

Ascitic fluid analysis in the differential diagnosis of ascites, a simple randomised study conducted in a tertiary care centre

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Abstract

Introduction: Ascites is the accumulation of protein-containing (ascitic) fluid within the abdomen. Many disorders can cause ascites, but the most common is elevated blood pressure in the portal veins which is usually due to cirrhosis. If large amounts of fluid gets accumulated, the abdomen becomes distended, which may result in loss of appetite and shortness of breath. Analysis of the fluid can help in determining the cause.

Aim: To find the Differential diagnosis of ascites based on ascitic fluid analysis.

Material and Method: A total of 100 patients were studied, their ascitic fluid were analysed. Parameters used are Serum Ascitic Fluid Albumin Gradient (SAAG) and Ascitic Fluid Total Protein (AFTP).

Results: The most common differential diagnosis is Liver Cirrhosis in males and Congestive cardiac failure in Females.

Conclusion: SAAG has high positive predictive value while AFTP has high negative predictive value.

Introduction

Ascites ^[1] is the accumulation of protein containing fluid within the abdomen. Many disorders can cause ascites, but the most common is high blood pressure in the veins that bring blood to the liver which is usually due to cirrhosis ^[2]. If large amounts of fluid accumulate, the abdomen becomes very large, making people lose their appetite and produce difficulty in breathing making them uncomfortable. So the evaluation of the patients with ascites requires the cause of ascites to be established. A proper diagnosis is a prerequisite for the successful management of these patients. Diagnostic ascitic fluid aspiration is the most rapid and cost effective test for identifying the basic disease etiology. Before the 1980s The AFTP concentration was used to classify ascites as exudative (AFTP ≥ 2.5 g/dl) or transudative (AFTP ≤ 2.5 g/dl). But using this criteria the correct etiological factor could not be determined. This drawback led to a new approach to classify ascites, based on the difference between the serum and ascitic fluid albumin concentration.

This newer concept classified ascites as

- 1) High SAAG ascites with SAAG ≥ 1.1 g/dl in cases with portal hypertension.
- 2) Low SAAG ascites with SAAG < 1.1 g/dl in cases with ascites, unrelated to portal hypertension.

The SAAG [3] is a better way to categorise the causes of ascites. In view of the above, this study is undertaken among the patients admitted with ascites in the medical wards of Tertiary medical centre to evaluate the value of SAAG in the diagnosis of ascites.

Aims and Objective

- 1) To differentiate various cases of ascites [4] on the basis of serum ascites albumin gradient.
- 2) To determine the sensitivity and specificity of serum ascites albumin gradient in identifying the etiology of ascites.

Material and Method

The study was conducted in the Department of General Medicine in a tertiary care centre, Palakkad, Kerala during the period 2020 February-2021 January. After receiving permission from the 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 and with normal coagulation profile.

Exclusion criteria: Patients not willing to participate in the study.

A total of 100 adult patients were selected for the study and a detailed history and clinical examination of the patients were conducted. 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. The SAAG was calculated after measuring the serum and ascitic fluid albumin concentrations and subtracting the ascitic fluid value from the serum value. To correct the SAAG in the setting of high serum globulin level the following formula was used: $Corrected\ SAAG = Uncorrected\ SAAG * 0.16 * (Serum\ globulin + 2.5)$ 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.

Results

Total number of cases: 100.

Males: 70.

Females: 30.

The table below shows the results of a randomized study done for Ascitic Fluid Analysis in the differential diagnosis of Ascites:

Table 1

Diagnosis	Male	Female
Cirrhosis of liver	31	0
CCF	4	7
Nephrotic Syndrome	2	3
Liver Metastasis	6	4
Peritoneal Carcinomatosis	2	3
TB Ascites	9	6
Pancreatitis	4	1
Splenic Abscess	2	1
Hypothyroidism	0	3
Lymphomas	3	1
Constrictive pericarditis	0	1
HCC	5	0
Budd-Chiari Syndrome	1	0
Cholangiocarcinoma	1	0 TB ascites (12.8%)

It was observed that among the 100 candidates the majority were males and the common causes of ascites in males are cirrhosis [6] of liver (44%), malignancies [7, 8] and metastasis of liver (15.1%), TB ascites (12.8%) and pancreatitis (5.7%). In females the common causes are CCF (23%), TB ascites (20%), liver metastasis (13%), hypothyroidism (10%), and nephrotic syndrome (10%).

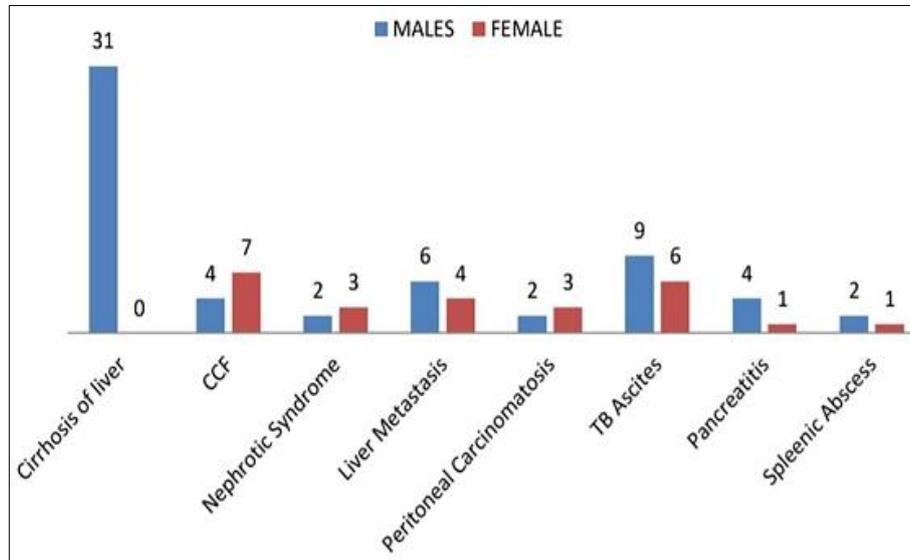


Fig 1

Table 2

Age	No of cases
11-20	Nephrotic syndrome-1 Hypothyroidism-1
21-30	Nephrotic Syndrome-2 Hypothyroidism-1
31-40	Hypothyroidism-1 TB Ascites-2
41-50	TB Ascites-1 Lymphoma-1

51-60	CCF-1 Liver Metastasis-1 TB Ascites-2
61-70	CCF -2 Liver Metastasis-1 TB Ascites-1 Splenic Abscess-1 Peritoneal Carcinomatosis-1
71-80	CCF-5 Constrictive pericarditis-1 Liver Metastasis-2 Peritoneal Carcinomatosis-2

The causes of ascites vary with age. In children the causes were nephrotic syndrome and hypothyroidism, while in adults the major cause was TB ascites and in elderly the major cause was CCF.

Comparison of SAAG and Portal hypertension

Pathophysiology.	High SAAG.	Low SAAG
Portal HT.	68(True positive).	5(False negative)
Non portal HT.	3(False positive).	24(True negative)

On comparing the high SAAG [9] value and the presence of portal hypertension 68 people with SAAG had a pathophysiology related to portal hypertension i.e. true positive (a), whereas only 3 patients with high SAAG did not have portal hypertension i.e. false positive. (b) On the other hand, 24 patients with low SAAG did not have portal hypertension .i.e true negative (c) and 5 patients with low SAAG had portal hypertension as its pathophysiology i.e. false negative.

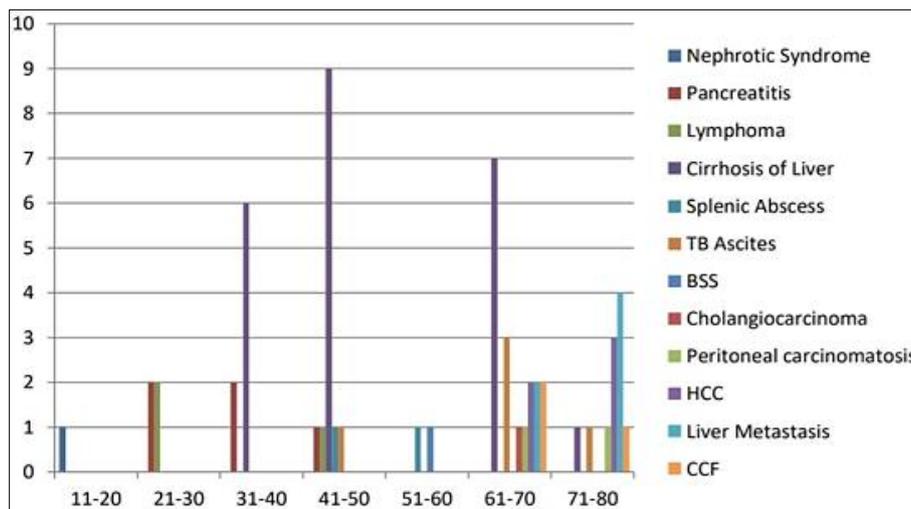


Fig 2

Sensitivity of SAAG = $68 / (68 + 5) \times 100 = 95.78\%$
 Specificity of SAAG = $24 / (24 + 3) \times 100 = 82.76\%$
 Positive predictive value of SAAG = $68 / 73 \times 100 = 93.15\%$
 Negative predictive value of SAAG = $24 / 27 \times 100 = 88.89\%$

Table 3: Comparison of Ascitic fluid total protein (AFTP) in Exudates and transudates

AFTP	>2.5g/dl	< 2.5g/dl
Exudate	25	5
Transudate	19	51

Sensitivity of AFTP = $25 / (25+5) \times 100 = 83.34\%$

Specificity of AFTP = $51 / (51+19) \times 100 = 72.85\%$

Positive predictive value of AFTP = $25 / (25+19) \times 100 = 56.81\%$

Negative predictive value of AFTP = $51 / (51+5) \times 100 = 91.10\%$

Discussion

This study was conducted to determine the role of serum-ascites albumin gradient in differential diagnosis ^[10] of ascites. A total of 100 patients of ascites were enrolled in the study. It was observed that the majority of the study subjects were males (70%) as opposed to females (30%). The incidence of ascites increases as age advances and peaks at 42-65 years. The common causes of ascites in males are cirrhosis of liver (44%), TB ascites ^[11, 12] (12.8%), malignancies and metastasis of liver (15.1%). In females the common causes are CCF (23%), TB ascites (20%), liver metastasis (13%), hypothyroidism (10%), and nephrotic syndrome (10%). The causes of ascites vary with age. In children the causes were nephrotic syndrome and hypothyroidism, while in adults the major cause was cirrhosis and TB and in elderly it was CCF.

Comparison of SAAG and portal hypertension ^[13] was done and it was observed that sensitivity ^[14], specificity, positive predictive value and negative predictive value of SAAG ^[15] are 95.78%, 82.76%, 93.15% and 88.89% respectively. Comparison of AFTP in transudate and exudates was done and it was observed that sensitivity, specificity, positive predictive value and negative predictive value of AFTP are 83.34%, 72.85%, 56.81% and 91.10% respectively. Hence it was concluded that SAAG ^[16] has high positive predictive value (93.15%) and AFTP has high negative predictive value (91.10%).

Conclusion

In conclusion, we can ascertain the sensitivity and specificity of SAAG in differentiation of different types of ascites are 95.78% and 82.76% respectively and that of AFTP is 83.34% and 72.85% respectively.

SAAG has high positive predictive value 93.15% while AFTP has high negative predictive value (91.10%).

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