Chapter 8

Non-pharmacological Treatment of Ascites

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Abstract

Diuretics are considered the first-line pharmacological treatment option for ascites. Diuretic treatment begins with spironolactone and furosemide. Non-pharmacological options include salt restriction, large-volume paracentesis (LVP), transjugular intrahepatic portosystemic shunt (TIPS), and peritoneovenous shunt. Ascites can be mobilized if renal sodium excretion tops 78 mmol daily (88 mmol–10 mmol daily) after restricting sodium intake to 88 mmol/day (about 2000 mg/day). The majority of patients with cirrhotic ascites respond to a combination of sodium restriction and diuretics such as spironolactone and furosemide (90%). Ascites that does not respond to sodium restriction and high-dose diuretic treatment (400 mg/day of spironolactone and 160 mg/day of furosemide) or following paracentesis is labeled refractory. Refractory ascites can be managed with large-volume paracentesis or transjugular intrahepatic portosystemic shunt. Peritoneovenous shunting is considered as a third-line treatment option after all other measures such as diuretics, large-volume paracentesis, or transjugular intrahepatic portosystemic shunt deemed unsuccessful or contraindicated. It has a high rate of shunt obstruction.

Keywords: ascites, treatment, TIPS, paracentesis, non-pharmacological

1. Introduction

According to the European Association for the Study of the Liver [1], management of ascites is based on grading and the patient's clinical presentation. Grade 1 ascites (mild ascites identified by ultrasound) require no treatment. Grade 2 ascites (moderate ascites with moderate abdominal distention) require sodium restriction and diuretics. Grade 3 ascites (gross ascites with marked abdominal distention) necessitate large-volume paracentesis (LVP) followed

by both sodium restriction and diuretics. In addition, treatment depends on the underlying cause. Ascites with high serum-ascites albumin gradient (SAAG) is caused by portal hypertension and is managed with sodium restriction and diuretics [2]. On the contrary, treatment of ascites with low SAAG is achieved by managing the causative pathology [2]. In this chapter, the role for non-pharmacological therapeutic options such as sodium restriction, paracentesis, transjugular intrahepatic portosystemic shunt (TIPS), and peritoneovenous shunt (PVS) in the management of ascites will be discussed (**Table 1**).

	Treatment	Comment
1	Salt restriction	• First-line therapy along with diuretics
2	LVP	• Needs albumin infusion to prevent PICD
3	TIPS	• Encephalopathy is the main complication • High patency rate with PTFE-coated stent • Proper selection prevents hepatic decompensation
4	PVS	• Very limited use in clinical practice • High occlusion rate

Table 1. Non-pharmacological therapy for ascites due to liver cirrhosis.

2. Dietary sodium restriction

In ascites, the decreased sodium excretion leads to a positive sodium balance [3]. Dietary sodium restriction, along with diuretics, is considered the first-line treatment options for patients with cirrhotic ascites [2]. Limiting sodium intake to 88 mmol/day (about 2000 mg/day) is recommended [4]. Cirrhotic patients without fever or diarrhea have about less than 10 mmol of non-renal sodium excretion daily [5]. Ascites can be mobilized if renal sodium excretion tops 78 mmol daily (88 mmol–10 mmol daily) [2]. Adherence to dietary sodium restriction can be assessed by 24-hour urinary sodium, random urinary sodium concentrations, or urine sodium/potassium ratio [2]. A urine sodium/potassium ratio >1 with no evidence of weight loss indicates nonadherence [6]. Unfortunately, only 10–20% of the patients improve with sodium restriction, necessitating the additional use of diuretics for better mobilization of ascites [3]. Moreover, strict limitations of sodium intake may exacerbate the already existing state of malnutrition these patients already have [7].

3. Large-volume paracentesis

Nearly 90% of patients with cirrhotic ascites respond to a combination of sodium restriction and diuretics (spironolactone and furosemide) [8]. About 5–10% become refractory to the abovementioned treatment [9]. Ascites that does not respond to sodium restriction and high-dose diuretic treatment (400 mg/day of spironolactone and 160 mg/day of furosemide) or

following paracentesis is labeled refractory [10]. Patients who require more than three admissions annually have recurrent ascites [11]. Moreover, patients with refractory ascites have a low average survival rate of about 6 months [12]. Patients with either refractory ascites or grade 3 ascites require LVP [12]. LVP is a procedure performed in the office-based setting by inserting a needle in the left iliac fossa or by inserting a peritoneal drain for duration of 3 days [12, 13]. Of notice, there is no increased risk of spontaneous bacterial peritonitis (SBP) with the latter method [14]. Quintero et al. concluded that removal of 5 l of ascites by paracentesis in patients with pitting edema caused the fluid to shift from the periphery and redistribute [15]. Moreover, both Gentile et al. [16] and Pinto et al. [17] agreed on the safety of tapping 5 l of ascetic fluid without the hemodynamic changes that follow the procedure, such as a drop in diastolic pressure, aldosterone release, and decreased sodium excretion. With large-volume paracentesis alone, decreased blood volume more than 3 hours after paracentesis is expected to happen as right atrial pressure, Pulmonary capillary wedge pressure (PCWP), and cardiac output markedly drop [18]. Removing a considerable amount of ascetic fluid increases the risk for paracentesis-induced circulatory dysfunction (PICD) [19]. PICD is associated with increased mortality rate at 6 months [20]. Administering 8 g of intravenous albumin/liter of ascetic fluid removed prevents paracentesis-induced circulatory dysfunction (PICD) following drainage of more than 5 l of ascetic fluid [1, 6, 21]. Gines et al. evaluated the role of IV albumin administration in patients who underwent LVP. Only 2% of patients who received IV albumin experienced renal dysfunction and hyponatremia in contrast to those who did not receive IV albumin (21%) [21]. In PICD, vasodilation leads to activation of the renin-angiotensin system in an attempt to restore systemic vascular resistance [22]. Renal dysfunction, vasopressin release and water retention, hypervolemic hyponatremia, and underfilling are consequences [22]. Interestingly, using 4 g (half the dose) of IV albumin in prevention of PICD was as effective as using 8 g [23]. Studies also reported the role of terlipressin, a V1 receptor agonist, as a vasoconstrictor in preventing the neurohumoral responses following paracentesis [24, 25]. Moreau et al. compared the actions of both IV albumin and terlipressin in inhibiting arterial vasodilation, and both were found to be effective [24]. In contrast to albumin, terlipressin is much cheaper [24].

4. Transjugular intrahepatic portosystemic shunt

TIPS could be a substitute for LVP in patients who require more than three LVPs monthly or those with recurrent ascites [12]. In TIPS, a communication is created between the portal and outflow hepatic veins, aiming at lowering portal venous pressure and subsequent activation of renin-angiotensin system [26]. Ascites usually resolves without the need for diuretics or sodium restriction following TIPS insertion, as patients easily excrete sodium; however, diuretics may be needed for few months after TIPS placement [27–29]. Moreover, norepinephrine, plasma renin, and aldosterone activities decrease following TIPS insertion, leading to improved renal function in patients with cirrhosis [27–29]. The main indication for TIPS in cirrhotic patients is acute variceal bleeding not responding to endoscopic and medical therapy, refractory ascites, or for secondary prevention of gastric variceal bleeding [2]. Several studies compared the role of TIPS to LVP with IV albumin infusion. Unfortunately, the results of the studies showed that patients

with TIPS insertion had a worse prognosis in patients with refractory ascites [30–33]. This may be explained by poor patient selection for TIPS. However, patients who have TIPS insertion with polytetrafluoroethylene (PTFE)-covered stents had better outcomes and stent patency compared to those with bare-metal stents [34, 35]. Model for end-stage liver disease (MELD) is a scoring system for evaluating the severity of chronic liver disease. It was developed initially to predict the 3 months of mortality in patients who had undergone a TIPS procedure [36] and was subsequently adopted for prioritizing receipts on the waiting list for liver transplantation [37, 38].

High MELD score [39] and bilirubin levels >3 mg/dl [40, 41] increase mortality rates in patients who had TIPS placement; therefore, good selection of candidates for TIPS is very important for good outcome. Hepatic encephalopathy is the main complication encountered in 25–30% of patients who undergo TIPS, especially older patients [41, 42]. TIPS is contraindicated in patients with severe pulmonary hypertension, portal thrombosis, heart failure, and advanced liver disease (Child-Pugh class C) [3].

5. Peritoneovenous shunts

PVS can be used in the treatment of refractory ascites that needed multiple LVPs or patients who cannot have TIPS placement or liver transplantation [13, 43]. In PVS, a one-way valve tube is created to allow movement of ascites from the positively pressured peritoneum to the superior vena cava through the internal jugular vein in the negatively pressured chest cavity [44]. If central venous pressure gets elevated, the flow is hindered [3]. Most common complication encountered with PVS is obstruction of the shunt [45]. Coagulation disorders, severe cardiac or kidney failure, and loculated ascites are contraindications for PVS [13]. Moreover, PVS is not frequently used due to lack of survival benefit and low shunt patency rate [46, 47]. In addition, sepsis and SBP prompt shunt removal [43]. The abovementioned leaves PVS with very limited use in clinical practice as a treatment option after all other measures such as diuretics, LVP, and TIPS deemed unsuccessful or contraindicated [43, 48, 49].

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