Congestive Cholecystopathy; A Frequent Sonographic Sign of Evolving Esophageal Varices in Cirrhotics

KHALID REHMAN YOUSAF, MIAN SAJID NISAR*, SALMAN ATIQ, *AZHAR HUSSAIN*, AMNA RIZVI*, M. ISMAIL KHALID YOUSAF, ZAHID MANSOOR.*
*Departments of Radiology and * Medicine, Omer Hospital, Lahore, Pakistan.*
Correspondence to Dr. Khalid Rehman Yousaf, Radiologist, New Radiology Department, SIMS/ S.H.L.
Cell 923009458404 Email: khalid_yousaf@yahoo.com

ABSTRACT

Background: Gallbladder wall congestion (congestive cholecystopathy) is frequent sonographic feature demonstrated in patients with chronic liver disease. Hypoalbuminemia is still considered as a most probable cause of gallbladder wall thickness in cirrhotics.
Objective: To demonstrate and establish congestive cholecystopathy as a consistent sonographic sign of developing portal hypertension and its association with evolving esophageal varices in Child's class B (compensated) and C (decompensated) cirrhotic patients.
Methodology: This cross-sectional study was conducted in Department of Radiology in collaboration with Department of Medicine, Omer Hospital, Lahore, between September 2009 and January 2011. We included 103 randomly sampled cirrhotic patients (67 men, 36 women; age range 38-79 years) who were clinically categorized into Class B and Class C liver disease through modified Child Pugh Classification. Upper gastrointestinal video endoscopy was performed for assessment of esophageal varices in all patients according to Japanese Research Society. Gall bladder targeted transabdominal ultrasound was performed on gray scale as well as color Doppler. Gallbladder wall thickness (4mm as a reference upper normal limit), pattern of wall thickening (striated or non-striated) and flow in wall were evaluated.
Results: Out of 103 patients, 57 (55.3%) cases were of Child's B and 46 (44.7%) of Child's C class. There were 16, 32, 28 and 27 patients having F0, F1, F2 and F3 endoscopic grades of esophageal varices. On ultrasound, 76 out of 103 cirrhotics demonstrated wall thickness. Only 24 (31.5%) showed serum albumin levels below 35g/L. Gall bladder wall thickness was more common in mild and moderate ascites. Striated pattern of wall thickening was documented in 11 cases (14.5%). On color Doppler evaluation, 23.6% patients with thick walled gall bladder demonstrated venous flow pattern in the vicinity of thick walls suggesting ectatic vessels in or along the gall bladder wall causing congestion.
Conclusion: Congestive cholecystopathy is an important early sonographic sign of evolving esophageal varices and portal hypertension in liver cirrhosis. Recommendation is made for future studies to validate congestive cholecystopathy as a non-invasive screening parameter to evaluate evolving esophageal varices in the background of portal hypertension in liver cirrhosis.
Key words: Congestive cholecystopathy, portal hypertension, esophageal varices, liver cirrhosis.

INTORDUCTION

Gallbladder wall congestion is frequent sonographic feature demonstrated in patients with chronic liver disease[1]. Originally, wall thickness was defined in association with acute cholecystitis; however, later on, many other conditions have been documented as a culprit for gallbladder wall congestion or edema including ascites, hypoalbuminaemia, right-sided heart failure, renal diease, infectious hepatitis and alcoholic liver disease. Hypoalbuminemia is still considered as a most probable cause of gallbladder wall thickness in cirrhotics; this feature is well documented in association with bowel wall thickening due to low serum albumin and ascites. However, gallbladder wall thickening can not be simply explained in cirrhotics keeping hypoalbuminemia and ascites the only reasons[2]. Congestive cholecystopathy is the term previously reported in few studies suggesting congestion of gallbladder wall. This could be a representative of portal hypertension and evolving esophageal varices early in the course of decompensated chronic liver disease, even in the absence of low serum albumin levels and ascites.

The purpose of our study was to demonstrate and establish congestive cholecystopathy as a consistent sonographic sign of developing portal hypertension and to correlate this sign with evolving esophageal varices in Child's class B (compensated) and C (decompensated) cirrhotic patients.

MATERIAL AND METHODS

This cross-sectional study was conducted in Department of Radiology in collaboration with Department of Medicine, Omer Hospital, Lahore, between September 2009 and January 2011. We included 103 randomly sampled cirrhotic patients (67 men, 36 women; age range 38-79 years) referred through endoscopy Unit. The diagnosis was based on clinical findings, categorizing the patients into compensated (Class B) and decompensated (Class C) liver disease through modified Child Pugh Classification. Patients' hepatitis status was confirmed through HBsAg and antibodies to hepatitis C virus using enzyme immunoassays. Serum biochemical and hematolological tests were carried out as to calculate Child Pugh score. Patients with cholelithiasis, choledocholithiasis, obstructive jaundice or a previous history of gallbladder and biliary disease were excluded from the study.

Upper gastrointestinal video endoscopy was performed for assessment of esophageal varices in all patients, either as a screening or surveillance examination for diagnostic as well as therapeutic purposes. Endoscopy team included a consultant gastroenterologist with two assistant physicians. Esophageal varices were graded according to Japanese Research Society into four grades, i.e. F_0 (no varices), F_1 (small and non-tortuous varices), F_2 (tortuous varices occupying less than 50% of lumen) and F_3 (very large and tortuous varices). The risk for bleed on the basis of red wale markings and portal gastropathy was also noted.

Transabdominal ultrasound was performed in overnight fasted cirrhotics within one week after endoscopic evaluation. Scanning was done on gray scale as well as color Doppler by a single radiologist to avoid an inter-observer variation. We used Toshiba Nemio XG ultrasound equipment (SSA 660A; Tokyo, Japan) with 3.5 MHz curvilinear transducer. Gallbladder wall thickness 4 mm or greater was considered abnormal. Gallbladder was scanned along its longitudinal axis in the right anterior oblique position of patient. Anterior wall thickness of gallbladder was acquired with a beam perpendicular to the wall. We also looked for the pattern of wall thickening, i.e. striated or non-striated. The color Doppler evaluation was done to see flow in the ectatic vessels in gall bladder wall causing its congestion.

Serum albumin levels were estimated serially for at least 1 week prior performing ultrasound scan. Albumin levels of most of the patients in Child's B category were 35 g/l and above. Abdominal girth was measured periodically for 1 week before ultrasound scan to assess the progression, stability or regression of peritoneal ascites (if present).

RESULTS

Clinical categorization of 103 patients included 57 (55.3%) cases in Child's B class and 46 (44.7%) in Child's C class. About 2/3rd were male, representing liver parenchymal disease being more prevalent in males (table-1). The patients were further characterized endoscopically according to variceal grades, red wale markings and portal gasteropathy. There were 16 patients who didn't show any evidence of esophageal varices. Grade F1, F2 and F3 were found in 32, 28 and 27 cases. The trend of red wale markings and portal gasteropathy increased proportionally with grades of varices (table-2).

Table -1: Clinical categorization and gender distribution in Child's B class and 46 (44.7%) in Child's C class.

Total cirrhotics (n=103)	**Child's B**	**Childs's C**
Male (n=67)	57(55.3%)	46(44.7%)
Females (n=36)	16(28%)	20(43.5%)

The evaluation of gall bladder wall thickness was done keeping 4mm as a maximum upper normal limit. Wall thickness above 4mm was considered abnormal; we divided patients in various groups, i.e. 4-5.9mm, 6-7.9mm, 8-9.9mm and more than 10mm. We found that 76 out of 103 cirrhotics demonstrated wall thickness. Gall bladder wall thickness was most profound in the patients with smaller (F1) and moderate (f2) esophageal varices. Most of the patients with no varices had normal gall bladder wall (table-3).

Table-2: Endoscopic grading with associated findings in chirrhotic patients.

Grades of varices (n=103)	Without any associated finding	Red wale markings	Portal gastrography`
F0 (n=16)	13	1	2
F1 (n=32)	11	7	16
F2 (n=28)	5	17	21
F3 (n=27)	0	22	27

Comparison was made between cirrhotics with normal and low serum albumin levels. It was found that only 24 (31.5%) showed hypoalbuminemia, while 52 (68.5%) had serum albumin levels of 35g/L and above. Similarly, ascitic patients were categorized in either absent, mild, moderate or severe forms. Gall bladder wall thickness was more common in mild and moderate ascites. Of the two variables, it was found that ascites rather than hypoalbuminemia was more commonly associated with gall bladder wall thickness (Table-4, 5).

Table-3: Gall bladder wall thickness demonstrated in cirrhotic patients with different grades of esophageal varices.

Gallbladder wall thickness	Grades of varices				Total (n=103)
	F0 (n=16)	F1(n=32)	F2 (n=28)	F3 (n=27)	
Less than 4mm	14	9	3	1	27(26.2%)
4-5.9mm	2	5	12	10	29(28.1%)
6-6.9mm	0	11	4	5	20(19.4%)
8-9.9mm	0	3	7	5	15(14.6%)
10mm & above	0	4	2	3	9(8.7%)

There were two patterns of gall bladder wall thickness recognized in our study population, i.e. striated and non-striated. Striations were documented only in 11 cases (14.5%), while 65 cases (85.5%) demonstrated non-striated thickened gall bladder wall. This non-striated pattern was more in keeping with the fact that gall bladder wall thickness is due to congestion rather than inflammation (Table-6).

Table-4: Comparison of serum albumin levels in cirrhotic patients with thickened gall bladder walls.

Thick walled gallbladder (n=76)	Serum albumin level	
	Less than 35g/L	35g/L and above
	24 (31.5%)	52(68.5%)

Table-5: Comparison of various forms of ascites with thick walled gall bladder in cirrhotic patients (n=76)

Absent	Mild	Moderate	Severe
34(44.7%)	29(38.1%)	9(11.8%)	4(5.2%)

On color Doppler evaluation, we found that 23.6% patients (n=18) with thick walled gall bladder demonstrated venous flow pattern in the vicinity of thick walls (table-7). This finding was suggestive of presence of ectatic vessels in or along the gall bladder wall causing congestion. The mechanism of this congestion was presumed to be the same as that of congestive gastropathy due to portal hypertension in decompensated liver disease.

Table-6: Pattern of wall thickness of gall bladder in cirrhotic patients (n=76)

Striated	Non striated
11(14.5%)	65(85.5%)

Table-7: Flow pattern on color Doppler around thick walled gall bladder (n=76)

Venous	No flow

flow	
18(23.6&)	58(76.4%)

DISCUSSION

In decompensated liver parenchymal disease, three important factors including ascites, hypoalbuminaemia and portal hypertension have been implicated in causing gallbladder wall thickening[3]. The association between ascites and gallbladder wall thickening may just be secondary to the frequent association of ascites with both hypoalbuminaemia and portal hypertension. In our study population, 76 patients demonstrated variable gall bladder wall thickening out of which 34 cases (44.7%) didn't demonstrate any sonographic evidence of ascites. Similarly, there were only 24 cases (31.5%) having low serum albumin levels. Considering these two factors, the thickeness of gallbladder wall goes against the fact that ascites due to hypoalbuminemia causes wall thickening of gall bladder. Instead, the more common cause of ascites in cirrhotics, in particular to those with normal serum albumin levels, is the developing or established portal hypertension[4]. This factor consolidated our hypothesis that gall bladder wall thickness is most likely due to congestion rather than imbibition of fluid in the gall bladder wall due to hypoalbuminemia. So the term "congestive cholecystopathy" is more appropriate in cirrhotics rather than acalculus cholecystitis or simply the gall bladder wall thickening.

Most of the previous studies documented hypoalbuminaemia as a prime determinant for the gallbladder wall thickening[5, 6]. However, we came across the fact that it is not only the hypoalbuminaemia which is the major culprit. Few previous studies are in keeping with our present results. In one study, not only a single hypoalbuminaemic patient on chronic peritoneal dialysis with markedly lowered serum albumin levels had a thickened. Another study suggested that portal hypertension is the dominant factor in producing gallbladder wall thickening in stable cirrhotics. In another study, cirrhotic patients were treated with propranolol, portal pressure reduction was associated with a decrease in gallbladder wall thickness[7, 8]. This supports our hypothesis that portal hypertension is an important influence on gallbladder wall thickness.

In our patients, almost 2/3rd of the study population (76 cases, 73.7%) demonstrated various grades of oesophageal varices confirming the presence of portal hypertension. This was even more common in the patients with smaller and moderate varices, suggesting that evolving portal hypertension causes congestion of the gall bladder wall in a similar fashion through which portal congestive gastropathy is caused as documented on endoscope (thickening of the stomach by ectatic vessels). However, we were able to demonstrate this mechanism pericholecystic venous flow on color Doppler due to ectatic vessels in only 23.6% patients.

Limitations: One of the limitations of our study was that almost half of the patients in our study population were recruited from the indoor department who were admitted for workup of cirrhosis followed by subsequent treatment. Most of these patients were getting either albumin infusions or dietary supplements (egg white) for the correction and maintenance of serum albumin level. So the level of 35 g/L and above could be transitory. Another limitation of our study was that we did not measure wedge pressure to confirm portal hypertension. Rather, we included indirect sign of portal hypertension in the form of evolving or developed esophageal varices.

CONCLUSION

We conclude that congestive cholecystopathy is an important early sonographic sign of evolving esophageal varices and portal hypertension rather than hypoalbuminaemia or ascites causing gall bladder wall thickening in liver cirrhosis. We highly recommend further studies to validate congestive cholecystopathy as a non-invasive screening parameter in patients with liver cirrhosis to evaluate evolving esophageal varices in the background of portal hypertension.

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