

Serum/Ascites Albumin Gradient (SAAG), a Very Cost Effective and Reliable First-Line Diagnostic Parameter in the Differential Diagnosis of Ascites - A Study in a North-East Indian Population

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ABSTRACT

Introduction: Ascites is one of the most common condition confronted by a doctor in any medical set up, which, if the underlying cause is not diagnosed properly, complicates the patient's situation. The estimation of Serum-Ascites Albumin gradient (SAAG) has been proposed in many studies to categorise ascites better than either the ascitic fluid total protein or other parameters of ascitic fluid analysis.

Aim: The present study was aimed to find out the significance of SAAG in the differential diagnosis of ascites and to compare its diagnostic sensitivity and diagnostic accuracy with Ascitic fluid Total Protein level.

Materials and Methods: In this study 100 diagnosed ascites patients were enrolled. They were further divided into two groups, Group A - Ascites related to Portal Hypertension and Group B - Ascites not related to Portal Hypertension. Paired ascitic fluid and serum samples were collected for the estimation of AFTP and SAAG.

Results: The diagnostic accuracy of SAAG and AFTP were 95% and 68% respectively.

Conclusion: SAAG should be estimated for the etiological diagnosis of ascites.

Clinical Significance: SAAG is a parameter which has a high diagnostic accuracy and could be used as a first line investigation in the etiological diagnosis of ascites for initiation of prompt treatment. Moreover facility is available for its estimation in most of the rural medical set-ups.

Keywords: Serum-Ascites Albumin gradient (SAAG), Ascitic Fluid Total Protein (AFTP), AF - Ascitic Fluid, PHT - Portal Hypertension, Cross-sectional Study.

INTRODUCTION

Ascites is the accumulation of excess fluid within the peritoneal cavity. ^[1]

It is one of the most common clinical conditions confronting a doctor in any medical set-up, urban or rural. It occurs as a consequence of many underlying diseases and complicates the patient's condition. Successful management of such cases requires a quick evaluation and

establishment of the cause of ascites in the patient.

Ascites represents a state of total body sodium and water excess, but the events that initiate the imbalance of water and sodium is unclear. It is a common complication of cirrhosis and indicates the presence of portal hypertension and hepatic decompensation. Its occurrence in patients with cirrhosis is associated with poor

prognosis with survival around 50% at 1 to 2 years. 75% cases of ascites are due to cirrhosis, but it can also develop due to mechanisms unrelated to liver pathology, the most common being tubercular peritonitis, congestive cardiac failure peritoneal carcinomatosis, renal diseases, pancreatic ascites and few others. ^[1,2] They lead to the exudation of protein rich fluid in the peritoneal cavity.

Diagnostic ascitic fluid aspiration has been proved as the most rapid and cost effective test for identifying the basic disease process.

The AFTP concentration was used to classify ascites as either “exudative” [AFTP \geq 2.5 g/dl] or “transudative” [AFTP $<$ 2.5g/dl]. But this classification was not very efficient in correctly differentiating the underlying aetiology of the process and many had challenged its usefulness in various clinical conditions. A newer approach based on the difference between the serum and ascitic fluid albumin concentration [SAAG] had been found to be more effective in many studies in categorising ascites better than either the AFTP or other parameters of ascitic fluid analysis. ^[3] It classified ascites into two categories - 1.High SAAG ascites with SAAG \geq 1.1 g/dl in cases with PHT. 2. Low SAAG ascites with SAAG $<$ 1.1 g/dl in cases with ascites, unrelated to PHT.

There are a lot of advanced and definitive investigations to establish the aetiology of ascites, but mostly in the referral centres. The poor rural population avails such facilities very late or never. The facility for colorimetric quantitative estimation of serum or ascitic fluid albumin levels is available in most of the rural medical set-ups in our country nowadays, and hence it helps in the prompt starting of treatment and to advise further investigations, when required.

In view of the above, the present study was undertaken among the in-patients, admitted with ascites in the various wards of Assam Medical College & Hospital, which is a premier referral centre in Upper Assam and neighbouring North-East states catering

patients from different strata of the society, to evaluate the significance or value of SAAG in the etiological diagnosis of ascites.

Aims and objectives:

1. To study the significance of SAAG in the differential diagnosis of ascites.
2. To compare the sensitivity and accuracy of SAAG and AFTP in differential diagnosis of ascites.

MATERIALS AND METHODS

The present cross-sectional study was conducted in a group of 100 diagnosed patients with ascites, admitted in the various wards i.e. Medicine, Surgery, TB wards etc. of Assam Medical College and Hospital, Dibrugarh. Patients with coagulopathy or those who were not willing to participate were excluded from the study. After obtaining informed consent of each patient, a detailed history was taken and a clinical examination of each patient has been done and noted in the proforma prepared for the study. Then diagnostic abdominal paracentesis was done and at the same time a blood sample was collected. These samples were collected on their first 1-2 days of admission and then later followed up to know the aetiology of ascites or the diagnosis and then categorised into two groups - Group A, comprising of patients with ascites related to PHT and Group B, comprises of patients with ascites not related to PHT.

The aetiology of ascites had been confirmed by clinical examinations and various investigations like UGI Endoscopy, USG abdomen, CT Scan, Cytological studies, Sputum for AFB, Chest X-Ray, ELISA etc.

Total protein and albumin estimation is done colorimetrically in both ascitic fluid and serum samples. The SAAG was calculated by simply subtracting the ascitic fluid albumin value from the serum value.

Methods of estimation:

- Albumin by Bromocresol Green Method
- Total Protein by Biuret Method

RESULTS

Patients of all age group were included in this study. In Group A, out of the 60 total patients, 47 were males and 13 females and in Group B, out of total 40, 22 were males and 18 females. The peak incidence of ascites in Group A was found in the range 51-60 years, whereas in case of group B the peak incidence was in the age bracket 41-50 years.

Table (1): Distribution of patients according to aetiology of ascites

Group	Etiology of ascites	No. of patients
Group A	1. Alcoholic Liver Disease	39
	2. Hepatitis B Cirrhosis	8
	3. Hepatitis C Cirrhosis	2
	4. Cardiac failure	3
	5. Nephrotic Syndrome	2
Group B	Tubercular ascites	29
	Malignant ascites	11

Table (2) : Mean AFTP and SAAG values in the two groups A & B with their "p" values

Parameters	Group A	Group B	"p" value
AFTP (gm/dl)	2.22 ± 0.63	3.34 ± 0.87	< 0.001
SAAG (gm/dl)	1.81 ± 0.49	0.75 ± 0.27	< 0.001

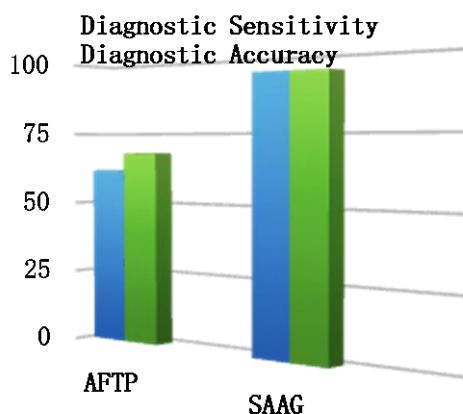


Figure (1): Showing Diagnostic Sensitivity and Accuracy of SAAG compared to AFTP

DISCUSSION

The management of ascites is based on evaluating its aetiology/pathophysiology and than its treatment. In the present study PHT was found to be the most common pathophysiology in generation of ascites. Patients with PHT need specific treatment to prevent its complications, and similarly patients of ascites with causes other than PHT need further investigations and

treatment accordingly. In presence of PHT, osmotic pressure gradient between plasma and AF has to be raised to counterbalance the high hydrostatic pressure driving the fluid into the intra-peritoneal cavity. Albumin being the single most important factor of osmotic pressure generation, the difference between the serum and ascitic fluid albumin concentration (SAAG) is used to differentiate ascites into this two categories - ascites as due to PHT i.e. High SAAG and causes other than PHT i.e. with Low SAAG. [4,5]

In this study it was observed that Liver pathology (Alcoholic liver disease+ Hep B+ Hep C+ Cryptogenic cirrhosis), comprising of 55% of the total patients, was the most common cause of ascites in the study population of this region, followed by Tubercular ascites (29%), Malignancy (11%), etc. It was comparable with a study conducted by U.H. Malabu et.al who observed that liver cirrhosis was present in 44%, Tubercular peritonitis in 23%, malignant ascites in 22%, heart diseases in 6% and nephrotic syndromes in 5% cases of ascites. [6] In another group of 132 people studied by Al- Knawy BA et.al. the division of Gastroenterology, King Saud University, Abha, Saudi Arabia, observed 69.7% liver cirrhosis, 10.6% peritoneal tuberculosis, 9.1% malignant ascites, 7.6% decompensated cardiac failure and 3% nephrotic syndrome. [7] In the present study, SAAG had a sensitivity of 95% and a specificity of 95%. Its positive predictive value was 96.61%, while it had a negative predictive value of 92.68%. These findings are close to the results observed by M Beg, et.al and S. Suresh Saravanakumar et.al. [8,9]

In this study it was observed that 2 cases (3.33%) with alcoholic liver disease and 1 case with Cryptogenic ascites had SAAG<1.1 gm/dl. This is due to the fact that this cirrhotic patient had serum albumin concentration <1.1 gm/dl, hence the SAAG was falsely low. Moreover a low SAAG may also be due to arterial hypotension which results in a decrease in the portal pressure and narrowing of SAAG. In two

cases (5%) of Group B (one tubercular and one malignant ascites), the SAAG values were ≥ 1.1 gm/dl. It had been observed that these cases also had transudative character of the ascitic fluid. These cases may be having associated causes like cirrhosis of liver or some pathology (e.g. tumour compressing the vein, thrombus in portal vein, massive hepatic metastasis etc.), which had raised the portal pressure.

The sensitivity of AFTP in this study was 61.66% and its diagnostic accuracy was 68%. In 1996, E. A. Akriviadis et.al, in a study, compared the SAAG, Serum Ascites Total Protein ratio, Ascitic Lactate Dehydrogenase concentration, and ascitic/serum Lactate Dehydrogenase ratio. They found that the Diagnostic accuracy was 98% for SAAG compared with only 52%-80% for the other four test parameters. [10] Tarn AC et.al has recommended that SAAG should be performed in the lab as a first-line test for ascites and than additional testing should be restricted to specific diagnostic queries and requires close collaboration between the laboratory and the clinician. The results of this study suggest that SAAG is far more superior in the differential diagnosis of ascites than AFTP. [11]

Limitations: A bigger sample size comprising of more patients with ascites other than PHT and comparison of diagnostic accuracy of SAAG among them may give more insight into the clinical significance of SAAG.

CONCLUSION

SAAG is a reliable, cost-affective, rapid and easily available investigation for the differential diagnosis of ascites due to PHT from ascites due to causes other than PHT and hence could be used very effectively in every medical set-up, rural or urban.

Clinical Significance

SAAG is a parameter which has a high diagnostic accuracy and could be used as a first line investigation in the etiological diagnosis of ascites for initiation of prompt

treatment. Moreover facility is available for its estimation in most of the rural medical set-ups.

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