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Original Research Article

To study the relation between spontaneous bacterial peritonitis and serum ascitis albumin gradient in chronic liver disease patients

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ABSTRACT

Background: About half the patients with cirrhosis develop ascites during 10 years of observation. The present study was designed to study the relation between spontaneous bacterial peritonitis and serum ascites albumin gradient in chronic liver disease patients.
Methods: This prospective observational study was done in 55 patients with chronic liver disease attending IPD of tertiary hospital. Based on investigation findings, patients were divided into two groups: Group A-Patients with sterile cirrhotic ascites, Group B- Patients with spontaneous bacterial peritonitis. Detailed history, examination and relevant investigation were done. Data was collected, recorded and statistical calculation was done using in Microsoft excel 2007.
Results: Most common presenting symptoms of SBP patients were increasing ascites refractory to treatment (90%), followed by peripheral edema (80%). Jaundice and hepatic encephalopathy was found in 75% and 65% respectively. Serum and ascites albumin levels were lower in Group B (2.54±0.33 and 0.43±0.23 g/dl respectively) as compared to Group A (2.85±0.36 and 0.91±0.31 g/dl respectively) and it was statistically significant. The Mean±SD of SAAG for group A and group B was (1.94±0.36) and (2.09±0.47 g/dl) respectively. This difference was statistically not significant.
Conclusions: Study conclude that the development of spontaneous bacterial peritonitis in chronic liver disease patients with sterile ascites is directly proportional to ascitic fluid albumin and serum albumin concentration whereas occurrence of SBP is not affected by variation in SAAG ratio if it is already higher than 1.1 g/dl.

Keywords: Chronic liver disease, SAAG, Spontaneous bacterial peritonitis

INTRODUCTION

Chronic liver disease is one of the major causes of morbidity and mortality throughout the world. Ascites is most frequent complication of cirrhosis. About half the patients with cirrhosis develop ascites during 10 years of observation. The serum ascites albumin gradient is a calculation to help determine the cause of ascites. SAAG less than 1.1gm/dl implies exudates. Patients with ascites are at risk for developing spontaneous bacterial peritonitis (SBP) - a severe complication associated with high mortality.[1] The incidence of SBP in cirrhosis has been reported to be 20% on an average, the mortality rate related to this complication being more than 50%.[2-5]

Spontaneous bacterial peritonitis is characterized by spontaneous infection of ascitic fluid in the absence of any intra- abdominal source of infection. Majority of SBP infections have been caused by aerobic gram-negative organisms (50% of these being *Escherichia coli*). The remainder has been due to aerobic gram-positive organisms (19% *Streptococcal species*). A study

describes 34.2% incidence of *Streptococci*, ranking in second position after *Enterobacteriaceae*. Viridians group streptococci (VGS) accounted for 73.8% of these streptococcal isolates.[6,7] Nowadays the most important analysis of SBP are quantitative cell count, fluid culture and sensitivity and calculation of serum ascites albumin gradient (SAAG) which reflects the differences in oncotic pressure and correlates with portal venous pressure. The SAAG is measured by subtracting the serum albumin level from the ascites fluid albumin level. A SAAG greater than 1.1, known as high-SAAG ascites, has a sensitivity of 97% in indicating portal-hypertensive ascites.[8,9] Total protein concentration is lower in spontaneously affected ascitic fluid compared to sterile fluid obtained from different patients. The opsonic activity of ascitic fluid correlate closely with the fluid's protein concentration. Fluids with protein less than 1 g/dl have been reported to have essentially no opsonic activity and therefore no protection from bacterial infection. The present study was designed to see how SAAG affects development of SBP in sterile ascites of cirrhotic patients.

METHODS

The study was carried out in the post-graduate institute of medicine, GSVM Medical College. The material of study included patients of all age group having chronic liver disease with ascites selected from medicine indoor wards. Type of study was prospective observational study.

Inclusion criteria

Patients of all age group having chronic liver disease with ascites selected from medicine indoor wards.

Exclusion criteria

Patients having had a peritoneal paracentesis with in last 2 weeks for cardiac reasons, malignancy, tubercular peritonitis, pancreatic ascites, congestive heart failure, acute viral hepatitis and secondary peritonitis were excluded.

Detailed history (Weight loss, jaundice, fever, distension of abdomen, abdominal pain, dyspnea, Malena, hematemesis, history of alcohol and drug intake. Examination of each patient was done.

Complete haemogram, serum protein, serum albumin, RBS, liver function test, serum creatinine, ascitic fluid examination, ultrasonography whole abdomen, HBsAg Elisa, anti HCV, ESR, urine R/M was done. Serum ascites albumin gradient was calculated by subtracting the ascitic albumin from serum albumin. Based on investigations patients were divided into two groups.

- Group A- patients with sterile cirrhotic ascites
- Group B- patients with spontaneous bacterial peritonitis.

Data was collected, recorded and statistical calculation was done using in Microsoft excel 2007.

RESULTS

In present study 55 cases of chronic liver disease with ascites have been investigated and studied for ascitic fluid physical, cytology, gram stain, culture, ascitic/serum total protein ratio and serum ascitic albumin gradient. Out of which 35 patients were of sterile ascites (group A) whereas 20 patients were found to have spontaneous bacterial peritonitis (group B) (Figure 1).

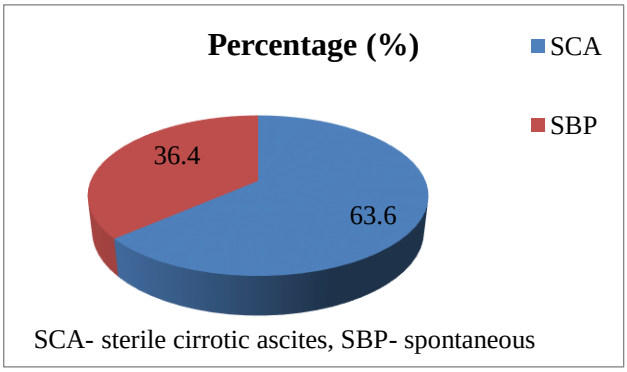

Figure 1: Incidence of spontaneous bacterial peritonitis.

In this study, it was observed that most of the symptoms are more common in SBP group but significant difference is noted between temperature more than 100F (65% versus 28%), increasing ascites (90% versus 42%), peripheral edema (80% versus 60%), jaundice (75% versus 60%), abdominal tenderness (60% versus 28%), rebound tenderness (45% versus 0%), hepatic encephalopathy (65% versus 14%), chills (15% versus 8%) and decreased bowel sound (5% versus 0%) (Table 1).

Table 1: Presenting clinical features in Group A and Group B.

Clinical features	Group A (SCA)		Group B (SBP)	
	No.	%	No.	%
Temp>100F^0	10	28	13	65
Chills	3	8	3	15
Increasing ascites	15	42	18	90
Peripheral edema	21	60	16	80
Jaundice	21	60	15	75
Abdominal tenderness	10	28	12	60
Rebound tenderness	0	0	9	45
Decreased bowel sounds	0	0	1	5
Hepatic encephalopathy	7	14	13	65

In this study group B, patients have lesser serum albumin than compared to group A patients. The mean ± SD of serum albumin for group A and group B was (2.85±0.36)

g/dl and (2.54±0.33) g/dl respectively. The p value for this was 0.0026 which was statistically significant (Table 2). Study found that majority of patients with SBP have less than 0.5 g/dl albumin in ascitic fluid whereas patients with sterile cirrhotic ascitis have >0.7 g/dl albumin. The mean ± SD of ascitic albumin for group A and group B was (0.91±0.31) and (0.43±0.23) respectively. The p value for this was <0.001 which was statistically highly significant (Table 3).

Table 2: Total serum albumin levels in Group A and Group B.

Groups	Serum albumin (g/dl)			
	<2.1-2.50	**2.51-3.0**	**>3.0**	
Group B	11	9	0	p-value = 0.0026
Group A	7	21	7	

Table 3: Total ascitic albumin in Group A and B.

Groups	Total ascitic albumin (g/dl)				
	<0.50	**0.51-0.75**	**0.76-1.0**	**>1.1**	
Group B (SBP)	17	1	1	1	p-value <0.001
Group A (SCA)	2	8	12	6	

Almost all patients of both groups have SAAG ratio greater than 1.1 g/dl. The Mean±SD of SAAG for group A and group B was (1.94±0.36 g/dl) and (2.09±0.47 g/dl) respectively. The p value for this was 0.19 which was statistically not significant (Table 4).

Table 4: Serum ascites albumin gradient (SAAG) in Group A and Group B.

Groups	Serum ascites albumin gradient(g/dl)			
	<1.5	**1.51-2.0**	**>2.0**	
Group A (SCA) (no)	4	17	14	p value = 0.19
Group B (SBP) (no)	2	7	11	

DISCUSSION

In Present study of 55 patients of chronic liver disease, 20 patients were diagnosed to have spontaneous bacterial peritonitis (36.4%) based on clinical features and ascitic fluid investigations. Rests of the patients, i.e. 35 patients were found to have sterile ascites (63.6%). The prevalence of SBP depends on severity of liver dysfunction, being higher in advanced liver disease. In one study 29 patients with persistent ascites were observed. Six episodes of spontaneous bacterial peritonitis occurred after an average 12.8 weeks. Occurrence of SBP significantly correlated with ascitic fluid protein concentration (p=0.01) and serum bilirubin (p=0.04). Moreover, its association with acid-suppressive therapy was found of borderline significance (p=0.08).[10] In a study from India, Jain et al reported similar prevalence of SBP 34.92% out of 63 hospitalized patients.[11] One reason for lower incidence of SBP is the strict criteria for diagnosing a clinical case of liver cirrhosis.

In this study, most common presenting symptoms of SBP patients were increasing ascites refractory to treatment (90%), followed by peripheral edema (80%). Jaundice and hepatic encephalopathy was found in 75% and 65% respectively. Mihas et al reported fever in 54% pain in abdomen in 57%, and hepatic encephalopathy in 67% Patients.[12] In other study, Pelletier et al, found 89% of patients were having fever, UGI bleed (42%) 53% patients had pain abdomen, and 50% cases had hepatic encephalopathy.[13] One thing that was common in all the studies were the clinical features. These were more common in SBP group in comparison to patients with sterile cirrhotic ascites. Therefore, if any patient with SCA developing temperature more than 100F with chills, increasing ascites, abdominal tenderness, upper GI bleed, hepatic encephalopathy, we should suspect that patient is developing S.B.P. However, according to one study it is to be noted that one third or more of patients with SBP may have no symptoms or signs directly referable to abdomen. These clinical features are important as prognosis of CLD patients could be improved by early identification of these clinical features of SBP.

Study found that group B patients have lesser serum albumin than compared to group A patients. The Mean±SD of serum albumin for group A and group B

was (2.85±0.36) and (2.54±0.33) g/dl respectively. The p value for this was <0.001 which was statistically significant. In a study by Huang CH et al, using the cut-off point for serum albumin level of 2.85 g/dl as a predictor for recurrence of SBP, the sensitivity was 70.2% and the specificity was 76.3%.[14] Weinstein MP, et al studied 28 cases of spontaneous bacterial peritonitis over a period of 5 years and found that mortality was considerably higher in patients with serum albumin lower than 2.5 g/dl. It is suggested from these studies that serum albumin < 2.5gm/dl is significantly associated with adverse prognostic effects, for instance recurrence of SBP and mortality rate is increased.[15]

Patients with spontaneous bacterial peritonitis were found to have significantly lower ascitic fluid albumin in comparison to patients with sterile cirrhotic ascites. The mean for group A and group B is 0.91 and 0.43 respectively (p <.001). This difference was statistically highly significant. In an earlier study, it was found that the ascites fluid total protein, albumin and globulin concentration were significantly lower in patients with liver cirrhosis with SBP (n=8) as compared to sterile cirrhotic ascites (n=11) (P<0.001). The opsonic activity of ascites fluid has been shown to correlate closely with the fluids protein and albumin concentration. Decrease level of albumin and protein in fluid decreases opsonic activity and therefore no protection from bacterial infection.[16]

There was no significant difference found between group A and group B in relation to SAAG ratio. The Mean±SD of SAAG for group A and group B was (1.94+0.36) and (2.09+0.47 g/dl) respectively. The p value for this was 0.19 which was statistically not significant. This suggest that occurrence of SBP is not affected by variation in SAAG ratio if it is already higher than 1.1 g/dl.

CONCLUSION

In present study, the incidence of SBP was 36.36% (20 patients). Patients of chronic liver disease presenting with refractory distension of abdomen, fever >100F, upper GI bleed, abdominal tenderness have increased risk of developing spontaneous bacterial peritonitis.

The present study suggests that the development of spontaneous bacterial peritonitis in chronic liver disease patients with sterile ascites is directly proportional to ascites fluid protein and albumin concentration. Patients with SBP, i.e. Group B, have significantly lower level of serum albumin and ascetic fluid albumin in comparison to Group A patients.

However, no significant difference is found between the two groups regarding the SAAG ratio. That means SAAG ratio is found to be more than 1.1 g/dl in almost all patients of chronic liver disease with ascites whether it is sterile or infected.

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