilatation of small intrahepatic bile ducts (parallel channel sign) with various degree of increased echogenicity of bile duct wall, and floating or dependent, discrete, non-shadowing, intraluminal echogenic foci in gallbladder were the characteristic findings of clonorchiasis.

Clonorchiasis is a disease caused by chronic infestation of adult worms of *Clonorchis sinensis*, a liver fluke residing in the medium-sized and small intrahepatic bile ducts(i.e., tertiary, quaternary, and more peripheral tributaries) and occasionally gallbladder and pancreatic duct. Man is one of the natural definitive hosts and is infested by ingestion of raw flesh of freshwater fish in endemic areas. The purpose of this report is twofold ; one is to calculate the rate of infestation in Nakdong river basin, the longest river and the most prevalent area in Korea, because our hospital is located in this endemic area, and the other is to describe the sonographic feature on the basis of my previous report in 1988.

Materials and Methods

The hospital records and ultrasonographic examinations of two groups of clonorchiasis patients proved by stool examination were reviewed ; Group 1 included 528 patients who visited our Health Center for checking their health condition, and Group 2 included 404 patients who were the regular patients of our hospital. All patients of Group 1 and 206 patients of Group 2 underwent upper abdominal ultrasonography during a 2-year period from January, 1989 to December, 1990 in Inje University Pusan Paik Hospital ; the former were performed with a Diasonic DRF-200 and the latter with a Toshiba Sonolayer-VSSA-90-A (with 3.5 MHz sector and linear transducer). The ultrasonographic findings of only Group 2 patients were analysed for (a) diffuse dilatation of intrahepatic bile ducts (parallel channel sign) with increased echogenicity of bile duct wall and (b) floating or dependent, discrete, non-shadowing, intraluminal echogenic foci in gallbladder, and they were compared with the results of our previous report in 1988 at Biannual Symposium of Korea-Japan Radiological Society (Ultrasonographic Findings of Clonorchiasis ; Significance of Intraluminal Floating Echo ; unpublished), because the same ultrasonographic machine was used to the Group 2 as in 1988 patients. Dilatation of intrahepatic bile ducts was considered if the ducts were equal to or wider than one-half of the accompanying portal venous branches or if ductules were present in the peripheral portion of the liver.

In addition, the positive rate of infestation of the patients who lived in Nakdong river basin, the largest endemic area in Korea, was calculated from only Group 1.

Results

Group 1 : 5978 persons who lived in Kyungsang-do province were examined for *C. sinensis* ova in their stools including 734 Nakdong river basin residents ; 8.8% (528 patients) had positive stool finding and 34.7% of them(183/528) was Nakdong river basin residents. So, 24.9% (183/734) of Nakdong river basin residents were infested, while 6.6% (345/5244) of Non-Nakdong river basin residents were infested. 11.6% (366/3147) of male and 5.7% (162/2831) of female were infested, respectively, and 86% (445/528) of the patients was between 30 and 59 years of age in both sexes (Table 1).

Group 2 : 206 persons of Group 2(404) underwent upper abdominal ultrasonography ; Sonograms in 102 patients(49.5%) showed diffuse

Table 1. Health center (1989. 1. ~ 1990. 12)

Area	No. of Pts. No. of Stool Exam. for CS ova	Stool(+)	Positive Rate(%)
Nakdong river basin	734	183	24.9
Non-Nakdong river	5244	345	6.6
Total	5978	528	
	m : 3147	m : 366	m : 11.6
	f : 2831	f : 162	f : 11.6

dilatation of small intrahepatic bile ducts (parallel channel sign) with various degree of increased echogenicity of bile duct wall, and in 17 patients (8.3%) floating, non-shadowing, intraluminal echonenic foci in gallbladder were seen in addition to parallel channel sign with increased bile duct wall echo, and in only one patient(0.5%) floating, non-shadowing, intraluminal echogenic foci in gallbladder without other findings were seen.

18 gallbladders(8.8%) had stones with or without wall thickening(over 3mm). Dilated extrahepatic bile duct with smooth tapering end was seen in 8 patients(3.9%. There was no associated cholangiocarcinoma, peripheral or central type (Table 2).

Discussion

Human infestation of clonorchiasis depends on eating habits[1]. Korean men have a marked preference for raw fish in their diet as a social customs, and Nakdong river basin is the most prevalent area in Korea. According to the data from "Yearbook of Health and Social Statistics, 1989" reported by Ministry of Health and Social Afairs of Korea, the infestation rate of clonorchiasis in Korea in 1988 was 0.1% and 0.5% in Kyungsangnam-do province(south of Kyungsang-do province), the highest rate in Korea, and 0.2% in Kyungsangbuk-do province(north of Kyungsang-do province), through both areas Nakdong river flows.

In my study, 24.9% of the residents in Nakdong river basin was infested, whereas 6.6% of Non-Nakdong river basin residents was infested. 11.6% of male and 5.7% of female were infested, respectively, so the positive rate of Nakdong river basin was 3.8 times higher than that of Non-Nakdong river basin and the positive rate in male was more than double that of female. 86% of the patients was between 30 & 59 years of age.

Table 2. Ultrasonographic findings (Regular Pts. : 1989. 1 ~ 1990. 12)

1. Diffuse dilatation of small IHBD	102(49.5)
2. Increased echogenicity of IHBD wall with 1.	79(38.3)
3. Floating, non-shadowing, echogenic foci in GB with 1 & 2.	17(8.3)
4. Floating, non-shadowing, echogenic foci in GB only without 1 & 2.	1(0.5)
5. Additional Findings	
a) Gallstones with or without wall thickening	18(8.8)
b) Dilated EHBD with smooth tapering	8(3.9)
c) Liver SOL	8(3.9)
d) Fatty liver	2(1.0)
e) IHBD & EHBD stones	2(1.0)
f) Cholesterolosis in GB	1(0.5)

Diffuse dilatation of the small intrahepatic bile ducts(parallel channel sign) with increased echogenicity of bile duct wall and floating or dependent, discrete, non-shadowing, intraluminal echogenic foci in gallbladder were known as the characteristic sonographic findings of clonorchiasis[2-3]. These findings reflect the basic disease process. Adult worms of the liver flukes reside in medium and small intrahepatic bile ducts and produce cholangitis, and dilatation of smaller bile ducts is most likely caused by the worms perse because the 8 to 15mm worm or aggregates of worms can easily occlude the small peripheral ducts, but larger ducts such as right and left hepatic ducts and extrahepatic ducts are wide enough to be patent, even if worms are lodged within them. Adenomatous hyperplasia, inflammatory cell infiltation, and periductal fibrosis produce diffuse thickening of the bile ducts, which may play additional roles in the occlusion of the ducts and the resultant dilatation of proximal intrahepatic ducts[1-5]. Although the flukes or aggregates of flukes can be shown as a non-shadowing echogenic focus or cast within the bile ducts with the advent of newer high resolution sonographic equipment[6], flukes within the bile ducts usually are difficult to be shown with sonography. Demonstration of a worm or worms depends on the size of the worms or its aggregation and the degree of bile duct dilatation. But flukes within the gallbladder are much easier to see[2-3]. Usually flukes sink in the dependent portion, but float with a change in position or a light blow on the gallbladder with the transducer. Flukes occasionally float spontaneously, and these motions are considered to be caused by the movement of living flukes. These discrete, echogenic foci are not considered stones because they are fusiform, weakly echogenic, and non-shadowing. Similar sonographic findings of dilatation of intrahepatic bile ducts and concentric thickening of the intra- and extrahepatic biliary tree may be seen in sclerosing cholangitis[7], but the thickening of the bile ducts is more severe than that seen in clonorchiasis, and bile duct dilatation is focal and discontinuous[8]. Thickening of the bile duct may be encountered in cholangitis in AIDS[9]. Infestation of *Fasciola hepatica* results in biliary dilatation and thickening of the bile ducts[10], and mobile vermiform structures within the gallbladder are virtually the same as the echogenic foci in clonorchiasis[2].

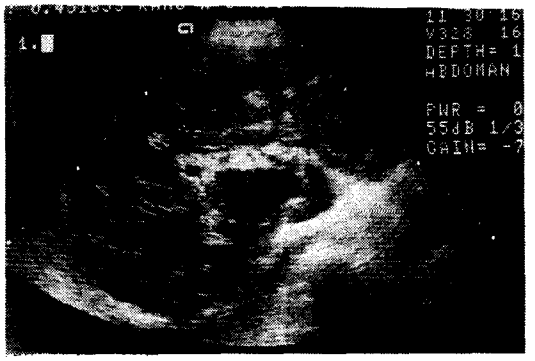
In 1988, we analysed 881 patients who underwent both upper abdominal ultrasonography and stool examiniation for *C. sinensis* and 225 patients of them having *C. sinensis* ova in their stools for the sonographic findings, and reported the result in Biannual Symposium of Korea-Japan Radiological Society(Ultrasonographic Findings of Clonorchiasis : Significance of Intraluminal Floating Echo ; unpubhished) ; the most sensitive finding was parallel channel sign as was expected (sensitivity ; 56%), but intramulinal floating echo plus parallel channel sign was the most specific finding (specificity ; 99.2%), so clonorchiasis is highly suggestive when intraluminal floating echo is seen coupled with parallel channel sign on ultrasonogram of the patients from endemic area(Table 3).

In this study, parallel channel sign was shown in 49.5% (102/226)(Fig. 1), increased echogenicity of intrahepatic bile duct wall with parallel channel sign in 38.3% (79/206)(Fig. 2), floating,

Table 3. Sensitivity & specificity of US Findings (1988)

1988 US Findings	Sensitivity	Specificity
Parallel channel sign	56.0% (126/225)	93.8% (615/656)
Floating echo in GB	18.7% (41/219)	99.1% (646/652)
P + F	14.2% (31/219)	99.2% (611/616)

Fig. 1. Diffuse dilatation of medium-sized and small intrahepatic bile ducts(parallel channel sign) are visualized.



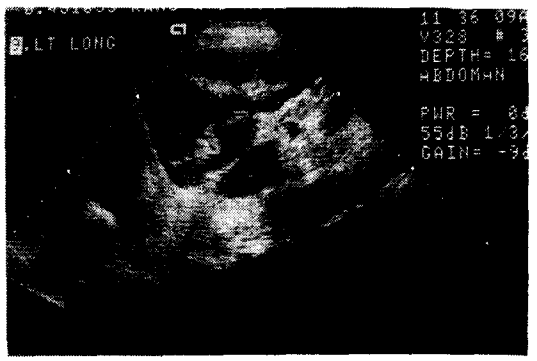
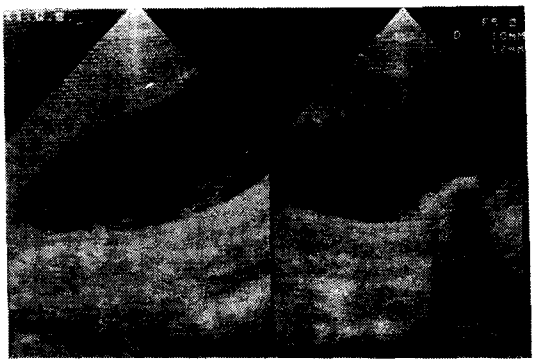


Fig. 2. Increased echogenicity of dilated intrahepatic duct walls with dirty echo pattern in right-(a) and left lobe(b) of the liver.

non-shadowing, echogenic foci in gallbladder associated with above two findings in 17(8.3%)



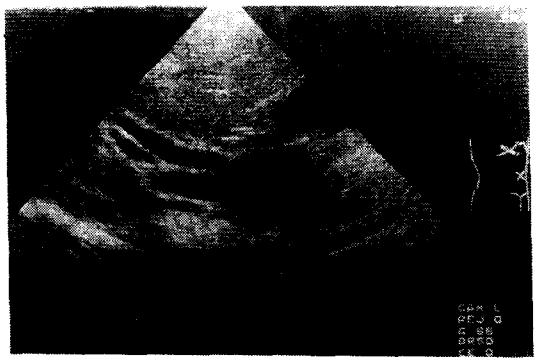


Fig. 3. (The smae patient as Fig. 2) Multiple, discrete and aggregated, floating, non-shadowing, intraluminal echogenic foci within gallbladder (right side) associated with multiple larger, highly echogenic foci dwith posterior shadowing(left side) are noted. The former are by the worms and the latter by the stones.(a) In addition, diffuse and slight dilatation of extrahepatic duct without obstructing cause is also noted.(b)

(Fig. 3), and one patient had only floating, non-shadowing, echogenic foci in gallbladder without other findings. As compared with the previous our study, there was similar percentage of parallel channel sign between two studies, and although the number of the patients was small(18 in this - and 41 in previous studies), all the patients having floating, non-shadowing, echogenic foci in gallbladder revealed *C. sinensis* ova in their stools in both studies, so even when the latter only is visualized on sonogram without other findings, it can be diagnosed as active infestation of clonor-

Fig. 4. In this patient, only floating, discrete non-shadowing, echogenic foci in gallbladder without other findings are visualized.

chiasis. But, parallel channel sign can be seen either as active infestation or as a sequela of clonorchiasis because of about 50% of its sensitivity as well as chronicity of clonorchiasis and repeated infestations of Korean, expecially in endemic area.

In heavy infestation, flukes may reside in the pancrease[11-13], and cause dilatation of pancreatic duct in the tail and its tributaries, but sometimes small filling defects that might be caused by adult flukes are found in the main pancreatic duct. This pattern of dilatation is quite different from dilatation due to other causes. In chronic pancreatitis, the main pancreatic duct is dilated irregularly, resulting in a beaded appearance, whereas in cancer of the panceras, the main pancreatic duct frequently is dilated uniformly[3].

There are the reports about clonorchiasis with pancreatitis[14] and the relationship to intrahepatic stone, gallstone, chronic cholecystitis, and recurrent pyogenic cholangitis[1][11], and the close correlation between *C. sinensis* infestation and cholangiocarcinoma[15][23]. Bile stasis and the presence of flukes and ova or their debris can form a nucleus for the formation of gallstones or bile duct stones, and this could instigate all the consequent abnormalities, resulting in a vicious cycle of repeated bouts of cholangitis and stone formation, and focal atypical epithelial hyperplasia and invasive cancer[24]. In this study, 18 patients(8.8%) had gallstones with or without thickened wall, dilated extrahepatic duct with smooth tapered end and hepatic SOL such as cyst (2), hepatoma (3), or unknown histology (3) were seen in 8 patients (3.9%), respectively. In 2 patients(1.0%) both intra- and extrahepatic duct stones were found. There was neither cholangiocarcinoma nor pancreatic involvement although 3 of 8 hepatic SOLs were not confirmed histopathologically.

Conclusion

1) The positive rate of clonorchiasis in Nakdong river basin was 3.8 times higher than that of Non-Nakdong river basin area, the posotive rate in male was more than double that of female (2.03 : 1), and most of patients was between 30 and 59 years of age (86%).

2) Diffuse dilatation of small intrahepatic bile ducts with various degree of increased echogenicity of bile duct wall, and floating, non-shadowing, intraluminal echogenic foci in gallbladder were the pathognomonic sonographic findings of clonorchiasis ; parallel channel sign was either as a sign of active infestation or as a sequela of clonorchiasis, while floating, non-shadowing, intraluminal echogenic foci in gallbladder represented active infestation.

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