Research Article

Role of serum-ascites albumin gradient in differential diagnosis of ascites

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Abstract

Introduction: Ascites is mentioned even in the most ancient of medical texts, i.e. the papyrus Ebers of Ancient Egypt and the ayurveda of Hindu tradition (Jalodara), both dating from as early as 1500-1600 BC. The serum ascites albumin gradient has been proved in multiple studies to categorize ascites better than either the ascitic fluid total protein or other parameters in ascitic fluid analysis. **Aims and objectives:**To differentiate various causes of ascites on the basis of serum ascites albumin gradient and **t**o determine the sensitivity and specificity of serum ascites albumin gradient in identifying the etiology of ascites. **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. **Results:** Cirrhosis of the liver (74%) was the most common cause of ascites in the study subjects. 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. sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of SAAG are 94.59%, 92.3%, 97.2%, 85.7% and 94% respectively.
Conclusion: The accuracy of etiological diagnosis of ascites using SAAG was 94%.
Keywords: serum-ascites albumin gradient, ascites

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Received Date: 21/07/2014 Accepted Date: 30/07/2014

Access this article online

Quick Response Code:

Website: www.medpulse.in

DOI: 30 July 2014

INTRODUCTION

Ascites is mentioned even in the most ancient of medical texts, i.e. the papyrus Ebers of Ancient Egypt and the ayurveda of Hindu tradition (Jalodara), both dating from as early as 1500-1600 BC[1]. Ascites is the pathological accumulation of fluid within the peritoneal cavity. It is one of the most common clinical conditions, confronting a physician, a surgeon and a gynaecologist too. It complicates a various disorders like cirrhosis, decompensated heart failure, nephrotic syndrome, peritoneal tuberculosis, disseminated carcinomatosis, pancreatitis, myxoedema etc. In these conditions, ascites develops only as a consequence of the underlying illness. So the evaluation of the patients with ascites requires that the cause of ascites be established. A proper diagnosis is a prerequisite for the successful management of these patients.[2] Diagnostic ascitic fluid aspiration is the most rapid and cost effective test for identifying the basic disease process. Before the1980s, the ascitic fluid total protein [AFTP] concentration was used to classify ascites as either exudative [AFTP>/= 2.5 g/dl] or transudative [AFTP<2.5g/dl][3]. However with this classification, the correct etiological factor responsible for ascites couldn't be determined. Hence this antiquated system of ascitic fluid classification is not efficient. This drawback led to a new approach to classify ascites, based on the difference between the serum and ascitic fluid albumin concentration[4] [Serum Ascites Albumin Gradient –

How to site this article: S Suresh Saravanakumar, Buvana Balamugundan, Mervin K Soman. Role of serum-ascites albumin gradient in differential diagnosis of ascites. *MedPulse – International Medical Journal* August 2014; 1(8): 373-376. http://www.medpulse.in (accessed 01 August 2014).

SAAG]. This newer concept classified ascites into two categories.

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 serum ascites albumin gradient has been proved in multiple studies to categorize ascites better than either the ascitic fluid total protein or other parameters in ascitic fluid analysis[5]. In view of the above, the present study is undertaken among the inpatients, admitted with ascites in the medical wards of Aarupadai Veedu Medical College Hospital, to evaluate the value of SAAG in the etiological diagnosis of ascites.

AIMS AND OBJECTIVES

1. To differentiate various causes of ascites on the basis of serum ascites albumin gradient and
2. To determine the sensitivity and specificity of serum ascites albumin gradient in identifying the etiology of ascites.

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 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

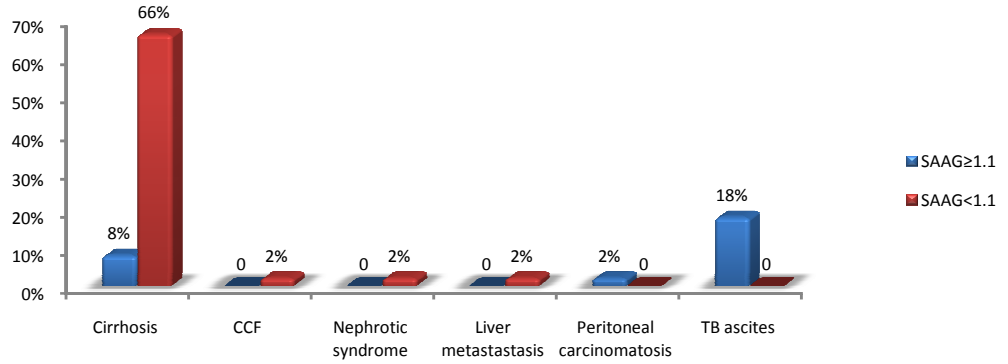
Table 1: Distribution according to age, sex and causes of ascites

Variable		No.	Percentage
Sex	Males	44	88
	Females	6	12
Age groups	11- 20	2	4
	21- 30	5	10
	31- 40	8	16
	41- 50	16	32
	51- 60	14	28
	61- 70	6	12
	71- 80	0	0
Cause of ascites	Cirrhosis	37	74
	Decompensated heart failure	1	2
	Nephrotic syndrome	1	2
	Liver metastasis	1	2
	Peritoneal carcinomatosis	1	2
	Tuberculous ascites	9	18
	Pancreatitis	0	0
	Splenic abscess	0	0
	Hypothyroidism	0	0

It was observed that the distribution of ascites among the males (88%) was more 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 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.

Table 2: Distribution of ascites on the basis of SAAG

Etiology	SAAG≥1.1	SAAG<1.1
Cirrhosis	4 (8%)	33 (66%)
CCF	0	1 (2%)
Nephrotic syndrome	0	1 (2%)
Liver metastasis	0	1 (2%)
Peritoneal carcinomatosis	1 (2%)	0
TB ascites	9 (18%)	0
Pancreatitis	0	0
Splenic abscess	0	0
Hypothyroidism	0	0



It was observed that 28% of the people were in high SAAG group and the remaining 72% were in low SAAG group. 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.

Table 3: Comparison of SAAG and Portal hypertension

Pathophysiology	High SAAG	Low SAAG
Portal HT	35 (True positive)	2 (False negative)
Non Portal HT	1 (False positive)	13 (True negative)

On comparing the high SAAG values and the presence of portal hypertension, 35 patients with SAAG had a pathophysiology related to portal hypertension i.e. true positive (a), whereas only one patient with high SAAG did not have portal hypertension i.e. false positive (b).On the other hand, 12 patients with low SAAG did not have portal hypertension i.e true negative (d) and 2 patients with low SAAG had portal hypertension as its pathophysiology i.e. false negative (c).

Sensitivity of SAAG= 35/(35+2) x 100 =94.59%

Specificity of SAAG= 12/(12+1) x 100 = 92.3%

Positive predictive value of SAAG = 35/(35+1) x 100 = 97.2%

Negative predictive value of SAAG = 12/(12+2) x 100 = 85.71%

DISCUSSION

The present study was conducted to study the role of serum-ascites albumin gradient in differential diagnosis of ascites. 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. The most common cause of ascites was Cirrhosis of the liver (74%) followed by tuberculous peritonitis (18%). Decompensated heart failure, Nephrotic syndrome, Liver metastasis and peritoneal carcinomatosis were seen in 2% cases each. In a study conducted by U.H. Malabu et.al[6] observe that liver cirrhosis was perent in 44%, TB peritonitis in 23%, malignant ascites in 22%, heart diseases in 6% and nephrotic syndromes in 5% cases of ascites. In another group of 132 people studied by Al-Knavy BA et.al[7] at 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. Thus the major causes of ascites are liver cirrhosis and malignant ascites in the western population, whereas tuberculous peritonitis leads the list in the Asians and Blacks. When that serum-ascites albumin gradient was calculated in all the study subjects it was observed that 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. The present study was comparable to a study conducted by Fariborz Mansour – Ghanaei, Afshin Shafaghi, Amir- Hossein Bagherzadeh, Mohammad- Sadegh Fallah[8] who concluded that tuberculous peritonitis should be considered in all patients with high gradient ascites in the developing countries. This is in contrast to the study conducted by Runyon *et al*[9] which stated malignant ascites as the commonest cause of low SAAG ascites in the developed countries. Myxoedema ascites is a rare entity and hypothyroidism as a cause of ascites accounts for less than one percent. A case report and review literature by Jeong – Seon Ji *et al*[10] at the department of internal medicine and Pathology, College of Medicine, The Catholic University of Korea, Seoul, Korea had stated that in a review of 51 well documented cases of myxedema ascites the mean SAAG and ascites were 1.5 and 3.9 g/dl respectively. Similarly a sixty year old hypothyroid female in our study, presented with high protein and high SAAG ascites. In the present study, the patients with malignant ascites presented as two groups – one with high SAAG ascites comprising 1

case of secondaries liver comprising about 25%. The other group presented with low SAAG ascites consisting of 1 cases of peritoneal carcinomatosis comprising about 75%. A similar on the study of the clinical pattern of ascites due to malignancy" was conducted in Qatar, by Khan F Y, Ahmed M S, Lotf A Q and Acsamawi M[11] during the year 2005 -2006, at Hamad General Hospital among 22 patients. The study revealed that SAAG was able to discriminate peritoneal carcinomatosis from other types of malignant ascites, since it is related to the genesis of ascites and it is very crucial in clinical practice. The diagnostic accuracy of SAAG in malignant ascites is 100% in our present study. Comparison of SAAG and Portal hypertension was done and it was observed that the sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of SAAG are 94.59%, 92.3%, 97.2%, 85.7% and 94% respectively. Thus we could say that the accuracy of SAAG in the etiological diagnosis is 94%.

CONCLUSION

In the end we conclude that the sensitivity and specificity of SAAG in the differentiation of different types of ascites are 94.59% and 94.59% respectively. The accuracy of SAAG in the etiological diagnosis is 94%.

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Source of Support: None Declared
Conflict of Interest: None Declared