

Paper V

The occurrence of asymptomatic and symptomatic simple hepatic cysts. A prospective, hospital-based study

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KEYWORDS

Ultrasound; Liver; Cyst; Occurrence

AIM: To examine the prevalence of asymptomatic and symptomatic liver cysts in a university hospital patient population using modern US equipment.

METHODS: Abdominal US scans of 1541 cases referred during the period 21 January to 11 November 2000 were examined for hepatic cysts.

RESULTS: Of 1541 cases, 174 (11.3%) were found to have hepatic cysts, i.e. 109 female (12.5%) and 65 (9.7%) male patients (9.7%). In 413 individuals younger than 40 years, no cysts were found. Above the age of 40 years, prevalence increased with age.

CONCLUSION: By using modern US equipment, we found a higher prevalence of hepatic cysts than that reported in previous studies. Patient selection and the prevalence of liver cysts in the population from which the patients were referred may have influenced our results.

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Introduction

Liver cysts develop from congenital malformations of the biliary ducts, i.e. remnants of fetal biliary ducts that end blindly, without connection to the rest of the biliary ductal system.¹ Fluid is produced by the single-layered biliary-duct-like cuboidal epithelium² covering the inner surface of the cyst. Liver cysts are slow growing, and solitary cysts are usually not diagnosed before the age of 40 years. Infrequently, liver cysts become symptomatic. In a large series of 88,000 laparotomies, Sanfelippo et al.³ found 22 symptomatic cysts (0.025%). Symptoms are due to hepatomegaly or pressure upon adjacent structures. At present, the treatment of choice for solitary symptomatic liver cysts is percutaneous ethanol sclerotherapy.⁴⁻⁸

In two previous US studies, the prevalence of liver cysts in a general population was 2.5% and 4.7%, respectively.^{9,10} Progress in imaging

technology may have caused an increased detection rate. The aim of the present study was to examine the prevalence of asymptomatic and symptomatic liver cysts in a university hospital patient population, using modern US equipment.

Materials and methods

During the period 21 January to 11 November 2000, patients referred for abdominal US at the Department of Radiology, Haukeland University Hospital (HUH), Norway, were prospectively and consecutively included. HUH is a tertiary hospital serving a population of 916,018 inhabitants in the three counties Rogaland, Hordaland and Sogn og Fjordane in western Norway. In total 1541 patients were included, 869 females and 672 males aged 0 to 99 years (mean 57.7 years). Mean age for the females was 59.6 years and for the males was 55.4 years. Referral was from the oncology department in 404 cases (26.2%); 243 (15.8%) were referred from different departments with an assumed low prevalence of malignant disease (departments of neurology, rheumatology, dermatology, psychiatry

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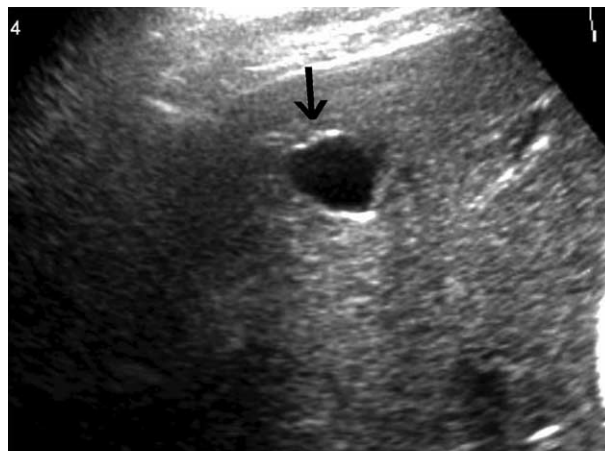
and the emergency unit); 290 (18.8%) from the department of internal medicine; 243 (15.8%) from the department of surgery; 148 (9.6%) from general practitioners and others; and 100 (6.5%) from the paediatric department (Table 1). Data on the referring department were missing in 113 cases (7.3%).

The US examinations were implemented by 24 different physicians with experience in US varying from 1 to 20 years. The difference between the 16 resident and 8 experienced radiologists in the detection rate of liver cysts was analyzed for 901 randomly selected cases. Senior radiologists carried out 118 (13.1%) of these examinations and residents performed 783 (86.9%).

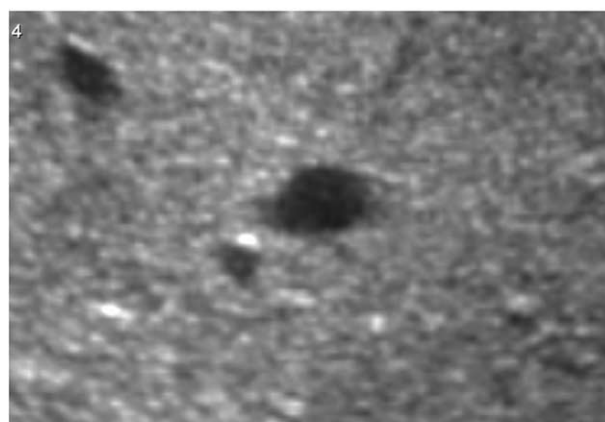
A Toshiba Power Vision 7000 or an ATL (Advanced Technology Ltd) HDI (High Definition Imaging) 5000 was used. Both were equipped with curved-array and phased-array sector multifrequency transducers. The sector transducers had frequency ranges of 2.0 to 4.0 MHz and 3.0 to 6.0 MHz for the ATL and the Toshiba machines, respectively, whereas the curved-array transducers had frequency ranges of 2.0 to 5.0 MHz and 3.0 to 6.0 MHz, respectively. Children were examined with an ATL HDI 5000 using a 4- to 7-MHz curved-array or a 5- to 8-MHz microcurved transducer. Harmonic imaging and sonographic contrast materials were not involved in this study.

The sonographic criteria used for the diagnosis of liver cysts comprised a focal liver lesion with anechoic contents, thin walls not distinguishable from the adjacent liver tissue, and posterior acoustic enhancement (Fig. 1A). The presence, diameter and number of cysts were recorded in the report. In cases of polycystic liver, the presence of cysts was recorded but not their size and number.

When the radiological reports were incomplete with regard to the size of liver cysts, the diameters of the cysts were assessed from the US images.



(a)



(b)

Figure 1 A. Liver cyst (arrow) characterised by anechoic contents, thin wall not discernible from the adjacent liver tissue, and posterior acoustic enhancement. B. Sub-centimetre hepatic cyst with less characteristic appearance due to the partial volume effect. Cystic contents are not completely anechoic, posterior acoustic enhancement is missing and the wall is not sharply delineated.

Table 1 Number of patients and occurrence of cyst-positive livers related to age in years.

Age	Number of patients	Cyst-positive	Percentage
0-9	82	0	0.0
10-19	63	0	0.0
20-29	108	0	0.0
30-39	160	0	0.0
40-49	169	10	5.9
50-59	254	29	11.4
60-69	247	46	18.6
70-79	264	43	16.3
80-89	177	41	23.2
90-99	17	5	29.4
Total	1541	174	11.3

All recorded and measured data were imported into the statistical software package SPSS for Windows, version 11, for statistical analysis. The relation between prevalence of cysts and gender was tested with Fisher's exact test and logistic regression analysis, differences between senior examiners and residents in their ability to diagnose liver cysts was tested with Fisher's exact test, and the relation between the prevalence of cysts, age of subjects and referring department was tested with logistic regression analysis. All tests were two-tailed, and the alpha level decided *a priori* was 0.05. The study was approved by our institutional ethics committee.

Results

Liver cysts were found in 174/1541 patients (11.3%), and prevalence significantly increased with age ($p < 0.0005$) (Table 2). No cysts were found in subjects younger than 40 years; 109/869 females (12.5%) and 65/672 males (9.7%) were affected, but the gender difference was not statistically significant ($p = 0.088$) (Table 2). Of the 174 affected individuals, 14 had polycystic livers (3.5%). Among the remaining 160 (99 females, 61 males), 322 cysts were recorded; 91.9% cysts had a diameter of 3 cm or less; 6.2% of 3.1 to 6 cm; and 1.9% of > 6 cm. Excluding the paediatric department, the prevalence of liver cysts did not differ according to referring department ($p = 0.559$) (Table 1).

Polycystic liver disease was found in 14 cases (0.9% of all livers and 8.1% of 174 livers containing cysts). This group of subjects comprised 10 women and 4 men, with a mean age of 64.1 (44.1 to 85.2) years; 8 patients had isolated polycystic disease of the liver and 6 had simultaneous polycystic kidney disease.

Symptoms were caused by 6 cysts in 6 patients, 4 women and 2 men, aged 62.1 to 83.0 (mean 72) years. Symptoms consisted of upper abdominal pain in 5 individuals and fever and pain due to infected cyst in 1 person (Table 3). This represents 0.4% of all 1541 livers and 3.5% of all 174 livers containing cysts. The mean diameter of these cysts was 115 (180 to 60) mm. All 6 symptomatic cysts occurred in livers with solitary or few cysts.

Cysts were diagnosed in 19/118 (16.1%) of the examinations performed by senior radiologists and in 119/783 (15.2%) of the examinations performed by residents ($p = 0.785$).

Discussion

The prevalence of hepatic cysts in our hospital-based population was higher than that reported in previous US studies of similar design.^{9,10} This may in part be explained by differences in the populations

Table 3 Age and gender of 6 patients suffering from symptomatic liver cysts and maximum of cysts.

Case number	Age (years)	Gender	Cyst diameter (mm)
1	62	Male	68
2	78	Female	92
3	75	Female	160
4	63	Female	130
5	83	Male	180
6	71	Female	60
Mean	72		115

Upper abdominal pain was the main symptom in all cases, with the addition of fever in case 5, due to an infected cyst.

examined, and in diagnostic methods, techniques and experience of the examiners. The prevalence of 0.2% based on surgical exploration³ increased to 2.5% to 4.7%^{9,10} in cases examined with second-generation US machines, and to 11.3% in our study using third-generation US machines. This reflects 20 years of ongoing technical refinements of different aspects of US technology, such as emission frequency, focusing, advanced computerized organization of emission and receiver functions, and progress in post-processing capability.

In a recent study, Carrim and co-workers¹¹ found simple hepatic cysts in 110/617 patients (18%) referred for CT for reasons other than the detection of renal or hepatic disease. An explanation for this relatively high figure might be that the latest-generation CT machines are superior to modern US equipment in diagnosing focal liver lesions in obese people.

As in the studies by Gaines and Caremani,^{9,10} our patients were selected, representing the general population referred for diagnostic imaging. This was also true for the CT studies by Carrim,¹¹ with the exception that individuals with known renal and hepatic disease were excluded in his study. Although the prevalence of liver cysts was higher in women than in men, the difference was not statistically significant. This finding is in accordance with those reported by others.^{9,10}

Table 2 Prevalence of hepatic cysts in 1280 patients from different departments by gender.

Department	Total prevalence	Prevalence in females	Prevalence in males
Oncology ^a	40/404 (9.9%)	24/204 (11.8%)	16/200 (8.0%)
Internal medicine	41/290 (14.1%)	27/167 (16.2%)	14/123 (11.4%)
Surgery	36/243 (14.8%)	22/144 (15.3%)	14/99 (14.1%)
Other departments ^b	25/243 (10.3%)	15/132 (11.4%)	10/111 (8.9%)
Paediatric	0/100 (0.0%)		

^a Patients had either active or healed malignant disease.

^b Departments with a low prevalence of malignant disease (neurology, dermatology, rheumatology, psychiatry and the emergency department).

The occurrence of hepatic cysts in the present study is high compared with the results of Sanfelippo.³ He found an prevalence of symptomatic liver cysts of 0.02% (15/88,000 explorative laparotomies after parasitic, inflammatory and traumatic cysts had been excluded). Sanfelippo probably underestimated the prevalence of non-symptomatic hepatic cysts, having no modern imaging technology at that time; the rate of symptomatic liver cysts seems more valid. Other studies on symptomatic liver cysts report a predominance in females,⁴⁻⁸ but we could not reproduce this finding.

The increasing prevalence of cysts with age corresponds well with the results of Gaines.¹⁰ No cysts were diagnosed below the age of 40 years, a finding similar to the CT-based study of Carrim,¹¹ but this differs from the US-based study of Gaines⁹ in which 7% of all cysts were diagnosed in individuals below this age. Gaines agrees with us that cysts are infrequent in young people, and that focal liver lesions diagnosed in this age group are more likely to represent haemangiomas or malignant lesions.⁹ This is important in young cancer patients, when sub-centimetre diameters make the differential diagnosis between cysts and solid lesions difficult because of the partial volume effect (Fig. 1B).

The high number of examiners with different levels of experience might have biased our results. However, we found no differences between residents and senior radiologists in the detection rate of cysts, probably reflecting the fact that the sonographic criteria of liver cysts are well-defined and that teaching in abdominal US examination is given early to new residents.

Conclusion

To some extent, patient selection and the prevalence of liver cysts in the population from which the patients were referred may have influenced our results. However, the higher prevalence of simple liver cysts in our investigation (11.3%) compared with earlier studies (2.5% to 4.7%) probably reflects the higher quality of modern diagnostic US

technology. Cysts were symptomatic in only 3.5% of cases.

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