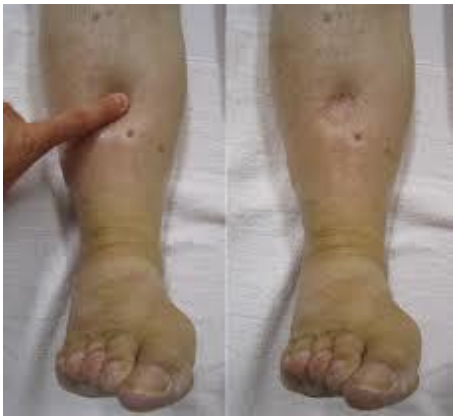
Lecture.9 Oedema and Ascites

Oedema

- Oedema is caused by an excessive accumulation of fluid within the interstitial space.
- Clinically, this can be detected by persistence of an indentation in tissue following pressure on the affected area (pitting oedema).

Pitting oedema tends to accumulate in the ankles during the day and improves overnight as the interstitial fluid is reabsorbed

***Non-pitting* oedema** is typical of lymphatic obstruction and may also occur as the result of excessive matrix deposition in tissues: for example, in hypothyroidism or systemic sclerosis.



Clinical assessment

- Dependent areas, such as the ankles and lower legs, are typically affected first but oedema can be restricted to the sacrum in bed-bound patients.
- With increasing severity, oedema spreads to affect the upper parts of the legs, the genitalia and abdomen.
- Ascites is common and often an earlier feature in children or young adults, and in liver disease.

Pleural effusions are common but frank pulmonary oedema is rare

- Facial oedema on waking is common. Features of intravascular volume depletion (tachycardia, postural hypotension) may occur when oedema is due to decreased oncotic pressure or increased capillary permeability.
- If oedema is localized – for example, to one ankle but not the other – then venous thrombosis, inflammation or lymphatic disease should be suspected.

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15.12 Causes of oedema

Increased total extracellular fluid

- Congestive heart failure
- Renal failure
- Liver disease

High local venous pressure

- Deep venous thrombosis or venous insufficiency
- Pregnancy
- Pelvic tumour

Low plasma oncotic pressure/serum albumin

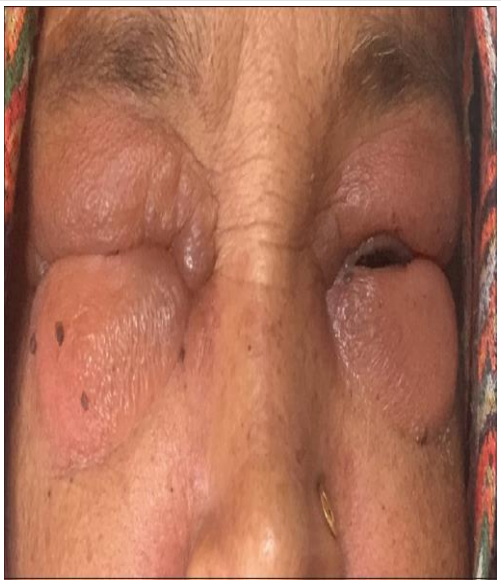
- Nephrotic syndrome
- Liver failure
- Malnutrition/malabsorption

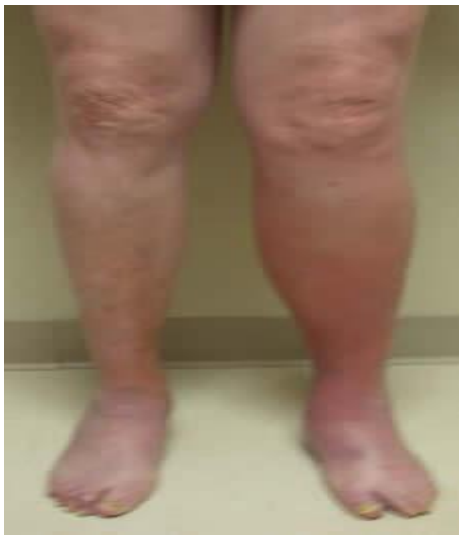
Increased capillary permeability

- Leakage of proteins into the interstitium, reducing the osmotic pressure gradient that draws fluid into the lymphatics and blood
- Infection/inflammation
- Severe sepsis
- Calcium channel blockers

Lymphatic obstruction

- Infection: filariasis, lymphogranuloma venereum (pp. 290 and 341)
- Malignancy
- Radiation injury
- Congenital abnormality





Investigations

- Oedema may be due to a number of causes , which are usually apparent from the history and examination of the cardiovascular system and abdomen.
- Blood should be taken for measurement of urea and electrolytes, liver function and serum albumin, and the urine tested for protein.
- Further imaging of the liver, heart or kidneys may be indicated, based on history and clinical examination.
- Where ascites or pleural effusions occur in isolation, aspiration of fluid with measurement of protein , albumin and glucose, and microscopy for cells, will usually help to clarify the diagnosis in differentiating a transudate (typical of oedema) from an exudate.

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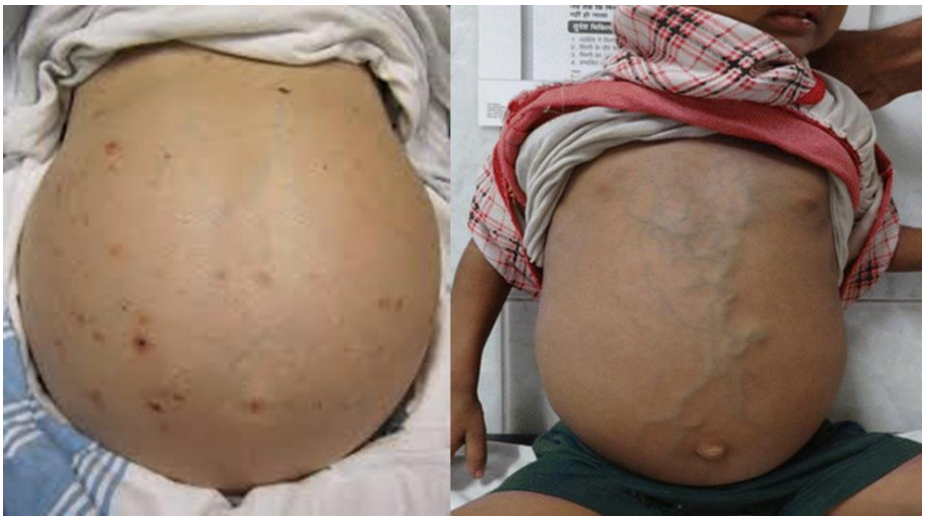
Management

- Mild oedema usually responds to elevation of the legs, compression stockings, or a thiazide or a low dose of a loop diuretic, such as furosemide or bumetanide.
- In nephrotic syndrome, renal failure and severe cardiac failure, very large doses of diuretics, sometimes in combination, may be required to achieve a negative sodium and fluid balance.
- Restriction of sodium intake and fluid intake may be required.
- Diuretics are not helpful in the treatment of oedema caused by venous or lymphatic obstruction or by increased capillary permeability.
- Specific causes of oedema, such as venous thrombosis, should be treated.

Ascites

- Ascites is accumulation of free fluid in the peritoneal cavity.
- Small amounts of ascites are asymptomatic, but with larger accumulations of fluid (> 1 L) will cause abdominal distension, fullness in the flanks, shifting dullness on percussion and, when the ascites is marked, a fluid thrill/fluid wave.
- Other features include eversion of the umbilicus, herniae, abdominal striae, divarication of the recti and scrotal oedema.
- Dilated superficial abdominal veins may be seen if the ascites is due to portal hypertension.



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Pathophysiology

- Ascites has numerous causes, the most common of which are cirrhosis , malignant disease and heart failure.
- Many primary disorders of the peritoneum and visceral organs can also cause ascites, and these need to be considered even in a patient with chronic liver disease
- Splanchnic vasodilatation is thought to be the main factor leading to ascites in cirrhosis. This is mediated by vasodilators (mainly nitric oxide) that are released when portal hypertension causes shunting of blood into the systemic circulation.
- Systemic arterial pressure falls due to pronounced splanchnic vasodilatation as cirrhosis advances
- This leads to activation of the renin–angiotensin system with secondary aldosteronism, increased sympathetic nervous activity, increased atrial natriuretic hormone secretion and altered activityof the kallikrein–kinin system . These systems tend to normalize arterial pressure but produce salt and water retention.
- In this setting, the combination of splanchnic arterial vasodilatation and portal hypertension alters intestinal capillary permeability, promoting accumulation of fluid within the peritoneum.

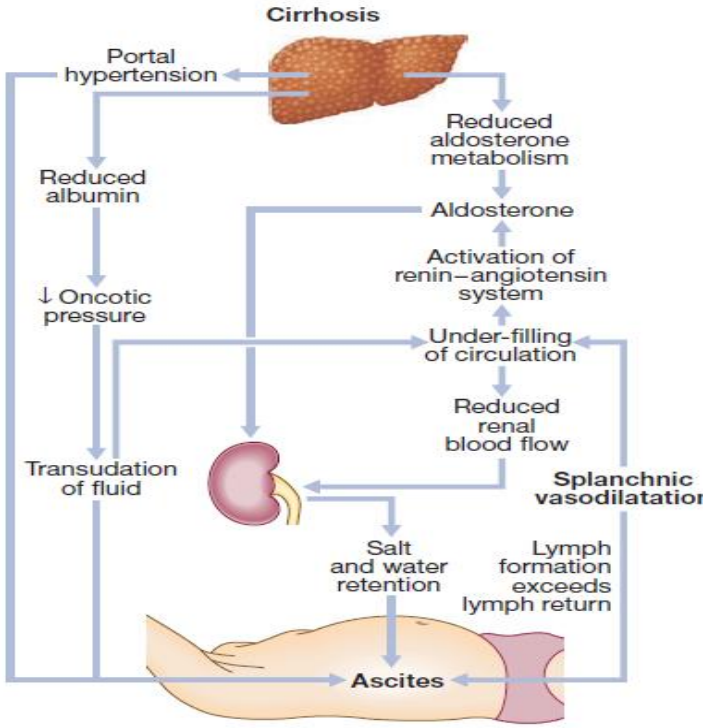
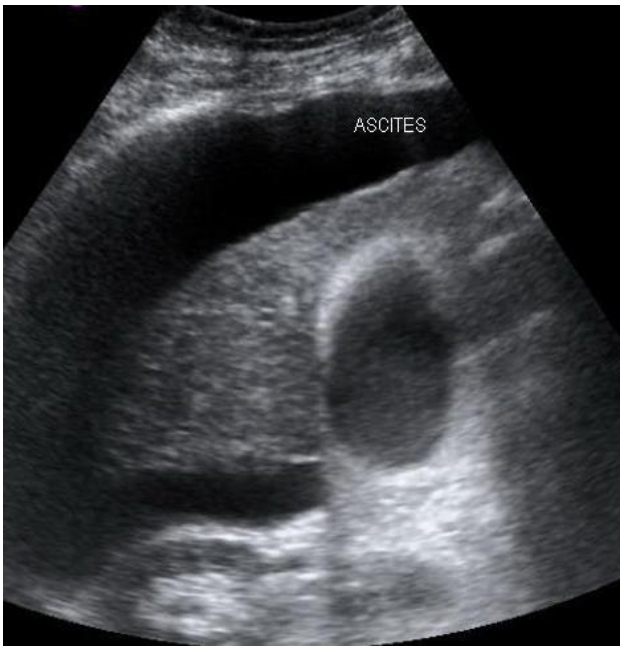


Fig. 22.16 Pathogenesis of ascites.



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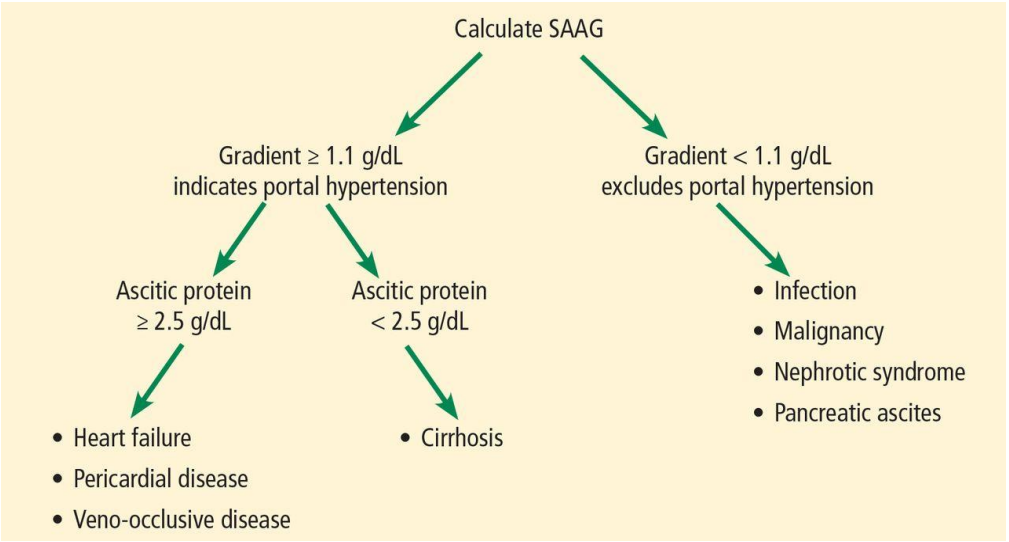
Investigations

- Ultrasonography is the best means of detecting ascites, particularly in the obese and those with small volumes of fluid.
- Paracentesis (if necessary under ultrasonic guidance) can be used to obtain ascitic fluid for analysis.
- The appearance of ascitic fluid may point to the underlying cause
- Pleural effusions are found in about 10% of patients, usually on the right side (hepatic hydrothorax); most are small and identified only on chest X-ray, but occasionally a massive hydrothorax occurs. Pleural effusions, particularly those on the left side, should not be assumed to be due to the ascites.
- Measurement of the protein concentration and the serum–ascites albumin gradient (SAAG) can be a useful tool to distinguish ascites of different aetiologies.
- Cirrhotic patients typically develop ascites with a low protein concentration ('transudate'; protein concentration < 25 g/L (2.5 g/dL)) and relatively few cells.
- In up to 30% of patients, however, the total protein concentration is > 30 g/L (3.0 g/dL). In these cases, it is useful to calculate the SAAG by subtracting the concentration of the ascites fluid albumin from the serum albumin. A gradient of > 11 g/L (1.1 g/dL) is 96% predictive that ascites is due to portal hypertension.
- Venous outflow obstruction due to cardiac failure or hepatic venous outflow obstruction can also cause a transudative ascites, as indicated by an albumin gradient of > 11 g/L (1.1 g/dL) but, unlike in cirrhosis, the total protein content is usually > 25 g/L (2.5 g/dL).
- High protein ascites ('exudate'; protein concentration > 25 g/L (2.5 g/dL) or a SAAG of < 11 g/L (1.1 g/dL) raises the possibility of infection (especially tuberculosis), malignancy, pancreatic ascites or, rarely, hypothyroidism.



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22.21 Causes of ascites

Low SAAG (exudative)	High SAAG (transudative)
Common causes	
Malignant disease:	Cardiac failure
Hepatic	Hepatic cirrhosis
Peritoneal	
Other causes	
Acute pancreatitis	Hypoproteinaemia:
Lymphatic obstruction	Protein-losing enteropathy
Infection:	Malnutrition
Tuberculosis	Hepatic venous occlusion:
Nephrotic syndrome	Budd–Chiari syndrome
	Sinusoidal obstruction syndrome (Veno-occlusive disease)
Rare causes	
Hypothyroidism	Meigs' syndrome*
	Constrictive pericarditis

*Meigs' syndrome is the association of a right pleural effusion with or without ascites and a benign ovarian tumour. The ascites resolves on removal of the tumour.
(SAAG = serum ascites albumin gradient; see text)

- Cytological examination may reveal malignant cells (one-third of cirrhotic patients with a bloody tap have a hepatocellular carcinoma).
- Polymorphonuclear leucocyte counts of > 250 × 106/L strongly suggest infection (spontaneous bacterial peritonitis).
- Laparoscopy can be valuable in detecting peritoneal disease

22.22 Ascitic fluid: appearance and analysis

Cause/appearance

- Cirrhosis: clear, straw-coloured or light green
- Malignant disease: bloody
- Infection: cloudy
- Biliary communication: heavy bile staining
- Lymphatic obstruction: milky-white (chylous)

Useful investigations

- Total albumin (plus serum albumin) and protein*
- Amylase
- Neutrophil count
- Cytology
- Microscopy and culture

*To calculate the serum–ascites albumin gradient (SAAG).

Management

- Successful treatment relieves discomfort but does not prolong life; if over vigorous, it can produce serious disorders of fluid and electrolyte balance, and precipitate hepatic encephalopathy .
- Treatment of transudative ascites is based on restricting sodium and water intake, promoting urine output with diuretics and, if necessary, removing ascites directly by paracentesis.

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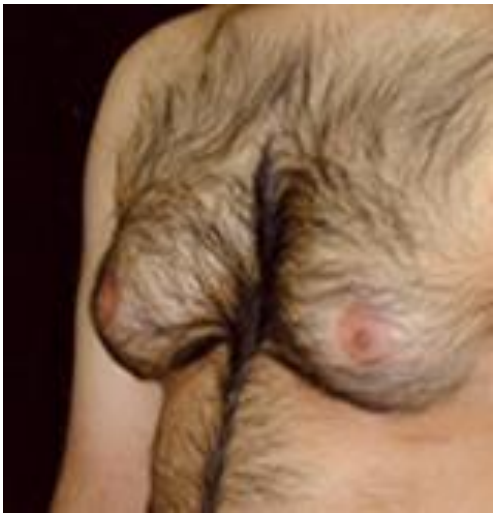
- Exudative ascites due to malignancy is treated with paracentesis but fluid replacement is generally not required. During management of ascites, the patient should be weighed regularly.
- Diuretics should be titrated to remove no more than 1 L of fluid daily, so body weight should not fall by more than 1 kg daily to avoid excessive fluid depletion.

Sodium and water restriction

- Restriction of dietary sodium intake is essential to achieve negative sodium balance and a few patients can be managed satisfactorily by this alone. Restriction of sodium intake to 100 mmol/24 hrs ('no added salt diet') is usually adequate. Drugs containing relatively large amounts of sodium, and those promoting sodium retention, such as non-steroidal anti-inflammatory drugs (NSAIDs), must avoided .
- Restriction of water intake to 1.0–1.5 L/24 hrs is necessary only if the plasma sodium falls below 125 mmol/L.

Diuretics



- Most patients require diuretics in addition to sodium restriction.
- Spironolactone (100–400 mg/day) is the first-line drug because it is a powerful aldosterone antagonist; it can, however, cause painful gynaecomastia and hyperkalaemia, in which case amiloride (5–10 mg/day) can be substituted.
- Some patients also require loop diuretics, such as furosemide, but these can lead to fluid and electrolyte imbalance and renal dysfunction.
- Diuresis may be improved if patients are rested in bed, perhaps because renal blood flow increases in the horizontal position.
- Patients who do not respond to doses of 400 mg spironolactone and 160 mg furosemide, or who are unable to tolerate these doses due to hyponatraemia or renal impairment, are considered to have refractory or diuretic-resistant ascites and should be treated by other measures.

Paracentesis

- First-line treatment of refractory ascites is large-volume paracentesis.
- Paracentesis to dryness is safe, provided the circulation is supported with an intravenous colloid such as human albumin (6–8 g per litre of ascites removed,

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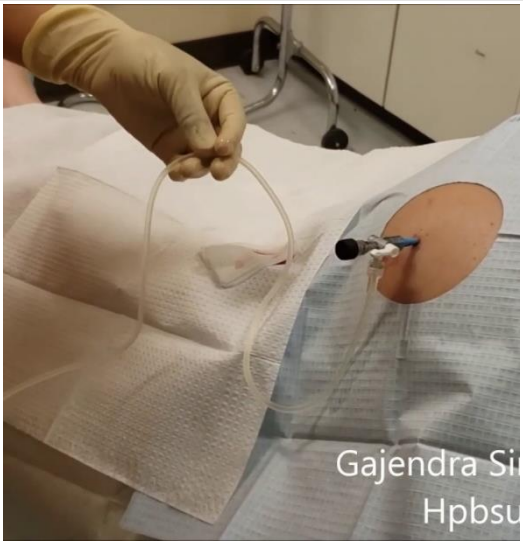
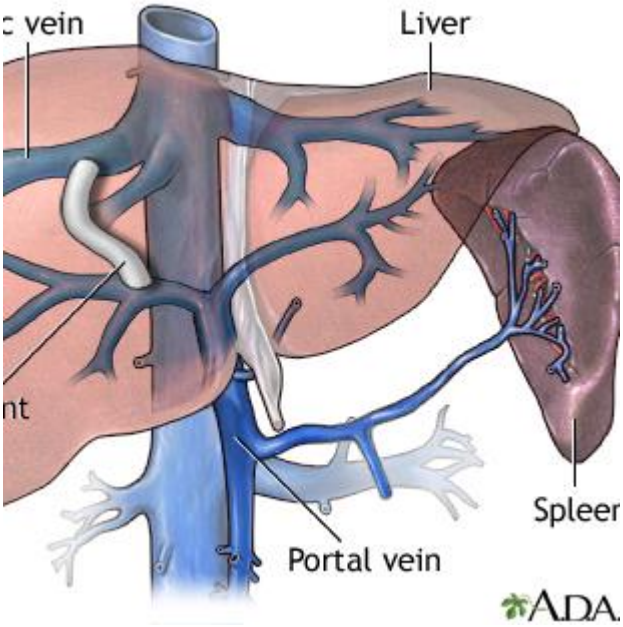
usually as 100 mL of 20% or 25% human albumin solution (HAS) for every 1.5–2 L of ascites drained) or another plasma expander. Paracentesis can be used as an initial therapy or when other treatments fail.



Transjugular intrahepatic portosystemic stent shunt (TIPSS)

- A transjugular intrahepatic portosystemic stent shunt can relieve resistant ascites but does not prolong life; it may be an option where the only alternative is frequent, large volume paracentesis.
- TIPSS can be used in patients awaiting liver transplantation or in those with reasonable liver function, but can aggravate encephalopathy in those with poor function.



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