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ORIGINAL ARTICLE

Comparison of Diagnostic Accuracy of Portal Serum Ascitic Albumin Gradient (SAAG) with Ascitic Fluid Total Protien (AFTP) Differentiating Portal Hypertension from Non-Portal in Patients with Ascites

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ABSTRACT

Introduction: Although majority of the cases of ascites have cirrhosis, there are 15% patients where there is a non-hepatic cause of fluid retention like malignancy, congestive heart failure and tuberculous peritonitis. Ascites is the most common complication of cirrhosis that leads to hospital admission.

Objective: To compare the diagnostic Accuracy of Serum Ascitic Albumin Gradient (SAAG) and Ascitic Fluid Total Proteins in patients with ascites by taking Ultrasound abdomen & Pelvis as gold standard. There are international studies on the accuracy of SAAG in determining cause of ascites but not much local data. Additionally, SAAG is not widely used in our setup. The results of this study will add to the existing knowledge and will help in the diagnosis and better management of these patients.

Material & Methods: A cross sectional validation study was conducted in the department of General Medicine, DHQTH, Dera Ismail Khan from 29th April to 29th Oct, 2019. Diagnostic Ascitic fluid was aspirated from the peritoneal cavity and ascitic fluid was sent to hospital laboratory for total protein and albumin. Blood was taken at the same time and was send to the hospital laboratory for the serum albumin. SAAG was calculated by subtracting ascitic albumin value from the serum albumin value. Both, Ascitic fluid total protein and SAAG values was documented in the proforma. Ultrasound Abdomen & Pelvis was done on each patient with special instruction for radiologist to comment upon Portal Vein diameter and any changes in its diameter with respiration.

Results: As per comparison Of SAAG with ultrasound in detecting ascites, sensitivity was 36.26%, specificity was 75%, PPV was 84.62%, NPV was 23.68% and accuracy was 44.35%. P Value was 0.299. As per comparison of AFTP with ultrasound in detecting ascites, sensitivity was 33.33%, specificity was 59.34%, PPV was 17.78%, NPV was 77.14% and accuracy was 53.91%. P value was 0.513.

Conclusion:SAAG exhibits that patients with ascites fluid possess the basis of portal hypertension. Thus we have come to this conclusion that SAAG can effectively enhance the diagnostic value of ascites fluid tests and therefore its classification can be considered to be a novel standard in the analysis of ascites fluid.

Keywords: Diagnostic Accuracy, Ascites Volume, Ascitic Albumin Gradient (SAAG), Ascitic Fluid Total Proteins (AFTP)

INTRODUCTION

Ascites is defined as accumulation of fluid within the peritoneal cavity. Most patients (approximately 85%) with ascites in the United States have cirrhosis. In about 15% of patients with ascites, there is a nonhepatic cause of fluid retention like malignancy, congestive heart failure and tuberculous peritonitis. Ascites is the most common complication of cirrhosis that leads to hospital admission.

Diagnostic paracentesis is used for the evaluation of ascites in determining its cause. Ascites is classified into 'exudative' and 'transudative' on the basis of ascitic fluid total protein (AFTP), which is high (≥25 g/L) in exudative and <25 g/L in transudative ascites. In many clinical conditions like cardiac ascites, patients on prolonged diuretic therapy and malignant ascites, AFTP is having poor diagnostic efficacy, thus traditional concept of exudative and transudative ascites is being challenged.[2] Due to these limitations, one other approach to classify ascites was devised which is based on serum/ascites albumin gradient (SAAG), and is calculated by subtracting the ascites albumin concentration from the serum albumin value. SAAG value of greater than 1.1 g/dL is consistent with ascites secondary to portal hypertension with approximately 98% accuracy. On the other hand, SAAG value less than 1.1 g/dL is associated with ascites secondary to infection, inflammation, malignancy, and disorders such as tuberculous peritonitis with ascites. Thus SAAG is considered an effective tool to define the underlying cause of ascites. According a study, SAAG classified the causes of ascites correctly in 96% of cases compared to AFTP (in 56% of cases).[2] In another study, diagnostic accuracy of SAAG was 96.7% and AFTP was 55.6%.[3]

In one study, 100 cases were selected randomly where SAAG was more sensitive and specific(94% and 90% respectively) than AFTP (78% and 50% respectively) in detecting portal hypertension and had higher positive and negative predictive values(97% and 82% respectively) compared to AFTP (85% and 38% respectively).[4]

Couple of studies done in India where the diagnostic accuracy and sensitivity of SAAG were 96% and 68% against the respective values 68% and 66% of AFTP.[5,6]

Besides these studies, Pare et al, Marshal et al, Cabrol et al, Goyal et al, Kajani et al also found similar results showing greater sensitivity and accuracy for SAAG as compared to AFTP.[7,8,9,10,11]

One of the initial study conducted by Runyon et al taking a total of 901 paired serum and ascitic fluid samples from patients with all forms of ascites and found that SAAG correctly differentiated causes of ascites due to portal hypertension in 96.7% of cases from those that were not due to portal hypertension against AFTP(in 55.6% of cases).[12] Another study showed that sensitivity and specificity of SAAG is greater than AFTP in the diagnosis of ascities associated with portal hypertension.[13]

In this study I want to assess the diagnostic accuracy of SAAG in patients with Ascites in our setup as there are international studies on the accuracy of SAAG in determining cause of ascites but not much data from our part of the world. Besides that, SAAG is not widely used in our setup. The results of this study will add to the existing knowledge and will help in the diagnosis and better management of these patients.

MATERIALS & METHODS

A cross sectional validation study was conducted in the department of General Medicine, DHQTH, Dera Ismail Khan from 29th April to 29th Oct, 2019. Sample size was 115 which was calculated by using diagnostic sample size calculator, taking statistics for sensitivity as 94%, specificity as 90%, prevalence as 15%, margin of error for sensitivity is 6% and specificity is 11.2%.[4]Sampling technique was consecutive, non-probability sampling. Patients of both gender, with age between 18-65 years having Ascites for more than one month were included while those with coagulatopathy diagnosed either clinically having bleeding diathesis or those having deranged PT/APTT (more than 2 times normal) were excluded.

After approval from the Hospital Ethical Committee, patients were recruited. Written informed consent was taken from the patients. Detailed history and physical examination was performed. Investigations like, full blood count, liver function tests, serum creatinine, and serum electrolytes (Na+, K+) was performed as a base-line. Diagnostic Ascitic fluid was aspirated from the peritoneal cavity and ascitic fluid was sent to hospital laboratory for total protein and albumin. Blood was taken at the same time and was send to the hospital laboratory for the serum albumin. SAAG was calculated by subtracting ascitic albumin value from the serum albumin value. Both, Ascitic fluid total protein and SAAG values was documented in the proforma. Ultrasound Abdomen & Pelvis was done on each patient with special instruction for radiologist to comment upon Portal Vein diameter and any changes in its diameter with respiration.

The data was entered and analyzed in SPSS version 20.0. Two by two Table was used to calculate sensitivity, specificity, PPV, NPV and diagnostic accuracy of SAAG and AFTP by taking Ultrasound Abdomen & Pelvis as gold standard.

RESULTS

As per descriptive statistics, mean and SDs for age was 42.5+12.14. Mean and SDs for duration of disease was 2.04+0.83. As per age wise distribution, 70 (60.86%) patients were in 18-45 years age group while 45 (39.13%) patients were in 46-60 years age group. As per gender wise distribution, 83 (72.17%) patients were males while 32 (27.82%) patients were female patients.

Table 1: Descriptive Statistics (n=115)

Mean and SD for Age	42.5+12.14
Mean and SD for Duration of Disease (days)	2.04+0.83
Male Female	72.17% 27.82%
Ascites on SAAG HIGH LOW	Patients 84 (73.04%) 31 (26.96%)
Ascites on AFTP HIGH LOW	Patients 34 (29.56%) 81 (70.43%)
Ascites on Ultrasound Portal Hypertension Non-Portal Hypertension	Patients 91 (79.13%) 24 (20.87%)

As per ascites on SAAG, 31 (26.96%) patients had high profile while 84 (73.04%) patients had low profile. As per ascites on AFTP, 34 (29.57%) patients had high profile while 81 (70.43%) patients had low profile.

As per portal hypertension ascites on ultrasound, 91 (79.13%) patients had positive result for portal hypertension ascites whereas only 24 (20.86%) patients had negative results for portal hypertension ascites. As per comparison Of SAAG with ultrasound in detecting portal hypertension ascites, sensitivity was 85.71%, specificity was 75%, PPV was 92.86%, NPV was 58.06% and accuracy was 83.48%. As per comparison of AFTP with ultrasound in detecting portal hypertension ascites, sensitivity was 71.43%, specificity was 33.33%, PPV was 15.90%, NPV was 86.86% and accuracy was 39.05%.

Table 2: Comparison of SAAG with Ultrasound in Detecting Portal Hypertension Ascites (n=115)

SAAG Findings	Ultrasound Findings		Total	Statistics
	Positive (Portal HTN)	Negative (Non-Portal HTN)		
High (Portal HTN)	78	06	84 (73.04%)	Sn= 85.71% Sp = 75.00% PPV = 92.86% NPV = 58.06% Accuracy = 83.48%
Low (Non-Portal HTN)	13	18	31 (26.96%)	
Total	91 (79.13%)	24 (20.86%)	115 (100%)	

Table 3: Comparison of AFTP with Ultrasound in Detecting Portal Hypertension Ascites (n=115)

AFT P Findings	Ultrasound Findings		Total	Statistics
	Positive (Portal HTN)	Negative (Non-Portal HTN)		
Low (Portal HTN)	65	16	81 (70.43%)	Sn= 71.43% Sp = 33.33% PPV = 15.90% NPV = 86.86% Accuracy = 39.05%
High (Non-Portal HTN)	26	8	34 (29.56%)	
Total	91 (79.13%)	24 (20.86%)	115 (100%)	

DISCUSSION

Ascites is the most common complication of cirrhosis that leads to hospital admission. Cirrhosis is the eighth leading cause of death in the United States. Approximately 15% of patients with ascites succumb in 1 year while 44%in 5 years.[1]It is therefore important to find out the accurate cause of the ascites.

Using single parameter of Total Protein (AFTP) wrongly classified many exudates originating in infectious or tumors as transudates, whereas some of the transudative conditions of cirrhosis and congestive cardiac failure may be erroneously categorized as exudates due to higher protein levels.[12]

SAAG is considered an effective tool to define the underlying cause of ascites. According to a study, SAAG classified the causes of ascites correctly in 96% of cases compared to AFTP (in 56% of cases).[2] In another study, diagnostic accuracy of SAAG was 96.7% and AFTP was 55.6%[3]

In one study, 100 cases were selected randomly where SAAG was more sensitive and specific(94% and 90% respectively) than AFTP (78% and 50% respectively) in detecting portal hypertension and had higher positive and negative predictive values(97% and 82% respectively) compared to AFTP (85% and 38% respectively)[4]There were two other studies which were conducted in India where the diagnostic accuracy and sensitivity of SAAG were 96% and 68% against the respective values 68% and 66% of AFTP.[5,6]

Besides these studies, Pare et al, Marshal et al, Cabrol et al, Goyal et al, kajani et al also found similar results.[7,8,9,10,11]

All these studies were based on the initial study conducted by Runyon et al taking a total of 901 paired serum and ascitic fluid samples from patients with all forms of ascites and found that SAAG correctly differentiated causes of ascites due to portal hypertension in 96.7% of cases from those that were not due to portal hypertension against AFTP(in 55.6% of cases)[12] Another study showed that sensitivity and specificity of SAAG is greater than AFTP in the diagnosis of ascites associated with portal hypertension.[13]

There are some other parameters which can be utilized in differentiating exudative AF (Ascitic Fluid) from transudative AF, thereby narrowing down the causes of ascites. One of which is cytology for which cut off is>500cell/mm^3 for an exudate but one study suggested it to be 300cells/mm^3 which dramatically increased the sensitivity of the test.[14] Another parameter which has been found useful in differentiating hepatic from non hepatic causes of ascites is described as; LDH of 400 SU, fluid/serum LDH ratio of 0.6, and fluid/serum total protein (TP) ratio of 0.5.[15] In cases when all these three values are below the cut off, it strongly suggests hepatic cause of AF.

CONCLUSION

Diagnostic accuracy of SAAG is superior to AFTP in differentiating portal ascites from non-portal ascites. Thus we have come to this conclusion that SAAG can effectively enhance the diagnostic value of ascites fluid tests and is superior to AFTP in terms of diagnostic accuracy, sensitivity and specificity. Therefore it can be considered to be a novel standard in the analysis of ascitic fluid.

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