Section: Medicine

Original Research Article

COMPARATIVE STUDY OF THE EFFECT OF LARGE VOLUME PARACENTESIS ON CEREBRAL AND RENAL FUNCTION IN PATIENTS WITH CIRRHOSIS OF THE LIVER WITH TENSE ASCITES AFTER EITHER ALBUMIN OR POLYGELINE INFUSION

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Abstract

Background: One of the severe scarrings of the human liver is Cirrhosis. The pathetic condition may be caused due to different forms of hepatic infections, liverseases, and diseases such as hepatitis and chronic alcoholism. The most common symptoms of liver cirrhosis are- tiredness, weakness, loss of appetite, Jaundice, muscle deterioration, nausea, vomiting, etc. Aim and Objectives: This work aimed to compare the incidence of renal and cerebral complications after the infusion of albumin and polygeline. This study also compared the efficacy and safety of albumin and polygeline infusion and its effects on renal and cerebral functions in patients undergoing large-volume paracentesis in cirrhotic ascites. **Materials and Methods:** This is a prospective and retrospective study for 18 months between July 2021 and December 2022. Fifty liver cirrhosis patients with tense ascites were treated with large-volume paracentesis and randomly allocated into two groups. The first group of 25 patients (Group 1) was infused with albumin, whereas the second group of remaining patients (Group 2) were infused with polygeline. Liver function tests, CBC, abdominal ultrasonography, urea, creatinine, Na+ level, K+ level, creatinine clearance test, EEG, NCT time, and BG II test were done. **Results:** The comparison of cerebral and renal function between group 1 and group 2 on day 2 and day 6 were studied. No deterioration of renal and cerebral function deterioration paracentesis induced circulatory dysfunction was seen. Cerebral and renal function was preserved in both groups – whether albumin or polygeline was infused as colloid replacement therapy after LVP. Moreover, there was a significant improvement in B-G II test scoring after LVP on day 2 and day 6 compared to the pre-LVP level. **Conclusion:** Our research and studies conclude that whether albumin or polygeline is given during LVP, visuomotor integration improves, and both are equally helpful in avoiding PICD-related declines in cerebral and renal function.

INTRODUCTION

In response to chronic liver damage that results in portal hypertension and end-stage liver disease, Cirrhosis is described as the histological development of regenerating nodules surrounded by fibrous bands.[1] It is a distributed process marked by fibrosis and the transformation of structurally abnormal nodules into normal liver architecture.[2] As a result of a persistent injury that changes the liver's natural lobular architecture, Cirrhosis is characterised by fibrosis and nodule formation in the liver. Various assaults, such as viral infections, toxins, genetic disorders, or autoimmune processes, can harm the liver. The live after every damage, the liver develops fibrosis (scar tissue) initially it retains its functionality. Most of the liver tissue becomes fibrosed after a protracted insult, which causes function loss and the onset of Cirrhosis.[3] After years or decades of sluggish progression, various chronic liver illnesses eventually reach the state known as Cirrhosis.[4] Cirrhosis prevalence is unclear globally; however, it has been estimated to range from 0.15% to 0.27% in the US.[1,5] Cirrhosliver cirrhosis is also a significant health issue in Indiading to the latest WHO data and

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https://www.worldlifeexpectancy.com/india-liver-disease from 2017 show that 259,749 people died from liver disease in India, accounting for 2.95% of all deaths and 18.3% of all cirrhosis deaths worldwide.[6,7] It is assumed that the etiological variables of liver cirrhosis in India may have changed over the past few years due to the country's fast expanding economy and changes in lifestyle and nutrition, which also impacts its side effects.[8] Ascites, spontaneous bacterial peritonitis, hepatic encephalopathy, portal hypertension, variceal hemorrhage, and hepatorenal syndrome are among the serious side effects of Cirrhosis. The most frequent major cirrhosis complication is ascites, which marks a significant turning point in the progression of chronic liver disease.[9] A reduced sodium diet and diuretics are the most often prescribed treatments for ascites in cirrhotic patients. But this course of action falls short in some important ways. Because hepatic encephalopathy, electrolyte imbalances, and renal dysfunction are frequently linked with significant diuresis in these patients. It is often advised that the dosage of a diuretic be changed to cause a reduction of body weight of about 500g per day.[10-12] This indicates that, in most situations, severe ascites mobilisation necessitates a lengthy hospital stay. Additionally, a significant portion of these patients must be readmitted numerous times throughout the course of the disease due to ascites that keeps building up despite long-term diuretic therapy.[13] Finally, diuretics and conservative treatment are ineffective in 20% of Cirrhotic with Ascites admitted to general hospitals.[14] Therefore, it is not surprising that many groups are actively looking into alternative ascites treatment options. One of the best medical procedures is therapeutic abdominal paracentesis. Paracentesis associated with plasma volume expansion is an effective and safe therapy of tense ascites in Cirrhosis. Regarding the frequency of problems from paracentesis, the medical literature is mixed. Based on a retrospective examination, earlier publications tended to be less positive and focused more on the potential drawbacks. Seven major complications, including serious haemorrhage (four), perforation of bowel with generalised peritonitis (one), perforation of bowel with abdominal wall abscess (one), and a catheter fragment left in the abdominal wall or cavity, were found in a retrospective analysis of 242 diagnostic abdominal paracentesis performed on patients with liver disease (one).[15,16] Some writers believed that paracentesis was the source of many occurrences of ascitic fluid infection.[17], the results of this study highlight the possible risks of this technique in these patients and raise the likelihood that complications may be more common than before. According to later prospective research, paracentesis is a safe technique, with a 1% risk of serious complications. According to the study, abdominal paracentesis in ascites patients is safe. As long as specific safety precautions are performed, fear of the technique's consequences shouldn't prevent performing a paracentesis.[18] Needless perforation of an abdominal viscus or solid organ, such as the liver or spleen, is the most terrifying complication. Others include ascites infection by nonsterile procedure, scrotal or penile edema, abdominal wall hematoma, intra-peritoneal hemorrhage following severance of an umbilical vein, and more. 5 L or more of ascetic fluid must be removed with a single large volume paracentesis (LVP). Cardiac output rises immediately following removing 4-5 L of ascitic fluid.[19]; however, within 6–18 hours, a decrease in central venous pressure, pulmonary capillary wedge pressures, and cardiac output take place. In order to maintain effective circulating volume and reduce the risk of problems from a fall in effective circulating volume, a plasma expander is utilised at the time of LVP.[20] Human albumin, dextran-70, dextran-40, and polygeline are the colloids under investigation for replacement. According to certain studies, intravenous albumin is the preferred and most effective plasma expander. Following an LVP, 6–8 g of albumin is typically given for every litre of fluid evacuated.[21] According to the different studies Dextran 70 and polygeline also appear to be as effective as albumin at reducing problems following LVP.[22-25] However, the effect of albumin or polygeline infusion on the cerebral and renal functions of patients with liver cirrhosis with tense ascites is still the subject of research. Since very scarce data is available related on the trend and risk factors associated with the effect of large-volume paracentesis on cerebral and renal function after either albumin or polygeline infusion, this study reports the results of the trial of cirrhotic patients with tense ascites who were assigned to groups receiving albumin or polygeline as plasma expanders after large-volume paracentesis. The study aimed to compare the efficacy of albumin or polygeline as replacement colloids following LVP in order to determine the impact of LVP on cerebral and renal functioning.

MATERIALS AND METHODS

Study Area: The study area was Darbhanga Medical College & Hospital, Darbhanga, Bihar, India.

Study Population: The study population was newly diagnosed 50 patients with Cirrhosis of the liver with tense ascites patients attending General Medicine Department in Darbhanga Medical College & Hospital, Darbhanga, Bihar, India.

Study Period: The study period was from July 2021 to December 2022.

Sample Size: The study subject included 50 patients with liver cirrhosis with tense ascites patients attending the Department of General Medicine at Darbhanga Medical College & Hospital.

Sample Design: The sample was taken till the desired size was reached.

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Inclusion Criteria

The patients having Cirrhosis with tense ascites were included for this trial. These patients were admitted to the medicine ward of Darbhanga Medical College & Hospital, Darbhanga, Bihar, India. Cirrhosis was diagnosed based on clinical & laboratory data along with ultrasonography. Patients with hepatic encephalopathy and electrolyte imbalance were involved after rectifying their disorder.

Exclusion Criteria

1. Bilirubin level> 10 mg/ dl
2. Prothrombin Time of> 40%.
3. Platelet count < 40000
4. The concentration of serum creatinine > 3 mg /dl.
5. Gastrointestinal hemorrhage within the preceding month.
6. Hepatocellular carcinoma
7. Patients suffered from respiratory, cardiac & renal disease.
8. Patient who were treated with propranolol for prophylaxis of variceal bleeding & rebleeding
9. Peritonitis and other infections at the time of their admission.
10. Patient suffering from diabetes mellitus.
11. Patient having neuro-psychiatric illness.

Study Design

The sample was designed as shown in the flow chart (Figure 1).

Parameters of the study

History and thorough clinical examination of the patients: Patients were admitted to the hospital at least five days before the treatment. The patient's chief complaints, along with his past history and family history, were analysed after the admission. These included: Anorexia, Weakness and fatigue, Loss of weight, Pale eyes & extremities, Easy braising, Haematemesis and melena, forgetfulness, altered sleep cycle, swelling in the abdomen, swelled legs, fever, decrease in the volume of urine, respiratory distress, blood transfusion, the sensation of needle prick, dental & other surgeries.

Along with these, the general habits of the patients were asked regarding alcohol intake, smoking and their food habits. The menstrual history of the female patients was also analysed.

Physical examination: Physical examination of the patients were done through a general survey for body temperature, pulse rate, breathing, blood pressure decubitus, build, nutrition, pallor, cyanosis, jaundice, pigmentation, haemorrhagic spots, oedema, lymphadenopathy, palmar erythema, spider angioma, parotid & lacrimal gland enlargement, clubbing of fingers, decrease in body hair, gynecomastia, testicular atrophy, hepatic flap, contracture of fingers.

Biochemistry

The biochemistry was studied by complete blood count (CBC) test, Urea, Creatinine, Liver function tests (LFT), prothrombin time (PT), electrolytes and viral marker.

- Complete blood count (CBC) test: haemoglobin, total count, differential count, platelet count was performed in the Pathology Department, Darbhanga Medical College & Hospital.
- Serum urea and creatinine: The test was done to estimate the glomerular filtration rate.
- Liver function tests (LFT): Total bilirubin (conjugated & unconjugated), albumin, globulin, Serum Glutamic Pyruvic Transaminase (SGPT), Serum Glutamic-Oxaloacetic Transaminase (SGOT) & alkaline phosphatase were done.
- Prothrombin time (PT): Prothrombin time test of the patients was also measured.
- Electrolytes: serum Na+ and K+ levels were analysed.
- Viral markers study: The study was done for hepatitis B & hepatitis C viruses.

All of the biochemical tests were performed at the Biochemistry Department of Darbhanga Medical College and Hospital.

Ascitic fluid study: Ascitic fluid study was done for cell type, cell count, protein, and sugar determinations to exclude peritonitis.

Ultrasound of the whole abdomen: The ultrasonography was done at the Radiology Department of Darbhanga Medical College and Hospital.

Upper GI endoscopy: The upper GI endoscopy was done in the Gastroenterology Department of the hospital

24 h urinary volume: The complete process was very carefully explained to the patients. The patients were asked to start collecting their urine in the morning. Before starting the procedure, they had to empty their bladder. After that, they noted the time of urination as the starting point of their urine collection procedure for the next 24 hours. The next 24 hours after this process was the urine collection time for all their urine, whenever they urinated. We provided them a large container from our biochemistry lab to collect the urine. The container was sterilized and it also contained preservative in it. The capacity of this container was about 4 L. The patients were advised urinate into the container carefully and not to touch the inner surface of the container with their fingers. It was kept in the refrigerator after every urination for 24 hours. They patients were directed to empty their bladder completely just before the end of the 24-hour period and the time was recorded. The patients were instructed to not to get any tiny piece of toilet paper, pubic hair, feces, menstrual blood, or any kind of foreign particle in the urine sample.

Creatinine clearance test: It was estimated from both blood samples, (i) the blood sample for creatinine and also (ii) the urine sample, which was collected over 24 hours. The patients who underwent this test must have not exercised strenuously for at least 48 hours (2 days). Our patients were admitted in the hospital by fulfilling all these criteria. The diet of the patients was observed so that they don’t eat

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more than 8 oz of meat, or any other kind of protein 24 hours prior to the blood creatinine test and also during the creatinine clearance urine test. Drinking plenty of fluids during the 24-hour urine collection was important for the test but it was advised not to have coffee and tea, because of their diuretic effect. Blood sample was taken for creatinine using standard antiseptic procedure and 24-hour urine sample was collected by the process which is described above.

Number Connection Test (NCT): NCT A test was used in this study. For this test, the subject was shown a sheet of paper which contained 1 to 25 numbered circles. These circles were randomly spread all through the paper. The task was to connect the circles from 1-25 as quick as possible. Test result showed the time needed by the subject to complete it including the time taken for error correction. It is a test of visual-spatial orientation and psychomotor speed, predominantly which is useful for screening for hepatic encephalopathy. The evaluation of this test is shown in Table 1.

Bender-Gestalt II test: The Visual Motor Gestalt Test 26 more commonly referred to as the Bender-Gestalt Test, has been one of the most popular assessment devices for over a half century. Its clinical utility in diverse settings and with a broad age range has been well documented.

It is used to measure the visual-motor integration skills in people, starting from the age of 4 yrs. to 85+ yrs. In the Bender-Gestalt Test, 12 stimulus cards were given to the patients sequentially and they were asked to copy them. Item number 5-16 were given to the patients from 8-85+ of years of age and item number 1-13 for children aged between 4-7 years. Their performance was assessed by giving different scores which depends upon the method of scoring. In this study the standard Global Scoring System was used. Here the scoring system evaluates the overall quality of the subjects' reproductions of each design on a 5-point scale ranging from 0 (no resemblance, random drawing, scribbling, lack of design) to 4 (nearly perfect). The results were evaluated by the psychologist at the Department of Neurology. The items 5-16 for Bender-Gestalt II test is shown in Figure 3.

EEG (Electroencephalogram): EEG test was done by the specialist neurologists. In this study the frequency of EEG was used as numerical variable as to diagnose the onset hepatic encephalopathy, specifically the subclinical encephalopathy, one should follow the change in EEG frequency; not qualitatively even if it is normal or abnormal.

Statistical analysis: To compare the continuous variables between two groups, the unpaired t-Test was done whereas; comparison of continuous variables in a particular group was made by paired t-Test. The statistical calculations (t-Test) were done using MEDCALC bvba statistical software (www.medcalc.org) for determination of p-value. Statistically significant value was assumed at $p<0.05$.

RESULTS

Basic clinical investigation and physical examination of the patients: Total 50 patients having Cirrhosis with tense ascites were included in this study. LVP was done to treat all of them. These patients were divided into two groups- (i) Group 1 and (ii) Group 2, on the basis of the infusion of albumin and polygeline after LVP. There were two female patients in each group. Mean age of the patients of group 1 was 44.08 years (SD was 10.29); whereas the mean age of the patients of group 2 was 47.12 years (SD was 11.87). Mean body weight for the patients of group 1 was 59.36 kg (SD= 3.31) and it was 59.8 kg (SD= 3.52) for the patients of group 2. All the patients were complained about the swelling of abdomen and respiratory distress as their main complications. The first ever symptoms of the appearance of abdominal swelling among the patients and its inclusion in this study has the time duration was almost from 6 months to 1year.

History and symptoms of the associated complains of the patients of group 1: In group 1, 10 patients were complained about anorexia and 21 patients were experienced weakness and fatigue as associated complains. 7 patients had associated pedal swelling. There were not any complain of weight loss, yellowish ness in eyes & extremities, easy braising, haematemesis and melena, forgetfulness, altered sleep cycle, fever and decrease in Urine Volume by these patients.

Out of 25 patients, 11 patients had the past history of jaundice. 7 had complained about pedal swelling although they didn't have any past history of this. 13 patients admit that they had the practice to take alcohol.

No one had received paracentesis earlier. 3 patients had family history jaundice, but the cause could not be stated by them. No patient had the past history of ascites, pedal swelling or hematemesis or melena. During the examination of the patients, it was found that, 9 patients had poor nutrition in the form of decreased muscle mass and subcutaneous fat. Pallor was found in 3 patients, edema in 7 patients, clubbing in 8 patients, decreased body hair in 8 patients, and gynaecomastia in 4 patients. No patient had palmar erythemia, cyanosis, testicular atrophy, hepatic flap, caput medusae and hepatomegaly. An enlarged spleen was found in 16 patients. 12 patients were found to have chronic hepatitis B virus infection. Oesophgeal varix was present in 9 patients.

History and symptoms of the associated complains of the patients of group 2: The analysis of the group 2 patients showed that 13 out of 25 were complained about anorexia and 20 patients were experienced weakness and fatigue as associated complains. 6 had complained about pedal swelling although they didn't have any past history of this. There were not any complain of weight loss, yellowish ness in eyes & extremities, easy braising,

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haematemesis and melena, forgetfulness, altered sleep cycle, fever and decrease in urine volume by these patients.

Out of 25 patients, 11 patients had the past history of jaundice. 12 patients admit that they had the practice to take alcohol.

No one in group 2 had received paracentesis earlier. 2 patients had family history of jaundice, but the cause could not be stated by them. No patient had the past history of ascites, pedal swelling or hematemesis or melena. During the examination of the patients, it was found that, 6 patients had poor nutrition in the form of decreased muscle mass and subcutaneous fat. Pallor was found in only one patient, edema in 6 patients, clubbing in 6 patients, decreased body hair in 7 patients, and gynaecomastia in 2 patients. No patient had palmar erythemia, cyanosis, testicular atrophy, hepatic flap, caput medusae and hepatomegaly. An enlarged spleen was found in 13 patients. 13 patients were found to have chronic hepatitis B virus infection. Oesophageal varix was present in 4 patients.

Out of 50 patients who underwent LVP, 25 patients received albumin infusion after LVP (Group 1) and 25 patients received polygeline infusion after LVP (Group 2).

These two groups did not vary significantly with respect to age, bodyweight, mean arterial pressure and baseline investigations' values.

Analysis of biochemical Tests: The result of the biochemical tests, were evaluated before and after paracentesis. The biochemistry was studied by complete blood count (CBC) test, Urea, Creatinine, Liver function tests (LFT), Prothrombin time (PT), electrolytes and viral marker. Patients body weight, mean arterial pressure (MAP), heart rate (HR) and urinary volume were also assessed before and after the treatment.

Mean hemoglobin was 11.2 g/dl in the patients of group 1 and 11.52 g/dl. Other parameters of hemogram were within normal range. Patients had advanced liver disease as verified by high Child-Pugh's score (8.76) in group 1 and (8.6) in group 2 and ultrasonography of abdomen. Total bilirubin level was also increased in the patients. It was measured > 1 mg/dl; whereas the concentration of serum albumin was reduced (< 3.0 g/dl) in almost all the patients.

Psychometric tests: Result of the psychometric measures for the assessment of hepatic encephalopathy by NCT test and BG II test does not show any significance difference in two groups. The comparison of the clinical and biochemical data between these two groups of the patients before paracentesis is shown Table 2. No p value found to be < 0.05.

Abbreviations:

Body wt. = Body weight (kg), MAP=Mean Arterial Pressure (mmhg),

FBS=Fasting blood sugar (mg/dl), TOTBIL=Total Bilirubin (mg/dl),

ALB= Albumin (g/dl), PT=Prothrombin Time (seconds),

CPSCORE=Child-Pugh' score, CRCRL=Creatinine clearance (ml/min),

UR Vol. =Urine volume (litre), DURPAR=Duration of paracentesis,

EEG CPS=Frequency of EEG wave,

NCT TIME=Time to finish Number Connection Test (seconds),

BG GSS=Bender-gestalt Test II score in Global Scoring System

Comparison of renal and cerebral function on day 2 and day 6 in group 1 and group 2 patients with renal and cerebral function before paracentesis: After paracentesis, the patients' renal and cerebral functions were assessed on days 2 and 6, with the paracentesis day taken into account. The results of comparison of renal and cerebral function on day 2 and day 6 with renal and cerebral function respectively before paracentesis in group 1 is shown in Table 3 and that in group 2 is shown in Table 4. These tables demonstrate that there is no difference in renal function between the two groups on days 2 and 6 compared to renal function before to paracentesis (p value >0.05); renal function is not deteriorated in either group.

Comparison of renal and cerebral functions on days 2 and day 6 after paracentesis in group 1 and group 2 patients: Regarding cerebral function, neither EEG frequency nor duration to complete the number connection test on days 2 or 6 differed significantly from those recorded before to paracentesis (p value >0.5).

However, there is a significant improvement in Bender-Gestalt test II (B-G test II) scores on days 2 and 6 compared to those obtained before to paracentesis (p value 0.0001) and (p value 0.0001). The B-G test II was scored in our study using the Global Scoring System. Table 5 compares renal and cerebral function on days 2 and 6 in group 1 patients whereas Table 6 compares renal and cerebral function on days 2 and 6 in group 2 patients. According to these tables, there was no evident change in renal function between days 2 and 6. EEG frequency and time for the number connection test show no changes in terms of cerebral function; however, the B-G test II score has significantly improved (p value <0.0001).

Abbreviations:

UR Vol. =Urinary volume before paracentesis,

UR Vol. 2 & UR Vol. 6= Urinary volume on day2 & day6

Urea= Urea level before paracentesis,

Urea 2 & Urea 6= Urea level on day 2 & day 6

CR=Creatinine before paracentesis,

CR 2 & CR 6= Creatinine on day 2 & day 6

Na+ = Sodium level before paracentesis,

Na+ 2 & Na+ 6= Sodium level on day 2 & day 6

K+= Potassium level before paracentesis

K+ 2 & K+ 6= Potassium level on day 2 & day 6

CRCRL=Creatinine clearance before paracentesis

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CRCRL 2 & CRCRL 6= Creatinine clearance on day 2 & day 6
EEGCPS=EEG frequency before paracentesis
EEG 2 & EEG 6= EEG frequency on day 2 & day 6
NCT Time= Time for number connection test before paracentesis
NCT 2 & NCT 6= time for number connection test on day 2 and day 6
BGGSS= Score of B-G test II in Global scoring system before paracentesis
BG 2 & BG 6= Score of B-G test II in Global scoring system on day 2 & day 6.

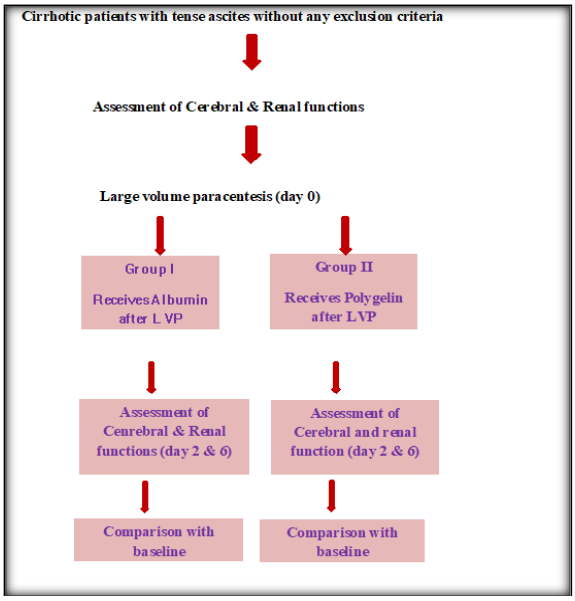
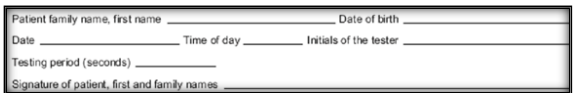


Figure 1: Flow chart showing the study design



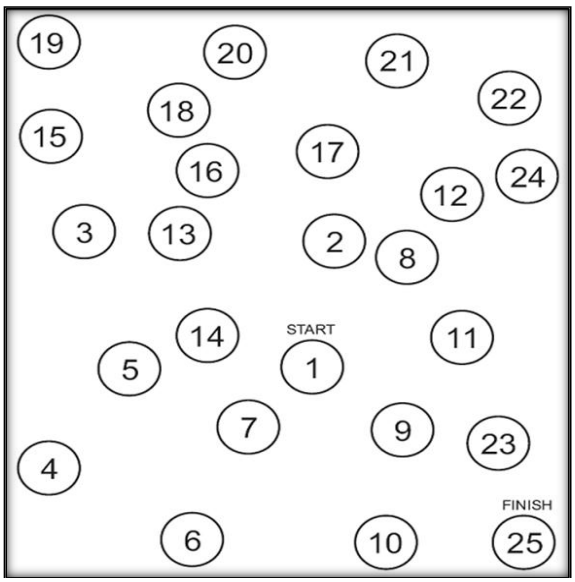


Figure 2: NCT test for diagnosis of hepatic encephalopathy

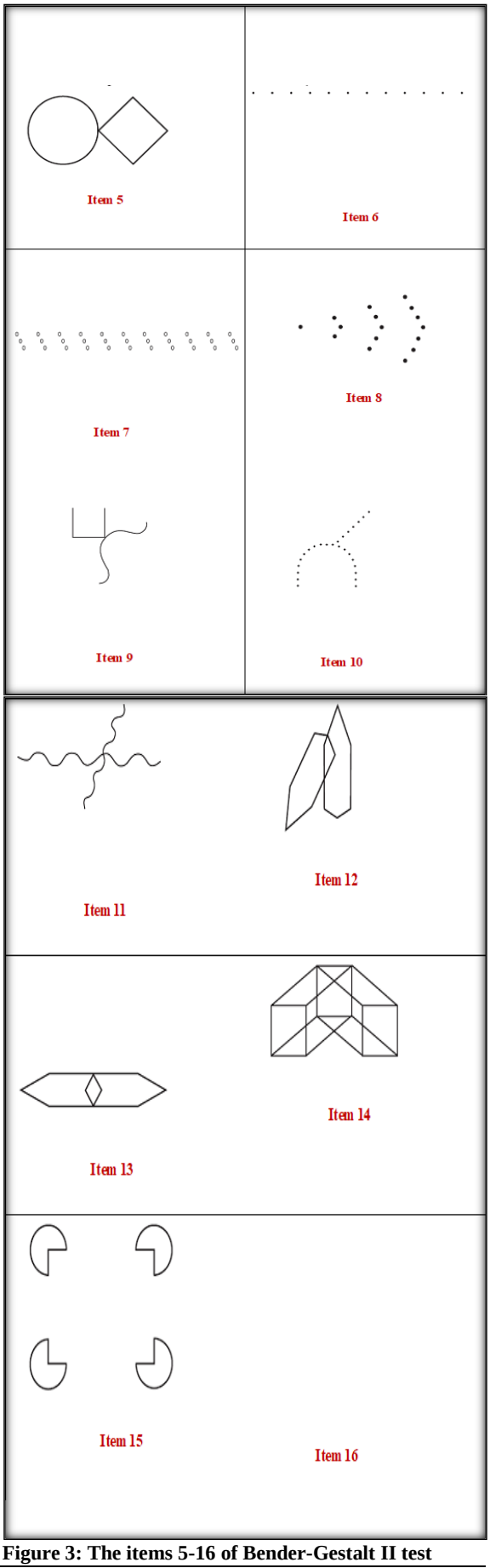


Figure 3: The items 5-16 of Bender-Gestalt II test

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Table 1: Evaluation of NCT test to access the grade of hepatic encephalopathy

Time required	Stage of PSE
Up to 30 sec.	No PSE
31-50 sec.	0-I
51-80 sec.	I-II
81-120 sec.	II-III
Forced termination	III

Table 2: Clinical and biochemical data of all patients before paracentesis

	Group	Number of patients	Mean	Standard Deviation	p-Value
Age	**1**	**25**	**44.08**	**10.295**	0.3383
	2	25	47.12	11.875	
Bodywt.	1	25	59.36	3.315	0.6513
	2	25	59.8	3.523	
MAP	1	25	105.56	8.5	0.1394
	2	25	101.8	9.178	
FBS	1	25	101.76	9.139	0.6244
	2	25	100.48	9.229	
TOTBIL	1	25	1.108	0.18	0.9329
	2	25	1.112	0.153	
ALB	1	25	2.832	0.162	0.8832
	2	25	2.84	0.217	
PT	1	25	13.788	0.53	0.1609
	2	25	13.536	0.664	
CP Score	1	25	8.76	0.435	0.2333
	2	25	8.6	0.5	
Urea	1	25	41.08	5.544	0.9788
	2	25	41.12	5.019	
Creatinine	1	25	0.992	0.208	1.000
	2	25	0.992	0.177	
Sodium	1	25	136.68	1.256	0.2035
	2	25	137.16	1.374	
Potassium	1	25	3.864	0.183	0.1810
	2	25	3.796	0.171	
CR CRL	1	25	79.48	19.598	0.9886
	2	25	79.4	19.617	
UR Vol.	1	25	1.48	0.232	0.3936
	2	25	1.536	0.228	
DURPAR	1	25	77.84	0.086	0.8820
	2	25	77.6	8.041	
EEG CPS	1	25	9.56	0.916	1.0000
	2	25	9.56	1.044	
NCT Time	1	25	26.68	1.62	0.3303
	2	25	26.2	1.825	
BG GSS	1	25	22.56	1.609	0.7019
	2	25	22.36	2.038	

Table 3: Comparison of renal and cerebral function on day 2 and day 6 with renal and cerebral function respectively before paracentesis in group 1 patients who received albumin

		Number of patients	Mean	Standard Deviation	p-Value
Pair 1	UR Vol.	25	1.48	0.232	
	UR Vol.2	25	1.476	0.189	
Pair 2	UR Vol.	25	1.48	0.232	1.000
	UR Vol.6	25	1.48	0.212	
Pair 3	Urea	25	41.08	5.544	1.000
	Urea 2	25	41.08	5.499	
Pair 4	Urea	25	41.08	5.544	0.9695
	Urea 6	25	41.14	5.5	
Pair 5	CR	25	0.992	0.208	0.6896
	CR 2	25	0.97	0.178	
Pair 6	CR	25	0.992	0.208	0.6756
	CR 6	25	0.969	0.177	
Pair 7	Na +	25	136.68	1.256	0.9401
	Na +2	25	136.708	1.362	
Pair 8	Na +	25	136.68	1.256	0.9566
	Na +6	25	136.66	1.33	
Pair 9	K+	25	3.864	0.183	0.9370
	K+2	25	3.86	0.173	
Pair 10	K+	25	3.864	0.183	0.6359
	K+6	25	3.84	0.173	

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	CRCRL	25	79.48	19.598	
Pair 11	CRCRL 2	25	79.86	19.346	0.9453
	CRCRL	25	79.48	19.598	
Pair 12	CRCRL 6	25	79.488	19.592	0.9989
	EEGCPS	25	9.56	0.916	
Pair 13	EEG2	25	9.72	0.89	0.5340
Pair 14	EEGCPS	25	9.56	0.916	
	EEG 6	25	9.68	0.85	0.6333
	NCT Time	25	26.68	1.62	
Pair 15	NCT 2	25	26.68	1.676	1.000
	NCT Time	25	26.68	1.62	
Pair 16	NCT 6	25	26.4	1.384	0.5143
	BGGSS	25	22.56	1.609	
Pair 17	BG 2	25	38.16	1.724	<0.0001
	BGGSS	25	22.56	1.609	
Pair 18	BG 6	25	41.64	1.655	<0.0001

Table 4: Comparison of renal and cerebral function on day 2 and day 6 with renal and cerebral function respectively before paracentesis in group 2 patients who received polygeline

		Number of patients	Mean	Standard Deviation	p-Value
	UR Vol.	25	1.536	0.228	
Pair 1	UR Vol.2	25	1.564	0.207	0.6514
	UR Vol.	25	1.536	0.228	
Pair 2	UR Vol.6	25	1.576	0.192	0.5055
	Urea	25	41.12	5.019	
Pair 3	Urea 2	25	41.092	5.018	0.9843
	Urea	25	41.12	5.019	
Pair 4	Urea 6	25	41.236	4.938	0.9347
	CR	25	0.992	0.177	
Pair 5	CR 2	25	0.993	0.177	0.9841
	CR	25	0.992	0.177	
Pair 6	CR 6	25	0.99	0.182	0.9687
Pair 7	Na +	25	137.16	1.374	
	Na +2	25	137.272	1.622	0.7933
	Na +	25	137.16	1.374	
Pair 8	Na +6	25	137.14	1.487	0.9608
	K+	25	3.796	0.171	
Pair 9	K+2	25	3.772	0.181	0.6321
	K+	25	3.796	0.171	
Pair 10	K+6	25	3.76	0.165	0.4525
	CRCRL	25	79.4	19.617	
Pair 11	CRCRL 2	25	79.6	19.58	0.9714
	CRCRL	25	79.4	19.617	
Pair 12	CRCRL 6	25	79.64	19.762	0.9658
	EEGCPS	25	9.56	1.044	
Pair 13	EEG2	25	9.68	0.988	0.6782
Pair 14	EEGCPS	25	9.56	1.044	
	EEG 6	25	9.72	0.843	0.5539
	NCT Time	25	26.2	1.825	
Pair 15	NCT 2	25	26.36	1.753	0.7533
	NCT Time	25	26.2	1.825	
Pair 16	NCT 6	25	26.12	1.42	0.8634
	BGGSS	25	22.36	2.038	
Pair 17	BG 2	25	37.92	1.6	<0.0001
	BGGSS	25	22.36	2.038	
Pair 18	BG 6	25	40.84	1.81	<0.0001

Table 5: Comparison of renal and cerebral functions on days 2 and 6 in group 1 patients

		Number of patients	Mean	Standard Deviation	p-Value
	UR Vol.2	25	1.476	0.189	
Pair 1	UR Vol.6	25	1.48	0.212	0.9442
	Urea 2	25	41.08	5.499	
Pair 2	Urea 6	25	41.14	5.5	0.9694
	CR 2	25	0.97	0.178	
Pair 3	CR 6	25	0.969	0.177	0.9842
	Na +2	25	136.708	1.362	
Pair 4	Na +6	25	136.66	1.33	0.9002
	K+2	25	3.86	0.173	
Pair 5	K+6	25	3.84	0.173	0.6846
	CRCRL 2	25	79.86	19.346	

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Pair 6	CRCRL 6	25	79.488	19.592	0.9464
Pair 7	EEG2	25	9.72	0.89	
	EEG 6	25	9.68	0.85	0.8716
	NCT 2	25	26.68	1.676	
Pair 8	NCT 6	25	26.4	1.384	0.5226
	BG 2	25	38.16	1.724	
Pair 9	BG 6	25	41.64	1.655	<0.0001

Table 6: Comparison of renal and cerebral functions on days 2 and 6 in group 2 patients

		Number of patients	Mean	Standard Deviation	p-Value
Pair 1	UR Vol.2	25	1.564	0.207	
	UR Vol.6	25	1.576	0.192	0.8326
	Urea 2	25	41.092	5.018	
Pair 2	Urea 6	25	41.236	4.938	0.9190
	CR 2	25	0.993	0.177	
Pair 3	CR 6	25	0.99	0.182	0.9531
	Na +2	25	137.272	1.622	
Pair 4	Na +6	25	137.14	1.487	0.7655
	K+2	25	3.772	0.181	
Pair 5	K+6	25	3.76	0.165	0.8075
	CRCRL 2	25	79.6	19.58	
Pair 6	CRCRL 6	25	79.64	19.762	0.9943
Pair 7	EEG2	25	9.68	0.988	
	EEG 6	25	9.72	0.843	0.8783
	NCT 2	25	26.36	1.753	
Pair 8	NCT 6	25	26.12	1.42	0.5972
	BG 2	25	37.92	1.6	
Pair 9	BG 6	25	40.84	1.81	<0.0001

DISCUSSION

Albumin infusion in Cirrhosis undergoing paracentesis reduces rapid re-accumulation of ascitic fluid while also lowering the likelihood of circulatory dysfunction following paracentesis.[27-29] However, despite significant research and contradictory conclusions, the function of human albumin in individuals with cirrhotic ascites remains unclear.[30,31] LVP with albumin or polygeline infusion was performed in our study without any complications, either systemic or local. There was no evidence of renal or cerebral function deteriorating as a result of circulatory dysfunction brought on by paracentesis. Regardless of whether albumin or polygeline was administered as colloid replacement treatment following LVP, cerebral and renal function was sustained in both groups. Additionally, the B-G test II scores significantly improved after LVP on days 2 and 6 compared to pre LVP levels.

Since there has been a large increase in the score from day 2 to day 6, this improvement will continue up until day 6. The B-G II test was utilised in this investigation to evaluate cerebral function. There hasn't been any research on using it to evaluate visuo-motor integration in cirrhotic patients in order to evaluate brain function. Our research unequivocally demonstrates that LVP improves visuo-motor integration. Regardless of the colloid type utilised, this enhancement happens. Therefore, our study demonstrates that LVP may be performed in a hospital ward without risk, and that if colloid replacement is performed after LVP, renal and cerebral function will not deteriorate. Regarding the type of colloid, polygeline and albumin have equal efficacy in preventing circulatory dysfunction brought on by paracentesis. Only few studies have compared the effects of polygeline and albumin following paracentesis.

According to Salerno F. et al.[32] both groups receiving albumin and haemaccel experienced the same frequency of paracentesis-related problems, likelihood of needing a hospital readmission for ascites (p = 0.48), and likelihood of surviving following enrolment (p = 0.85) (polygeline). Absolute non-responsiveness to diuretics was found to be the only independent predictor of death in a multivariate analysis of 16 factors, including treatment method. These findings suggest that for cirrhotic patients with refractory ascites, haemaccel infusion may safely take the place of albumin infusion following complete paracentesis.

Our investigation came to a similar conclusion because there were no complications in any of the groups. However, the B-G II test was not used in this investigation to evaluate cerebral function. We have employed it and discovered increased visuo-motor integration as a result of better cerebral function.

According to the study by Gines A. et al.[21] patients treated with dextran 70 (34.4%) or polygeline (37.8%; P = 0.004) experienced post-paracentesis circulatory dysfunction more frequently than those treated with albumin (18.5%). Both the volume of ascites drained and the plasma expander employed were independent predictors of this problem.

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A shorter time to first readmission (1.3 +/- 0.5 vs. 3.5 +/- 0.8 months, median +/- SEM; P = 0.03) and shorter survival (9.3 +/- 4.2 vs. 16.9 +/- 4.3 months; P = 0.03) were both related with post paracentesis circulatory dysfunction during follow-up. Serum concentrations of creatinine and salt, as well as the Child-Pugh score at inclusion and circulatory dysfunction during paracentesis, were all independent predictors of survival. According to the study's findings, post-paracentesis circulatory insufficiency is not naturally reversible and is linked to a shorter time to first readmission and a lower survival rate. The best plasma expander to eliminate this condition is albumin.

Our study differs from this study in that it demonstrates that no patient, regardless of whether they got albumin or polygeline, experiences a PICD-related problem. Additionally, the study did not evaluate cerebral function. According to the assessment made in our study, there has been no decline in cerebral function. More importantly, after LVP with albumin and polygeline infusion, visuo-motor integration has improved. Which colloid (albumin or synthetic colloids) should be utilised for plasma expansion following paracentesis or other issues necessitating fluid loading in patients with Cirrhosis is another issue addressed in the study by Moreau R et al.[33] The goal of the study was to evaluate the outcomes and hospital-related expenses for cirrhosis patients who received 20% human albumin vs those who received a synthetic colloid (3.5% polygeline). The main outcome was the first liver-related complication occurring. 30 patients were given albumin, and 38 were given a synthetic colloid when the trial was abruptly stopped due to safety worries about goods derived from cows. Five individuals underwent ascites removal by paracentesis and renal impairment, while 63 patients underwent ascites removal using paracentesis.

The albumin group's median time to the onset of the first liver-related event was not noticeably longer (20 vs. 7 days). The total number of liver-related issues, however, was considerably lower in the albumin group when corrected for a 100-day period. In the albumin group, the 30-day median hospital cost was considerably lower (1915 euros vs. 4612 euros). The study's conclusion was that human albumin appeared to be more effective than synthetic colloid at preventing liver-related problems in patients with Cirrhosis and ascites. This could lead to lower hospital expenses.

In our research, we have not followed up in any way. Therefore, we are unable to determine whether albumin and polygeline continue to have comparable efficacy after a prolonged follow-up. Our study's sample size is quite tiny. So, it was impossible to completely rule out the possibility of a type II error. The patients in our study were divided into two groups, but there was no follow-up on the patients' survival, readmission or the speed at which ascitic fluid re-accumulated. After paracentesis, neither plasma renin activity nor aldosterone was measured. According to another study by Diego Garca-Compean et al.[34] these markers represent surrogate markers for paracentesis-induced circulatory dysfunction (PICD) and may predict survival. This study analyses albumin with dextran-40 and comes to the conclusion that albumin is more effective at preventing PICD following LVP than dextran-40.

However, after both treatments, the frequency of complications, long-term recurrence of ascites, and survival were comparable. They actually advise using albumin when the volume of ascites removed is greater than 5 L and a less expensive plasma expander (Dextran-70, Dextran-40, Polygeline/Haemaccel) when the volume of ascites removed is less than 5 L because PICD may have a negative impact on survival. They add that because albumin is costly, additional research will be required in the future to determine its precise function, particularly studies that have survival as their primary objective.

In this investigation, we assessed PICD-related renal failure using urine volume, serum urea and creatinine, serum electrolytes, and creatinine clearance rather than Dextran-40 and did not test plasma renin activity and aldosterone. This study demonstrates that renal function is not compromised when polygeline and the aforementioned measures are employed to measure renal function. The previous study also did not evaluate cerebral function, however our study did and found that cerebral function had improved as seen by improved B-G II test results, which indicated enhanced visuo-motor integration.

Our research demonstrates that whether albumin or polygeline is given during LVP, visuo-motor integration improves and both are equally helpful in avoiding PICD-related declines in cerebral and renal function. The primary barrier to using albumin in our setup is its price. Our work demonstrates that polygeline, which is significantly less expensive than albumin, can be used in place of albumin following LVP to reduce issues linked to PICD, making its usage more economically sound. The B-G II test results show improved visuo-motor integration following LVP with albumin or polygeline infusion, which was not before done in any study. Our study also tested cerebral function after LVP, which has not previously been done.

To determine whether the long-term effects of albumin and polygeline are equivalent, additional trials assessing plasma renin activity and aldosterone as well as follow-up for the pace of reaccumulation of ascetic fluid and survival are required.

CONCLUSION

During the course of the trial, there were no local or systemic complications seen following LVP, albumin, or polygeline infusion. In all 50 cases,

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there was no decline in renal function in either of the two groups on days 2 or 6 after the procedure. In comparison to the pre-procedure state in all patients, the EEG revealed not any kind of abnormalities also when compared to the pre-procedure period, the time taken to complete the NCT did not exhibit any abnormalities. However, B-G II test results significantly increased on days 2 and 6 following LVP with albumin or polygeline infusion (day 0), indicating improvement in visuo-motor integration. It was observed that, LVP with an intravenous albumin or polygeline infusion has no negative effects on renal or cerebral function, but rather enhances visuo-motor integration, as indicated by the B-G II test.

These results indicate that total paracentesis associated with intravenous albumin/ polygeline can be safely performed in cirrhotic patients with tense ascites and suggest that these patients could be treated in a single-day hospitalization regime. Because albumin/ polygeline is currently a mainstay of therapy for LVP, the way to approach future studies would be evaluating slightly lower doses of these plasma expanders and factors that decrease the risk of adverse outcomes. Further research is needed to investigate its role in cardiac myopathy, hyponatremia and encephalopathy and above all in the prevention of recurrence of ascites.

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Declaration of Conflicting Interests

The Authors declare that there is no conflict of interest.

REFERENCES

1. Schuppan D, Afdhal NH. Liver cirrhosis. The Lancet. 2008;371(9615):838-51.
2. Anthony P, Ishak K, Nayak N, Poulsen H, Scheuer P, Sobin L. The morphology of Cirrhosis. Recommendations on definition, nomenclature, and classification by a working group sponsored by the World Health Organization. Journal of clinical pathology. 1978;31(5):395-414.
3. Sharma B, John S. Hepatic cirrhosis. 2018.
4. Wiegand J, Berg T. The etiology, diagnosis and prevention of liver cirrhosis: part 1 of a series on liver cirrhosis. Deutsches Ärzteblatt International. 2013;110(6):85.
5. Scaglione S, Kliethermes S, Cao G, Shoham D, Durazo R, Luke A, et al. The epidemiology of Cirrhosis in the United States. Journal of clinical gastroenterology. 2015;49(8):690-6.
6. Mokdad AA, Lopez AD, Shahraz S, Lozano R, Mokdad AH, Stanaway J, et al. Liver cirrhosis mortality in 187 countries between 1980 and 2010: a systematic analysis. BMC medicine. 2014;12(1):1-24.
7. Juneja D, Gopal PB, Kapoor D, Raya R, Sathyanarayanan M, Malhotra P. Outcome of patients with liver cirrhosis admitted to a specialty liver intensive care unit in India. Journal of critical care. 2009;24(3):387-93.
8. Mishra D, Dash KR, Khatua C, Panigrahi S, Parida PK, Behera SK, et al. A study on the temporal trends in the etiology of Cirrhosis of liver in coastal eastern Odisha. Euroasian Journal of Hepato-Gastroenterology. 2020;10(1):1.
9. Lindsay AJ, Burton J, Ray Jr CE, editors. Paracentesis-induced circulatory dysfunction: a primer for the interventional radiologist. Seminars in interventional radiology; 2014: Thieme Medical Publishers.
10. Shear L, Ching S, Gabuzda GJ. Compartmentalization of ascites and edema in patients with hepatic Cirrhosis. New England Journal of Medicine. 1970;282(25):1391-6.
11. Lieberman FL, REYNOLDS TB. Renal failure with Cirrhosis: observations on the role of diuretics. Annals of Internal Medicine. 1966;64(6):1221-8.
12. Sherlock S, Senewiratne B, Scott A, Walker J. Complications of diuretic therapy in hepatic Cirrhosis. The Lancet. 1966;287(7446):1049-53.
13. Faloon W, Evans G. Precipitating factors in genesis of hepatic coma. New York State Journal of Medicine. 1970;70(23):2891-6.
14. Arroyo V, Rodés J. A rational approach to the treatment of ascites. Postgraduate Medical Journal. 1975;51(598):558-62.
15. HR L. Hazards of abdominal paracentesis in the cirrhotic patient. New York state journal of medicine. 1962;62:2223-9.
16. Mallory A, Schaefer JW. Complications of diagnostic paracentesis in patients with liver disease. Jama. 1978;239(7):628-30.
17. Conn HO. Bacterial peritonitis: spontaneous or paracentetic? Gastroenterology. 1979;77(5):1145-6.
18. 18. Runyon BA. Paracentesis of ascitic fluid: a safe procedure. Archives of Internal Medicine. 1986;146(11):2259-61.
19. Pozzi M, Osculati G, Boari G, Serboli P, Colombo P, Lambrughi C, et al. Time course of circulatory and humoral effects of rapid total paracentesis in cirrhotic patients with tense, refractory ascites. Gastroenterology. 1994;106(3):709-19.
20. Garcia Jr N, Sanyal AJ. Minimizing ascites: complication of Cirrhosis signals clinical deterioration. Postgraduate Medicine. 2001;109(2):91-103.
21. Gines A, Fernandez-Esparrach G, Monescillo A, Vila C, Domenech E, Abecasis R, et al. Randomized trial comparing albumin, dextran 70, and polygeline in cirrhotic patients with ascites treated by paracentesis. Gastroenterology. 1996;111(4):1002-10.
22. Planas R, Ginès P, Arroyo V, Llach J, Panés J, Vargas V, et al. Dextran-70 versus albumin as plasma expanders in cirrhotic patients with tense ascites treated with total paracentesis: Results of a randomized study. Gastroenterology. 1990;99(6):1736-44.
23. Rothschild MA, Oratz M, Evans C, Schreiber SS. Alterations in albumin metabolism after serum and albumin infusions. The Journal of Clinical Investigation. 1964;43(10):1874-80.
24. Wilkinson P, Sherlock S. The effect of repeated albumin infusions in patients with Cirrhosis. The Lancet. 1962;280(7266):1125-9.
25. Gines P, Guevara M, De Las Heras D, Arroyo V. Albumin for circulatory support in patients with Cirrhosis. Alimentary pharmacology & therapeutics. 2002;16:24-31.
26. Bender L. A visual motor gestalt test and its clinical use. Research Monographs, American Orthopsychiatric Association. 1938.
27. Walayat S, Martin D, Patel J, Ahmed U, N. Asghar M, Pai AU, et al. Role of albumin in Cirrhosis: from a hospitalist's perspective. Journal of community hospital internal medicine perspectives. 2017;7(1):8-14.
28. Quinlan GJ, Martin GS, Evans TW. Albumin: biochemical properties and therapeutic potential. Hepatology. 2005;41(6):1211-9.
29. Henriksen JH, Siemssen O, Krintel JJ, Malchow-Møller A, Bendtsen F, Ring-Larsen H. Dynamics of albumin in plasma and ascitic fluid in patients with Cirrhosis. Journal of hepatology. 2001;34(1):53-60.
30. Shrestha DB, Budhathoki P, Sedhai YR, Baniya R, Awal S, Yadav J, et al. Safety and efficacy of human serum albumin treatment in patients with cirrhotic ascites undergoing paracentesis: a systematic review and meta-analysis. Annals of hepatology. 2021;26:100547.
31. Ginès P, Tító L, Arroyo V, Planas R, Panés J, Viver J, et al. Randomized comparative study of therapeutic paracentesis with and without intravenous albumin in Cirrhosis. Gastroenterology. 1988;94(6):1493-502.
32. Salerno F, Badalamenti S, Lorenzano E, Moser P, Incerti P. Randomized comparative study of hemaccel vs. albumin infusion after total paracentesis in cirrhotic patients with refractory ascites. Hepatology. 1991;13(4):707-13.
33. Moreau R, Valla DC, Durand- Zaleski I, Bronowicki JP, Durand F, Chaput JC, et al. Comparison of outcome in patients with Cirrhosis and ascites following treatment with albumin or a synthetic colloid: a randomised controlled pilot trial. Liver International. 2006;26(1):46-54.
34. García-Compean D, Blanc P, Larrey D, Daures J-P, Hirtz J, Mendoza E, et al. Treatment of cirrhotic tense ascites with Dextran-40 versus albumin associated with large volume paracentesis: a randomized controlled trial. Annals of hepatology. 2002;1(1):29-35.

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