Management of ascites in patients with liver disease

**Key points**

- Ascites is an abnormal accumulation of fluid in the abdomen, which can vary from small amounts to many litres. It can be graded from 1 to 3 according to the severity of symptoms (Box 1). This article discusses the pathophysiology, diagnosis and management of ascites, as well as implications for nursing practice. Ascites can have many causes, but this article focuses on ascites caused by liver cirrhosis.

- Ascites is an indicator that cirrhosis has changed from stable to decompensated.

- Ascites can be treated with diuretics, salt restriction and ascitic fluid drainage (paracentesis).

- Patients with ascites often struggle with disease prognosis and complications, so empathetic nursing care is needed.

- Non-alcoholic fatty liver disease (NAFLD) (Box 2).

- Often, patients with liver disease develop peripheral oedema as well as ascites.

**Pathophysiology**

**Liver cirrhosis**

There are many causes of ascites, such as widespread cancer or heart failure (Table 1), but the most common is cirrhosis of the liver (European Association for the Study of the Liver, 2010). Liver cirrhosis denotes irreversible scarring or fibrosis in the liver due to long-term inflammation and injury. The three most common causes of liver cirrhosis are:

- Alcohol misuse;
- Chronic viral hepatitis due to blood-borne viruses such as hepatitis B and C;
- Portal hypertension

With every heartbeat, blood is pumped around the body and enters the liver via the...
Portal hypertension causes the formation of ascites.

As cirrhosis progresses, the liver is unable to produce enough of the protein albumin, so albumin levels fall. One of the functions of albumin is to help hold fluid within cells, so when its levels fall, fluid is pulled out of cells, resulting in ascites and peripheral oedema (Kumar and Clark, 2017; Bacon et al, 2005).

Diagnosis

Symptoms
People with ascites tend to become symptomatic only if moderate-to-large amounts have accumulated in the abdominal cavity. This can manifest as an increase in abdominal girth with associated discomfort and bloating. As the volume of fluid increases, pressure increases on the diaphragm, causing shortness of breath and a reduction in oxygen saturation. In addition, ascitic fluid can migrate across the diaphragm and accumulate around the lungs (hydrothorax), which can also lead to shortness of breath.

Ascites increases abdominal pressure, which can cause hernias to form; while these can occur anywhere in the abdomen, the most common site is in the umbilicus (umbilical hernia). Surgical repair of hernias in patients with ascites is generally avoided due to the risk of ascites accumulating again and causing pressure on the healing wound, which can lead to ascitic leakage and/or wound breakdown. Surgery is only usually considered if the bowel within the hernia has become twisted. When this happens, the blood supply to the bowel becomes blocked, causing the bowel to become ischaemic; this causes severe pain and can lead to death.

Large amounts of abdominal ascites can impair mobility and make it difficult for patients to sit upright and lie down flat. The excess abdominal fluid can exert pressure on internal organs such as the bladder, causing urinary urgency, or the bowel, which causes constipation.

Detection
Ascites can be detected on physical examination through a technique known as percussion. The patient is asked to lie flat on their back – if this can be tolerated – and the health professional taps the abdomen, causing urinary urgency, or the bowel, which causes constipation.

Table 1. Causes of ascites

<table>
<thead>
<tr>
<th>General</th>
<th>Specific</th>
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<tbody>
<tr>
<td>Liver disease</td>
<td>Cirrhosis</td>
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<tr>
<td></td>
<td>Veno-occlusive disease</td>
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<tr>
<td>Heart disease</td>
<td>Congestive cardiac failure</td>
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<td></td>
<td>Constrictive pericarditis</td>
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<tr>
<td>Malignancy</td>
<td>Liver cancer</td>
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<td></td>
<td>Ovarian cancer</td>
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<td></td>
<td>Peritoneal metastasis</td>
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<td></td>
<td>Pancreatic cancer</td>
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<tr>
<td>Hypoalbuminaemia (low albumin)</td>
<td>Nephrotic syndrome</td>
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<tr>
<td></td>
<td>Protein-losing enteropathy</td>
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<tr>
<td></td>
<td>Malnutrition</td>
</tr>
<tr>
<td>Hepatic vein obstruction</td>
<td>Budd-Chiari syndrome</td>
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<tr>
<td>Chronic inflammation</td>
<td>Pancreatitis</td>
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<tr>
<td></td>
<td>Appendicitis</td>
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<td></td>
<td>Infective peritonitis</td>
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</tbody>
</table>

Box 2. Some causes of liver cirrhosis

- Alcohol misuse
- Chronic viral hepatitis B
- Chronic viral hepatitis C
- Non-alcoholic fatty liver disease
- Autoimmune diseases:
  - Autoimmune hepatitis
  - Primary biliary cholangitis
  - Primary sclerosing cholangitis
- Genetic diseases:
  - Haemochromatosis
  - Alpha 1 antitrypsin deficiency
  - Wilson’s disease
Clinical Practice

**Review**

**Box 3. Portal hypertension: life-threatening complications**

Life-threatening complications of portal hypertension include:
- Ascites
- Hepatic encephalopathy
- Varices:
  - Stomach
  - Oesophagus
  - Rectal
  - Umbilical

The tapping should start in the midline and move out towards the flanks. Once a dull sound is heard, the patient should roll onto the opposite side. Gravity will then make any fluid present flow down to the other side of the abdomen (Bickley et al, 2007). The health professional must keep their hand on the abdomen during this process and, once the patient has changed position, tap the exact same site again. A resonant sound should then be heard, as air should have filled the area previously occupied by fluid. This sign is known as ‘shifting dullness’ and is indicative of ascites (Innes et al, 2018; Bickley et al, 2007).

Evidence of ascites can also be provided by imaging. Abdominal ultrasound is the quickest, cheapest and most-convenient method, but computerised tomography (CT) and magnetic resonance imaging (MRI) can be also used, especially for staging disease or following up patients after a cancer diagnosis.

**Ascitic fluid investigations**

One method that can help determine the cause of ascites is to measure the amount of protein it contains. Ascites is divided into two subtypes based on the amount of protein it contains. Ascites is divided into two subtypes based on the amount of protein it contains. Transudates are caused by pressure differences between the inside and outside of cells and are associated with conditions such as liver cirrhosis, malnutrition, heart failure and nephrotic syndrome.

In recent years, another way of determining the cause of ascites has emerged and has become the preferred method. It involves taking a blood sample, measuring its albumin level and then subtracting the amount of albumin measured in the ascitic fluid. This metric is called the serum ascites albumin gradient (SAAG) (Hou and Sanyal, 2009); it is calculated as follows:

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SAAG = \text{blood serum albumin level} - \text{albumin level of ascitic fluid}
\]

In the presence of ascites due to portal hypertension caused by conditions such as liver cirrhosis, heart failure and Budd-Chiari syndrome, the SAAG will be >11g/L. In the presence of ascites caused by conditions such as cancer and pancreatitis, it will be <11g/L.

**Management**

**Diuretics**

Patients diagnosed with ascites are often prescribed diuretics (often known to patients as water tablets), which help the kidneys remove water and salt. The first-line diuretic of choice is spironolactone, usually started at a dose of 100mg once a day and, if needed, increased at weekly intervals up to a maximum of 400mg daily. If spironolactone alone is not effective, furosemide 40mg can be added to the regimen and its dose increased as long as the patient does not experience any side-effects.

Diuretics can cause disturbances of blood electrolytes such as sodium and potassium, so these must be monitored closely; this is usually done by taking a weekly measurement of urea and electrolytes (UEs). Table 2 shows the levels of sodium and potassium that warrant stopping medication.

Diuretic doses can be titrated up or down, or stopped altogether based on UEs (Table 2) and on weight loss – which means patients must be weighed daily. Drug doses should be adjusted to achieve a weight loss of around 0.5kg/day. In patients with peripheral oedema (fluid in the tissues, normally in the legs) as well as ascites, the aim is to achieve a weight loss of 1kg/day. If weight loss exceeds the target, drug doses need to be reduced (Lawson, 2014).

**Sodium and fluid restriction**

Sodium retains fluid, so limiting dietary intake of salt can help prevent extra fluid retention. In patients with cirrhosis who also have ascites, a total dietary sodium intake of 80-120mmol/day is recommended. A negative sodium balance (when sodium intake is less than what the patient excretes) can be achieved in 10-20% of these patients if they do not add any salt to their food and avoid pre-prepared foods (Moore and Aithal, 2006). However, some people may find salt restriction makes food so unpalatable that they have difficulty adhering to such a diet. Referral to a dietician can be useful for further advice and management.

Fluid restriction should only be considered when ascites is associated with low sodium caused by hypervolaemia (fluid overload). Again, patients may find it difficult to adhere to a fluid-restricted regimen, which has been reported to cause dry mouth and reduce quality of life (Reilly et al, 2015). Nurses can help by offering ice cubes or ice chips to patients, but will need to measure the amount of water these contain to maintain a strict fluid balance. Patients on fluid restriction should be encouraged to maintain good oral hygiene, as this helps keep the mouth fresh.

**Paracentesis**

Patients with moderate-to-large volumes of ascites can be treated by paracentesis (drainage of ascites). A temporary drain is

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**Table 2. Adjusting diuretics according to electrolyte counts**

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<thead>
<tr>
<th>Electrolyte count</th>
<th>Diuretic adjustment</th>
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<tbody>
<tr>
<td>Sodium &lt;125mmol/L</td>
<td>Stop all diuretics</td>
</tr>
<tr>
<td>Potassium &lt;3mmol/L</td>
<td>Stop furosemide</td>
</tr>
<tr>
<td>Potassium &gt;6mmol/L</td>
<td>Stop spironolactone</td>
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inserted under local anaesthetic and attached to a drainage bag, and the ascitic fluid is left to drain freely over 4-6 hours. The drain tube is held in place by a drain guard dressing that holds the drain against the skin, so it does not need to be sutured. Fig 2 shows the equipment needed for paracentesis. The most common site for ascitic drain insertion is the right or left lower abdominal quadrant, but care must be taken to avoid an enlarged liver or spleen, enlarged abdominal blood vessels, and arteries situated near the umbilicus (Moore and Aithal, 2006).

During ascitic fluid drainage, the patient needs to stay in bed to allow nurses to undertake regular observations (Table 3 outlines how often these should take place. Once the fluid has stopped draining, and the abdomen girth has decreased and is soft to touch, the drain is removed and a waterproof dressing applied to the puncture site.

For every 2.5L of ascitic fluid drained, 100ml of 20% albumin is infused intravenously. Albumin is a plasma expander and helps to reduce the risk of a drop in BP. It also helps reduce, in the days following drainage, the risk of acute kidney injury (AKI) linked to the removal of large volumes of ascitic fluid (Kumar and Clark, 2017).

For two days after paracentesis, patients are asked not to take diuretics, again to reduce the risk of AKI. To check kidney function and monitor patients for AKI, UEs need to be measured daily for three or four days after paracentesis. It is important to note that many patients with cirrhosis have low baseline urea and creatinine levels, which means that UE levels can double (indicating kidney injury) while remaining within, or just above, normal levels.

Paracentesis should not be undertaken if platelets are <50 and/or the international normalised ratio (INR) is >2. A low platelet count should be corrected by giving a platelet infusion before paracentesis, while an INR of >2 should be corrected with a transfusion of fresh frozen plasma.

Paracentesis should not be undertaken lightly, as it entails both minor and major risks. Aside from AKI, one of the major risks is haemorrhage because of clotting abnormalities, due to vitamin K deficiency (which can occur in patients who are jaundiced) and/or to clotting factor deficiencies caused by the failing liver. Other serious complications are bowel perforation and introducing infection into the abdomen.

The risk of introducing infection is reduced by removing the drain as soon as clinically indicated; usually the drain is left in place for six hours at the most. Minor risks of paracentesis are discomfort during the procedure and leakage from the puncture site (which may require stitching). Because of the risks, patients need to give written informed consent before the procedure is undertaken.

**Spontaneous bacterial peritonitis**

Spontaneous bacterial peritonitis (SBP) is an infection of the ascitic fluid, which can occur at any time without warning. Sometimes there are associated symptoms such as fatigue or weakness, deteriorating liver function, abdominal pain, hepatic encephalopathy, fever and shock. However, some patients are asymptomatic.

All patients diagnosed with new-onset ascites should have a sample of ascitic fluid taken and analysed to rule out SBP. (This should also be done to check for other causes of cirrhosis if the cause is uncertain.) Ascitic fluid samples are taken by inserting a needle into the abdomen, aspirating some fluid into a syringe and transferring it into universal containers and blood culture bottles, which are then sent to the laboratory. A white blood cell count of <250mm³ in the ascitic fluid is indicative of SBP (Runyon, 2013). The ascitic fluid is also examined for bacterial growth; if bacteria are found, antibiotic treatment should be initiated.

Patients with SBP used to have a mortality rate of around 90%, but improved diagnosis and treatment mean that the rate has improved to around 20% (EASL, 2010).

**Refractory ascites**

Sometimes, despite treatment with diuretics, salt restriction and paracentesis, ascites recur. This is called refractory ascites. In some cases, diuretics must be discontinued altogether because of electrolyte disturbances. Sometimes ascites can recur after as little as one week following paracentesis. Patients requiring repeated ascitic fluid drainage should be considered for liver transplantation or transjugular intrahepatic portosystemic shunt (TIPSS) (EASL, 2010; Moore and Aithal, 2006).
Implications for practice
The development of ascites is secondary to many different conditions, and the prognosis and outlook for patients will depend on the underlying cause. Ascites can be managed, but sometimes the underlying problem cannot be resolved. For patients and families, ascites is associated with poorer quality of life and increased risk of infection (especially SBP), renal failure and premature death. As liver cirrhosis tends to occur in younger age groups, it can be particularly difficult for patients and their families to come to terms with symptoms, complications and a shortened life expectancy.

With the development of advanced nursing roles, it is often nurses who: obtain written consent; prescribe local anaesthetic, analgesia and albumin; perform paracentesis; and offer supportive care. Nurses need to draw on their knowledge and skills to deliver high-quality holistic care, and help patients and relatives deal with the complications and poor prognosis of liver cirrhosis. Thoughtful, caring, empathetic support is needed when managing ascites.

Thoughtful, caring, empathetic support is needed when managing ascites.

References

To complete a learning unit on liver disease go to: nursingtimes.net/learning

Liver disease 1: nursing care for end-stage liver disease
Bit.ly/NTLiverDisease

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