ORIGINAL ARTICLE

Hemaccel as a Cheaper Alternative to Human Albumin for Plasma Expansion during Paracentesis in Cirrhotic patients

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ABSTRACT

Aim: To find out if intravenous hemaccel (polygelene) is equally as effective for plasma volume expansion and prevention of hemodynamic changes during large volume paracentesis in cirrhotic patients with tense ascites.
Design: Comparative study.
Setting: Medical department, Akhter Saeed trust hospital, from March 2014 to May, 2015
Methods: Fifty patients with cirrhosis admitted for the management of tense ascites were randomly divided in two groups of twenty five patients each. Group A received intravenous albumin in a dose of six grams/ liter of ascitic fluid removed and group B received polygelene (hemaccel) in a dose of 125 ml/ liter of ascites removed. Various hemodynamic and renal parameters were assessed immediately before and six days after the procedure.
Results: The various parameters observed (expressed as mean±SD) before / after the procedure are: Urea 43.7±12.2/41.2±12.2mg/dl for group A and 45.2±12.1/42.3±11.4mg/dl for group B (χ^2=0.35 p<0.05). Serum creatinine 1.4±0.4/1.3±0.6mg/dl for group A and 1.3±1.1/1.3±0.8mg/dl for group B. Serum sodium 134.5±2.9/131.5±2.4 for group A and 134.9±6.5/134.2±4.3mmol/l for group B. (χ^2=0.48, p<0.05). Plasma osmolality 300.7± 8.6 / 296.1 ± 9.0mosmol/l for group A and 302.8±10.6/297.6±9.23 mosmol/l for group B (χ^2 0.4, p<0.05). Calculated GFR 74.3±17.7/78.2±19.7ml/min for group A and 75.5±15. /77.9±2.4ml/min for group B (χ^2=0.73, p<0.05), and mean arterial pressure 98.8±8.3/94.0±6.1mmHg for group A and 98.2±10.6/93.7±6.7mmHg for group B (χ^2 =0.29, p<0.05).
Conclusion: It was concluded that hemaccel is as effective as albumin in preventing hemodynamic disturbances following large volume paracentsis in patients with cirrhosis and tense ascites.

Keywords: Cirrhosis, ascites, paracentesis, hemaccel, albumin.

INTRODUCTION

Ascites is one of the major manifestations of chronic liver disease. It is frequently resistant to treatment and a major cause of morbidity[1]. Therapeutic aspiration is an important mode of treatment, but is followed by various hemodynamic abnormalities including disturbed parameters of arterial filling, renal failure and electrolyte abnormalities[2, 3]. Intravenous albumin in a dose of 6gm/liter of fluid drained following the procedure is used to prevent most of these hemodynamic disturbances[4,5]. Other colloids including dextran were also found to be effective[6]. However albumin is costly and poses an unacceptable financial burden over the patient.

In search of cheaper alternative various studies have been conducted. Dextran as already mentioned above was found to be effective but has its own problems, including interference with blood grouping, cross-matching and allergic reactions.

Few studies have been conducted that compare albumin with polygelene (hemaccel), a substance that is shown to have few if any problems of its own. Thus in search to find a cheaper alternative to albumin, the present study was designed to compare the efficacy of intravenous polygelene with albumin in preventing hemodynamic changes following therapeutic ascetic aspiration. The study is important in our setting as intravenous polygelene is being much cheaper as compared to albumin.

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PATIENTS AND METHODS

The study was conducted at Akhter Saeed trust hospital from March 2014 to May 2015. Fifty patients were enrolled, all of them admitted for the management of tense ascites. They were randomly divided in two groups, twenty five were allotted to albumin group (A) and twenty five to hemaccel group (B).

Inclusion criteria were:

1. Cirrhosis with tense ascites
2. Serum bilirubin < 10mg/dl
3. Serum creatinine< 3 mg/dl
4. PT < 4 seconds prolonged (< 40% of normal)
5. Platelets > 40,000 /microliter

Exclusion criteria were:

1. Clinical, and laboratory or sonographic evidence of hepatocellular carcinoma
2. Presence of hepatic encephalopathy on admission
3. Presence of recent upper GI bleed or sub-acute bacterial peritonitis

On admission, after a detailed clinical assessment, baseline investigations including complete blood count, diagnostic ascitic fluid aspiration (culture / sensitivity if needed), prothrombin time and liver function tests were sent.

One day before the procedure samplesfor urea, creatinine, blood glucose and electrolytes weretaken and these were repeated six days later. Mean arterial pressure (MAP) (diastolic+1/3 of pulse pressure) and heart rate were measured before and after the procedure.

GFR and plasma osmolality were calculated using the formulae

GFR=(140-age) x body weight (kg)/72x s.creatinine (mg/dl)

Plasma osmolality=2x(Na^++K^+)+urea(mmol/l)+glucose (mmol/l)

The procedure was performed in the morning under fasting conditions. An 18 G needle was used to remove fluid by gravity drainage till the abdomen was flaccid and flat. The procedure was followed by IV infusion of albumin or hemaccel in a dose of 6 gm/l and 125 ml/l of fluid removed respectively. Half of the dose was given rapidly over half an hour and the remaining half slowly over another four hours. Mean arterial pressure and heart rate were measured before and after the procedure.

Parameters observed: Serum electrolytes, urea, creatinine, MAP and heart rate were observed immediately after and then six days after the procedure.

RESULTS

All patients included in the study had tense ascites with advanced liver disease. A comparison of clinical and laboratory features for patients of both the groups are shown in table 1. No local complication was observed except for a minor leakage of fluid from the site of puncture in one case which stopped spontaneously. One patient in group A developed signs of ileus and peritonitis 48hours after the procedure. The patient was managed with IV antibiotics and conservative measures. The patient was discharged in good condition. Table 2 shows comparison of various parameters for both the groups before and after the procedure. From the results it is obvious that the degree of change was similar and comparable between the two groups, and any changes were minor and insignificant.

Table 1: Clinical and laboratory features of patient in both the groups

Clinical/ lab features	**Group A**	**Group B**
Age (years)	53 ± 8.8	51.2 ± 9.2
Sex, male/female (%)	4(26.6)/1 (73.3)	8 (53.2)/7 (46.7)
Weight (kg)	53.4 ± 1.3	49.8 ± 15.3
Upper GI bleed	3	4
Encephalopathy	5	3
Recurrent ascites	11	12
Volume removed (liters)	3.5 ± 0.8	4.8 ± 1.7
Hemoglobin (gm)	10.2 ± 1.0	11.0 ± 1.5
Total bilirubin (mg/dl)	2.3 ± 0.5	1.9 ± 0.8
ALT (u/l)	56.5 ± 9.3	51.5 ± 7.4
PT (seconds); patient	14.6 ± 1.3	14.3 ± 1.2
Control	12.3 ± 0.2	12.2 ± 0.2
Total protein (gm/dl)	7.9 ± 1.8	8.2 ± 2.1
Albumin (gm/dl)	2.9 ± 1.6	3.1 ± 1.4
Globulin (gm/dl)	4.8 ± 1.2	4.9 ± 1.4

Table 2: parameters observed in both the groups

Parameters	**Group A**		**Group B**		**P. value**
	Before	**After**	**Before**	**After**	
Urea (mg/dl)	43.7 ± 12.2	41.1 ± 12.2	45.2 ± 11.1	42.3 ± 11.8	<0.05
Creatinine (mg/dl)	1.4 ± 0.4	1.3 ± 0.6	1.3 ± 1.1	1.3 ± 0.8	<0.05
Na^+ (mmol/l)	134.5 ± 2.9	131.5 ± 2.4	134.9 ± 3.5	132.7 ± 2.9	<0.05
P. Osm (mosmol/l)	300.7 ± 8.6	296.1 ± 9.0	302.8 ± 10.6	297.4 ± 9.2	<0.05
GFR (ml/min)	74.3 ± 17.7	78.2 ± 19.7	75.5 ± 15.8	77.9 ± 2.4	<0.05
MAP (mmHg)	99.0 ± 8.3	94.0 ± 6.1	98.2 ± 10.6	98.2 ± 10.6	<0.05

DISCUSSION

Ascites is an important complication of cirrhosis[1]. In addition to the physical discomfort for the patient it exerts adverse hemodynamic influences. Increased intra-abdominal pressure from tense ascites causes a functional block at inferior vena cava[2], increases portal venous pressure as well as increases flow through the azygous vein; an indirect measure of the flow through the portasystemic collaterals. These findings suggest increased risk of variceal bleeing[3]. Despite improved treatment, refractory ascites has poor prognosis and liver transplantation remains ultimate treatment[7]. Other treatment options for such cases include large volume paracentesis[8].

Therapeutic aspiration of ascites has been done for a long time. In early 1950's reports of adverse hemodynamic and renal influence of procedure along with introduction of potent diuretics made the procedure less favorable. Recently interest has returned in therapeutic paracentesis as an effective and safe treatment of tense refractory ascites. Removal of small (750ml) amounts of fluid leading to sufficient abdominal decompression was not only found to be safe but also had positive hemodynamic influences including increased cardiac output, decreased peripheral vascular resistance and decreased portal venous pressure[2]. Kravetz et al showed that large volume paracentesis significantly decreases variceal pressure and tension. They suggested that ascites removal can be useful in the treatment of variceal bleeding in cirrhotic patients[9].

These beneficial effects of the procedure over the systemic hemodynamics may be followed by adverse hemodynamic effects 48 hours to 6 days after the procedure[2]. However all these abnormal hemodynamic influences were preventable by plasma volume expansion by intravenous albumin[4,5].

Various studies comparing paracentesis with diuretics and paracentesis alone followed by plasma expansion by intravenous albumin, showed safety, convenience and efficacy of the last mentioned treatment modality[10,11,12].

Tito et al in 1990 treated 38 patients with total abdominal paracentesis in a single sitting followed by IV albumin. Most of their patients had advanced liver disease evidenced by history of complications and marked alterations of liver function tests. Some patients had moderate degree of renal failure. A mean of 10.7 ± 0.5 liters of fluid was removed (range 6.3-22.5 L). Most of the ascitic fluid could be mobilized by the procedure except in one patient. No local complication, except a small hematoma of the abdominal wall was encountered in one patient. Peripheral edema decreased markedly or resolved completely in all cases. Following the procedure liver function tests remained stable; complications encountered included encephalopathy, acute gastrointestinal bleed and bacterial peritonitis[5].

Studies comparing the efficacy of albumin with other colloids including dextran and polygelene have revealed variable results. Gines et al showed superior efficacy of albumin[13], while ameta-analysis of several studies showed equal efficacy of other colloids tested[14].

A recent study conducted in Pakistan showed equal efficacy of both albumin and polygelene in preventing hemodynamic consequences of large volume paracentesis in patients with cirrhsosis[15].

The patient characteristics and the observed parameters in our study are summarized in tables 1 and 2 respectively. The findings were equal and comparable in both groups and both groups remained totally asymptomatic.

Transient fall in PRA (Plasma Renin Activity) and PAC (Plasma Aldosterone Concentration) was observe by Pozzi et al following large volume paracentesis but returned to basal level after 6 days of observation[16].

A slight fall in mean plasma sodium concentration and hence calculated osmolality was observed in our study. This was insignificant from the degree of fall and from being completely asymptomatic. A slight fall of even lesser degree was observed by Tito et al[5] (Na^+ before 136±1 and after 135±2mmol/l and plasma osmolality before 282±2 and after 281±2mosmol/l). Similar observations were made by Planaset al[6].

A mild insignificant reduction in plasma urea and creatinine concentration in our study provided evidence of an improvement in renal function. Calculated GFR also improved. Improvement in GFR was also observed by Tito et al[5] who found GFR to increase 72±7ml/min before and 80±6ml/min after the procedure. Although no such improvement was observed by Planaset al[6], but our results are consistent with most of the previous studies. Thus large volume paracentesis followed by IV colloid as plasma volume expander to prevent hemodynamic disturbances is a safe and effective procedure and no abnormal hemodynamic or other complications occur except for a mild, asymptomatic fall in MAP.

CONCLUSION

Hemaccel is as effective as albumin in preventing hemodynamic disturbances following large volume paracentesis in patients with cirrhosis and tense ascites, and should be used as an effective and cheaper alternative to albumin.

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