Research Article

Efficacy of serum ascites albumin gradient and ascitic fluid protein in determining ascites etiology

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Abstract

Introduction: The pathologic accumulation of fluid in the peritoneal cavity denotes the term 'ascites'. The various causes of ascites may be classified into two broad patho-physiologic categories, first one is associated with a normal peritoneum and second one occurs in a diseased peritoneum. Earlier ascites was classified as transudative and exudative. But it was quite confusing as various diagnoses were overlapped in transudative and Exudative. to overcome these shortcomings ascites is being classified as "high gradient" and "low gradient" **Aims and Objectives:** To compare the diagnostic accuracy of serum ascites albumin gradient with the traditional marker ascitic fluid total protein. **Material and Method:** in the present study total 50 patients of ascites were enrolled. The serum ascites albumin gradient was calculated in all the patients after measuring the serum and ascitic fluid albumin concentrations and simply subtracting the ascitic fluid value from the serum value. To increase the accuracy of SAAG, specimens of serum and ascitic fluid were obtained simultaneously. Ascitic fluid total protein was also measured in all the cases. Sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of SAAG and AFTP was also calculated and compared. **Results:** Cirrhosis of the liver (74%) was the most common cause of ascites in the study subjects. There were 8% cases of cirrhosis, 18% cases of TB ascites and 2% cases of peritoneal carcinomatosis had high SAAG ascites. 66% of Cirrhosis patients and one case of CCF, Nephrotic syndrome and Liver metastasis had low SAAG ascites. 60% of cases presented as exudative and 40% of cases had transudative ascites. SAAG (94%) was having more diagnostic accuracy as compared to AFTP (62%). **Conclusion:** Thus Serum ascites albumin gradient (SAAG) is the single best test against ascitic fluid total protein (AFTP), in the differential diagnosis of ascites.

Keywords: serum ascites albumin gradient and ascitic fluid protein.

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INTRODUCTION

The pathologic accumulation of fluid in the peritoneal cavity denotes the term 'ascites'. The various causes of ascites may be classified into two broad patho-physiologic categories, first one is associated with a normal peritoneum and second one occurs in a diseased peritoneum. The most common cause of ascites is portal hypertension secondary to chronic liver disease, which accounts for more than 80% cases. The most common causes of non-portal hypertensive ascites include infections and intraabdominal malignancy.[1] Based on the total protein concentration of the ascetic fluid earlier ascites was classified as transudative and exudative. The traditional concept of high protein ascites (> 2.5 g/dl) as exudate was questioned because the normal peritoneal fluid protein concentration is sometimes > 4 g/dl[2]; the ascitic fluid protein concentration increases in cirrhotic patients with diuresis and albumin infusion. Some transudative ascites like cardiac ascites have high protein concentration while some traditionally Exudative ascites like malignant ascites have low concentration of protein[3]; and moreover cirrhosis may be the most frequent cause of

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high protein ascites[4]. Now to overcome these shortcomings ascites is being classified as "high gradient" and "low gradient"[5]. High gradient ascites is called if the difference between serum albumin and ascitic fluid albumin is > l.lg/dl. However if the difference is < 1.1 g/dl it is termed as low gradient ascites [6]. It should be noted that Sero Ascites Albumin Gradient (SAAG) is not a ratio but it is a substraction. The SAAG is based on oncotic hydrostatic balance. In Portal hypertension there is an abnormally high hydrostatic pressure gradient between the portal bed and the ascitic fluid. There must be a similarly large difference between ascitic fluid and intravascular oncotic pressure than other proteins. The difference between serum and ascitic fluid albumin concentration correlates directly with portal pressure[7].

AIMS AND OBJECTIVES

To compare the diagnostic accuracy of serum ascites albumin gradient with the traditional marker – ascitic fluid total protein.

MATERIAL AND METHOD

The present study was conducted in the Department of General Medicine, Aarupadai Veedu Medical College Hospital, Pondicherry during 2012- 2014. After receiving the approval of college ethical committee the study was conducted. Following inclusion and exclusion criteria was used to select the study subjects.

Inclusion Criteria

- All patients with ascites due to any cause with normal coagulation profile.

Exclusion Criteria

- Ascitic patients with severe coagulopathy or disseminated intravascular coagulation (DIC)
- Patients not willing to participate in the study.

Thus a total of 50 adult patients with ascites were selected in the study. On entry, a detailed history and clinical examination were conducted. The information collected was entered in a prestructured proforma. After obtaining informed consent from the patient and relatives, diagnostic abdominal paracentesis was done. Paired ascitic fluid and serum samples were collected from them simultaneously and were examined for ascitic fluid albumin, ascitic fluid total protein and serum albumin with established. The ascitic fluid collected was sent for cell count in an EDTA bottle, biochemical analysis including total protein and albumin in a plain bottle and for culture in a blood culture bottle. The serum ascites albumin gradient was calculated after measuring the serum and ascitic fluid albumin concentrations and simply subtracting the ascitic fluid value from the serum value. To increase the accuracy of SAAG, specimens of serum and ascitic fluid were obtained simultaneously. To correct the SAAG in the setting of a high serum globulin level the following formula was used. Corrected SAAG = Uncorrected SAAG x 0.16 x (Serum globulin + 2.5) Serum hyperglobulinemia (Serum globulin> 5 g/dl) leads to a high ascitic fluid globulin concentration and can narrow the albumin gradient by contributing to the oncotic forces. A narrow gradient caused by high globulin levels occurs in one percent of ascitic fluid specimens.

RESULTS

Table 1: Comparison of age wise and sex wise distribution

Age (years)	Female	Male	Total
11- 20	1	0	1 (2%)
21- 30	1	4	5 (10%)
31- 40	0	8	8 (16%)
41- 50	3	13	16 (32%)
51- 60	0	14	14 (28%)
61- 70	1	5	6 (12%)
71- 80	0	0	0 (00%)

It was observe that majority of the study subjects were male and were 40-60 years of age group.

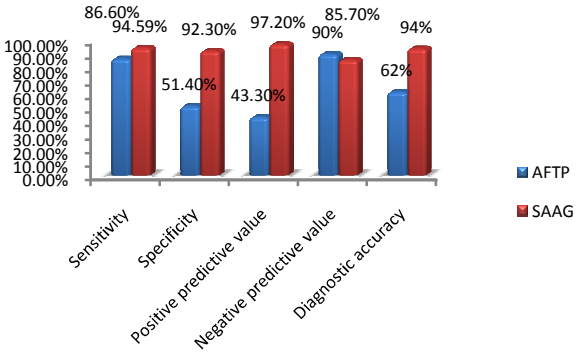
Table 2: Distribution of ascites on the basis of SAAG and AFTP

Etiology	SAAG		AFTP		Total number (percent)
	SAAG>/=1.1	SAAG<1.1	AFTP>/=2.5	AFTP<2.5	
Cirrhosis	4 (8%)	33 (66%)	28 (56%)	9 (18%)	37 (74)
CCF	0	1 (2%)	0	1 (2%)	1(2)
Nephrotic syndrome	0	1 (2%)	1 (2%)	0	1
Liver metastastasis	0	1 (2%)	1 (2%)	0	1
Peritoneal carcinomatosis	1 (2%)	0	0	1 (2%)	1
TB ascites	9 (18%)	0	0	9 (18%)	9
Pancreatitis	0	0	0	0	0
Splenic abscess	0	0	0	0	0
Hypothyroidism	0	0	0	0	0

It was observed that Cirrhosis of the liver (74%) was the most common cause of ascites in the study subjects. It was followed by tuberculous peritonitis (18%). Decompensated heart failure, Nephrotic syndrome, Liver metastasis and peritoneal carcinomatosis was seen in 2% cases each. In the present study the individuals with ascites were divided into high SAAG group and low SAAG group with a cut off value of 1.1. About 28% of the people were in high SAAG group and the left out 72% were in low SAAG group. There were 8% cases of cirrhosis, 18% cases of TB ascites and 2% cases of peritoneal carcinomatosis had high SAAG ascites. 66% of Cirrhosis patients and one case of CCF, Nephrotic syndrome and Liver metastasis had low SAAG ascites. We also classified the study subjects according to exudative and transudative group with the cutoff of ascitic fluid total protein as ≥2.5 and <2.5 respectively. 60% of cases presented as exudative and 40% of cases had transudative ascites. It was observed that 56% cases of cirrhosis were exudative i.e. having ascitic fluid total protein as ≥2.5 whereas 2% cases were of nephrotic syndrome and liver metastastasis each. Exudative ascetic fluid was observed in 18% cases of cirrhosis and TB ascites each.

Table 3: Comparison of efficacy of AFTP and SAAG

Parameters	AFTP	SAAG
Sensitivity	86.6%	94.59%
Specificity	51.4%	92.30%
Positive predictive value	43.3%	97.2%
Negative predictive value	90%	85.7%
Diagnostic accuracy	62%	94%



The diagnostic accuracy of ascitic fluid total protein and serum-ascites albumin gradient was compared. It was observed that SAAG (94%) was having more diagnostic accuracy as compared to AFTP (62%). Sensitivity and specificity of SAAG (94.59% and 92.3%) was more as compared to AFTP (86.6% and 51.4%).

DISCUSSION

The present study was conducted to study Efficacy of serum ascites albumin gradient and ascitic fluid protein in determining ascites etiology. A total 50 patients of ascites were enrolled in the study. It was observed majority of the study subjects were males (88%) male as compared to female (12%). The incidence of ascites increases as the age advances and the total number of cases peaks around 41-60years. Cirrhosis of the liver (74%) was the most common cause of ascites. It was followed by tuberculous peritonitis (18%). Decompensated heart failure, Nephrotic syndrome, Liver metastasis and peritoneal carcinomatosis were seen in 2% cases each. Similar observations were also reported by U.H. Malabu et.al[8] and Al-Knavy BA et.al[9] In majority of the Cirrhosis patients low levels of SAAG were observed. Tuberulous ascities was observed 18 of the study population. And all of these patients were having high SAAG. Similar finding were also reported by Fariborz Mansour *et al*[10] who stated that tuberculous peritonitis should be considered in all patients with high gradient ascites in the developing countries. In contrast to this, the study conducted by Runyon *et al*[11] stated that malignant ascites as the commonest cause of low SAAG ascites in the developed countries. The sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of SAAG was 94.59%, 92.3%, 97.2%, 85.7% and 94% respectively as compared to 86.6%, 51.4%, 43.3%, 90% and 62% respectively with ascitic fluid total protein. Thus it could be clearly demonstrate that SAAG offers an excellent discrimination of the causes of ascites. Similar observations have been reported by other studies too. In a study conducted by Al-Kanvy BA *et al*[9] in Saudi Arabia, two other parameters i.e. ascitic fluid lactic dehydrogenase and ascitic to serum ratio of total protein, in addition to SAAG and AFTP were compared. Among all the four, SAAG had the highest positive and negative predictive values (80% and 98%) against that of ascitic fluid total protein (68% and 96%). M. Beg *et al*[12] observed the diagnostic accuracy and sensitivity of SAAG were 96% and 68% against the respective values 68% and 66% of AFTP. In the other study, conducted by Gupta R *et al*[13] at the department of Gastroenterology and Pathology, M.L.N Medical college, Allahabad, observed that the diagnostic accuracies of AFTP and SAAG were found to be 88% and 92% respectively. Runyon *et al*[11] conducted a study among 901 patients in the University of Iowa, Iowa city in the year 1992. The diagnostic accuracy of SAAG and ascitic fluid total protein was 96.7% and 55.6% respectively. In another study conducted among 51 patients by Akriviadis EA *et al*[14] in the University of Thressaloniki, Hippocratical Hospital, Greece the diagnostic accuracy of SAAG was found to be 98% when compared to 52 – 80%

in the four other diagnostic markers compared. (Ascitic fluid total protein, Ascites/Serum total protein ratio, Ascitic lactate dehydrogenase concentration and Ascites/Serum lactate dehydrogenase ratio).

CONCLUSION

Thus Serum ascites albumin gradient (SAAG) is the single best test against ascitic fluid total protein (AFTP), in the differential diagnosis of ascites. The terms exudative and transudative can be replaced by high SAAG and low SAAG ascites.

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