

# Treating The Ascites of Cirrhosis: Is Therapeutic Paracentesis Indicated?

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## Abstract

*Although the ascites of cirrhosis has been treated traditionally with dietary sodium and fluid restriction in conjunction with diuretics, recent evidence suggests that therapeutic paracentesis is safe, effective, and shortens the duration of the hospital stay. This article presents a review of therapeutic paracentesis in cirrhotic patients reported in recent years.*

**Key words:** Cirrhosis, ascites, paracentesis.

Alcoholic cirrhosis of the liver is the most common cause of ascites in western countries.<sup>1,3</sup> Diagnostic paracentesis is routinely performed on all patients with new onset ascites, and in any cirrhotic patient with unexplained fever, abdominal pain, altered mental status or leukocytosis.<sup>4</sup> Forty years ago abdominal paracentesis was a standard therapeutic measure for the treatment of cirrhotic ascites. Because of the availability of potent diuretics and concern over complications of paracentesis (such as hypotension, encephalopathy, sepsis, etc.), as well as rapid re-accumulation of ascites following paracentesis, this procedure was abandoned in the mid 1960s.<sup>5,7</sup>

The hemodynamic and electrolyte abnormalities following paracentesis were attributed to hypovolemia caused by the rapid re-accumulation of fluid within the peritoneal cavity. However, treatment with diuretics also may cause complications such as hypovolemia and hyponatremia. The high frequency of these complications reported in earlier studies<sup>8</sup> has been reduced by monitoring BUN and

electrolytes, and by using distally acting diuretics such as Spironolactone (100-400 mg a day) rather than loop diuretics (e.g. Furosemide) alone.<sup>9,10</sup> Limiting the rate of diuresis to a weight loss of no more than 0.5 kg a day is particularly important in preventing complications<sup>11,13</sup> This implies that symptomatic relief often is delayed and the period of immobility is increased (as compared with paracentesis). This has led to the reconsideration of paracentesis as a form of therapy.

## Paracentesis Versus Diuretics

The renewed interest in therapeutic paracentesis stems from a study by Quintero et al from Barcelona, Spain.<sup>14</sup> in 1985 they reported the results of a randomized controlled clinical trial (Table 1) in which a daily paracentesis of five to six liters, together with an infusion of 40 gms of albumin, were compared with diuretic therapy (Spironolactone 200 - 400 mg plus Furosemide 40 - 240 mg, daily). Ascites was controlled completely in all patients treated by paracentesis, but in only 28 of the 34 patients treated with diuretics. Although mean weight loss was the same in both groups, the hospital stay was 12 days for those having paracentesis and 34 days for those given diuretics. Complications such as hypotension, azotemia, and encephalopathy were observed in 15 of the diuretic treated patients as opposed to nine patients treated with paracentesis. There were no differences in rates of re-admission or in mortality after

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**Table 1.** Effect of Multiple Paracentesis or Diuretics on Renal/Liver Function Tests. \*Mean Arterial Pressure and Clinical Course. (Data modified from the study by Quintero et al, Lancet; 1: 1985.)

Parameters	Paracentesis Group (n = 38)	Diuretic Group (n = 34)	P value
Satisfactory response (no. of cases)	38	28	NS
BUN (mg/dl)			
Before Treatment	22 ± 2]	25 ± 5 ]	p 0.02
After Treatment	26 ± 3] NS	31.6 ± 4.3]	
Serum Sodium (mmol/l)			
Before Treatment	135 ± 1]	134.4 ± 1.0]	p 0.01
After Treatment	134 ± 1] NS	130.5 ± 1.2]	
Serum Albumin (g/dL)			
Before Treatment	3.1 ± 1.7]	2.9 ± 1.9]	NS
After Treatment	3.0 ± 1.6] NS	3.0 ± 2.3]	
Mean Arterial Pressure			
Before Treatment	89.5 ± 1.5]	87.5 ± 2.0]	p 0.001
After Treatment	83 ± 1.6] 0.	78.7 ± 1.9]	
Duration of Hospital Stay (days)	12 ± 1.7	34 ± 3.2	0.001
Major Complications†	9	15	NS
Death	2	5	NS

\*Data are obtained the day before start of and 3 days after completion of the treatment.

†Several renal impairment, hepatic encephalopathy, gastrointestinal hemorrhage and serious infection.

NS = Not significant.

21 weeks.

In another study, Kao et al<sup>15</sup> examined the effects of large volume (over 4 liters) paracentesis without albumin replacement in 18 patients having tense ascites and peripheral edema. The only complication encountered was leakage from paracentesis sites in two patients. There were no significant changes in plasma volume although there was a modest elevation of BUN and creatinine concentrations.

Very recently, Gentile et al<sup>16</sup> reported the effectiveness and safety of large volume paracentesis in 19 cirrhotics with tense ascites. However, most of their patients who were not maintained on a sodium restricted diet and/or diuretics, and whose plasma aldosterone levels were elevated, regained some weight during the first week of paracentesis.

### Effects of Paracentesis on Hemodynamics and Renal Function

Simon et al<sup>17</sup> examined the effect of therapeutic paracentesis on central hemodynamics and renal function. Thirteen patients with cirrhosis and tense ascites (six with and seven without peripheral edema) underwent four to five liter paracentesis without albumin replacement. There was a prompt and sustained increase in cardiac output with no change in mean arterial pressure. However, central venous and pulmonary capillary wedge-pressure fell significantly at one hour and 24 hours after paracentesis. Creatinine clearing also fell significantly at 48 hours. Plasma renin activity (PRA), an index of intravascular volume measurement, rose after 24 hours. In these patients, peripheral edema did not

seem to protect renal function or to prevent a rise in plasma renin activity. Gines et al<sup>18</sup> made similar observations in their patients who underwent large volume paracentesis without replacement of albumin. But when they treated another group of patients with paracentesis (4-6 L/day) until disappearance of ascites, plus intravenous albumin infusion (40 gms after each tap), no significant changes in renal function tests, PRA and plasma aldosterone were observed.<sup>19</sup>

A similar observation was made earlier by Tito et al<sup>20</sup> who infused six gms of albumin for each liter of ascitic fluid removed in one session. In a recent study by the same group,<sup>21</sup> both paracentesis alone and paracentesis plus albumin infusion were found to be equally effective in eliminating the ascites. However, paracentesis without albumin infusion was associated with a significant rise in BUN, PRA and plasma aldosterone, and a significant drop in serum sodium concentration, which were not observed when albumin infusion was carried out. After disappearance of ascites, patients in both groups were discharged from the hospital on diuretics. Eleven patients who were not pretreated with albumin developed severe hyponatremia as opposed to only one patient who was pretreated with albumin infusion ( $p < 0.01$ ). The development of these complications could not be predicted by clinical and laboratory data before the institution of treatment. These authors conclude that intravenous albumin infusion is important in avoiding renal and electrolyte complications, and activation of endogenous vasoactive systems in cirrhotics with ascites who are treated with repeated large volume paracentesis. The development of such complications impaired survival in these patients and prolonged the hospital stay considerably.

Most patients in these studies had baseline serum creatinine concentrations of less than 1.2 mg and serum sodium concentration greater than 130 mEq/L. As a group they would be expected to respond well to salt restricted diet and diuretic therapy.<sup>9,11,13</sup> Although paracentesis shortened the hospital stay and thereby reduced costs in the study by Quintero et al,<sup>14</sup> patients treated with dietary measures plus diuretics do not have to stay in the hospital until the disappearance of ascites. Once an effective diuretic regimen is established without electrolyte derangement or renal function deterioration, patients may be discharged and followed as outpatients.

### Conservative Approach

In those ascitic patients with decompensated cirrhosis or concomitant alcoholic hepatitis, longer hospital stays may be desirable even after therapeutic paracentesis. When peripheral edema is present, no untoward effects are seen with a single paracentesis of less than five liters without replacement of

### Table 2. Management of Ascites.

1. Bed rest. Check postural BP changes and body weight daily in a.m.; BUN and electrolytes every other day.
2. 500 mg sodium diet.\* No salt on table; may use salt substitute. No pretzels, chips, etc. Avoid NSAIDs.
3. Limit fluid intake to 1 L/day. No carbonated beverages.
4. Diuretics, if ascites is not tense. Start with Spironolactone (up to 400 mg/day) plus Hydrochlorothiazide or Furosemide to achieve a weight loss of 1kg/day if edema is present; use smaller doses of diuretics to achieve a weight loss of 0.5 kg/day if no edema is present. Decrease or stop diuretics temporarily if edema disappears if BUN starts to rise or serum sodium drops below 130 mEq/L, or encephalopathy develops.
5. If the ascites is moderate or tense perform paracentesis (therapeutic) slowly over an hour and infuse salt-poor albumin (8 gms for each L) IV; if no edema is present or if large volume (5 L or more) paracentesis is required. Then place on salt-restricted diet and maintenance diuretics.

\*Failure to adhere to a low-sodium diet is the usual reason for ascites to be termed "resistant" or "refractory", in which case, determinations of urinary electrolytes may be informative.

albumin.<sup>15</sup> This peripheral edema appears to protect the intravascular space by allowing easy mobilization of fluid from the periphery.<sup>13</sup> In patients with tense ascites but without peripheral edema, it is safer to administer albumin for all large volume (greater than 4 liters) or repeated paracentesis. Paracentesis is certainly indicated in "refractory" ascites or when tense ascites causes cardiorespiratory embarrassment, abdominal discomfort or breakdown of the skin (especially if umbilical hernia is present). Albumin infusion should be withheld if cardiorespiratory embarrassment is present. All patients should be maintained on a sodium restricted diet and with diuretic(s) after paracentesis to prevent subsequent weight gain.<sup>20</sup>

### Conclusion

The patient with tense ascites is usually confined to bed because portal venous blood flow and renal perfusion increase with recumbency.<sup>11</sup> Many patients with cirrhosis and ascites can be managed by restriction of fluid and sodium intake (Table 2), and the use of diuretics (Spironolactone alone or in combination with Furosemid or Thiazide). Recent studies indicate, however, that therapeutic paracentesis is an appropriate and safe modality in the management of moderate or tense ascites due to cirrhosis. A single

(total) paracentesis is preferable to multiple smaller taps to avoid leakage from the paracentesis site and to reduce the chance of infection. Albumin should be administered when peripheral edema is absent or when large volume paracentesis is required. In all cases, therapeutic paracentesis should be followed by a salt-restricted diet, maintenance of diuretic therapy, and the monitoring of both serum electrolytes and renal function. The safety and effectiveness of therapeutic paracentesis may eliminate the need for peritoneolugular (LeVeen) shunts in so called "refractory" ascites in cirrhotic patients.

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