Ascites

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Abstract

Ascites is the abnormal accumulation of fluid in the peritoneal cavity. The most frequent cause of ascites is portal hypertension related to cirrhosis. Ascites in patients with cirrhosis is the consequence of the homeostatic activation of vasoconstrictor systems and sodium retention. These mechanisms are triggered by a decrease in effective arterial blood volume due to a severe arterial vasodilatation located mainly in the splanchnic circulation. The ascitic fluid of patients with cirrhosis is generally low in proteins and albumin. Since the presence of ascites is associated with poor prognosis and low survival, the patients with ascites should be evaluated for liver transplantation. The treatment consists basically of a negative sodium balance that is obtained by decreasing the sodium intake and increasing its excretion by the administration of diuretic agents. The patients in whom these drugs are not effective or cannot be administered (because they develop adverse effects, a condition well known as refractory ascites), should be treated with large-volume paracentesis plus albumin.

Keywords ascites; cirrhosis; diuretic; paracentesis

Ascites is defined as the accumulation of fluid in the peritoneal cavity exceeding the normal maximum volume of 25 ml. Cirrhotic ascites accounts for over 75% of patients who present with ascites, the remaining 25% being due to malignancy (10%), cardiac failure (3%), pancreatitis (1%), tuberculosis (2%) or other rarer causes.[1] Ascites occurs in more than 50% of patients within 10 years of the diagnosis of cirrhosis.

Pathogenesis

The peripheral vasodilatation theory is currently the most accepted hypothesis to explain ascites formation in cirrhotic patients.[2] This hypothesis suggests that cirrhosis and portal hypertension induce progressive splanchnic vasodilatation leading to an effective decreased plasma volume, which results in overactivity of endogenous vasoconstrictor systems and renal sodium and water retention (hyperdynamic circulation). In the early stages of cirrhosis, splanchnic arterial vasodilatation is moderate and the effective arterial blood volume is maintained within normal limits through increases in plasma volume and cardiac output. In the later stages of cirrhosis, splanchnic arterial vasodilatation is more important, the effective arterial blood volume decreases markedly, and arterial pressure decreases. Arterial pressure is maintained by activation of vasoconstrictor and antinatriuretic factors, determining sodium and fluid retention and ascites formation. As the disease progresses, there is impairment in sodium and water excretion followed by renal vasoconstriction that determines dilutional hyponatremia at first and hepatorenal syndrome later (Figure 1).[2–4]

Classification

Uncomplicated ascites is ascites that is not infected and that is not associated with the development of the hepatorenal syndrome (HRS).

- Grade 1 ascites is mild ascites only detectable by ultrasound examination.
- Grade 2 ascites, or moderate ascites, is manifest by moderate symmetrical distension of the abdomen.
- Grade 3 ascites is large or gross ascites with marked abdominal distension.

Refractory ascites – in 1996, the International Ascites Club defined 'refractory ascites' as ascites that cannot be mobilized or the early recurrence of which cannot be satisfactorily prevented by medical therapy.[4] It occurs in approximately 5–10% of cases of ascites.[5] Refractory ascites can be divided into

Proposed pathogenesis of ascites formation in cirrhosis according to the arterial vasodilatation hypothesis

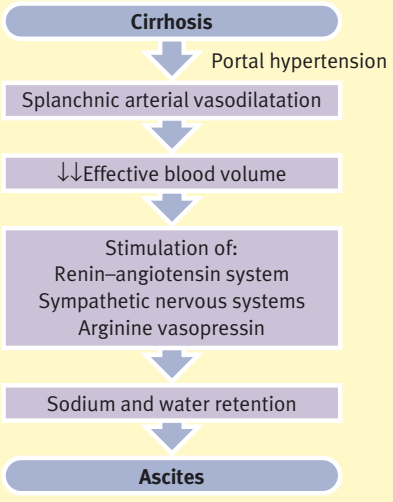

Figure 1

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two subgroups: diuretic-resistant ascites and diuretic-intractable ascites.[4]

General evaluation of patients with cirrhosis and ascites

The evaluation of patients with cirrhosis and ascites should include, not only the evaluation of liver function, but also the evaluation of renal and circulatory function (Table 1).[6]

Diagnosis

Diagnosis of ascites is simple when a large amount of fluid is accumulated in the peritoneal cavity. On physical examination, the abdomen is distended, the flanks bulge and a fluid wave may be demonstrable. If the volume of ascitic fluid is small, an abdominal ultrasound scan is useful; it can detect as little as 100 ml of abdominal fluid and may suggest the cause. The diagnosis is confirmed by fluid aspiration by paracentesis. The procedure should be performed by inserting a needle into the left lower abdominal quadrant under strict sterile conditions.

Characteristics of cirrhotic ascites – biochemical and cytological analysis of ascitic fluid provides important information. Traditionally, ascites in patients with cirrhosis was considered to have the characteristics of a transudate, with a total protein concentration of less than 2.5 g/dL and relatively few cells. It is helpful to subtract the concentration of the ascites fluid albumin from serum albumin; a serum–ascites albumin gradient of more than 1.1 g/dL predicts portal hypertension with great accuracy (Table 2).[7,8] The ascitic fluid in cirrhosis usually contains fewer than 300–500 white blood cells/mm^3. More than 70% of these cells are mononuclear leucocytes. When the ascitic fluid contains more than 250 neutrophils/mm^3, a diagnosis of spontaneous bacterial peritonitis is made.[9]

Evaluation of patients with cirrhosis and ascites[6]

Evaluation of liver disease
- Liver function and coagulation tests
- Standard haematological tests
- Abdominal ultrasonography or computed tomography
- Endoscopy of the upper gastrointestinal tract
- Liver biopsy in selected patients

Evaluation of renal and circulatory function
- Measurement of serum creatinine and electrolytes
- Measurement of urinary sodium (preferably from a 24-hour urine collection)*
- Measurement of urinary protein (from a 24-hr urine collection)
- Arterial blood pressure

Evaluation of ascitic fluid
- Cell count
- Bacterial culture
- Measurement of total protein
- Other tests (measurement of albumin, glucose, lactate dehydrogenase, amylase, and triglycerides; an acid-fast smear; and cytological examination)

*If possible, patients should be evaluated when they are not receiving diuretic drugs, since some variables related to these drugs may alter renal function.

Table 1

Differential diagnosis of ascites by the serum–ascites albumin gradient*

High gradient (≥1.1 g/dL)	Low gradient (<1.1 g/dL)
Cirrhosis	Peritoneal carcinomatosis
Congestive heart failure	Peritoneal tuberculosis
Fulminant hepatic failure	Pancreatitis
Alcoholic hepatitis	Biliary pancreatitis
Liver metastases	Chlamydia/gonococcal infection
Portal vein thrombosis	Nephrotic syndrome
Budd–Chiari syndrome	Connective tissue diseases
Veno-occlusive disease	
Myxedema	

*Serum ascites–albumin gradient = serum albumin concentration minus ascites albumin concentration.

Table 2

Differential diagnosis

The most frequent causes of ascites due to non-hepatic diseases are cardiac failure and neoplasm.[1] In the first case, the protein content of the ascites is usually elevated and the abdominal ultrasound shows expansion of suprahepatic veins. The existence of jugular ingurgitation suggests cardiac ascites.[10] The neoplasic invasion of the peritoneum causes the exudation of liquid that is usually rich in proteins (generally superior to 25 g/litre).[11] The diagnosis is made through the cytology of the ascitic fluid, which is positive in 60–90% of the cases. If the cytological examinations are repeatedly negative, the last option is to perform laparoscopy and biopsy of the peritoneum.

Other less frequent causes of ascites are peritoneal tuberculosis and pancreatic ascites. Ascitic fluid in peritoneal tuberculosis contains abundant lymphocytes, has a high concentration of the adenosindeaminase enzyme and is generally rich in proteins.[12] The culture of ascitic fluid is frequently negative. The diagnostic confirmation must be made by means of laparoscopy and biopsy of the peritoneum looking for granulomas. In pancreatic ascites, the ascitic fluid is very rich in amylase and lipase, making the diagnosis relatively easy.[13] Abdominal computerized tomography is useful to define the cause of ascites.

Managment of ascites

General measures

All patients with ascites should be evaluated as if they were possible candidates for liver transplantation because the presence of large ascites is associated with poor long-term survival.[7,14]

Reduction of sodium intake is beneficial in patients with ascites, particularly those with severe sodium retention who do not respond, or respond poorly, to diuretics.[15] A low-sodium diet (60–90 mEq/day) may facilitate the elimination of ascites and