Portal hypertension and ascites

Naaventhan Palaniyappan
Guruprasad P Aithal

Abstract

Portal pressure is the product of portal blood flow and resistance; an increase in either leads to increased portal pressure. Cirrhosis is the underlying cause in most cases, but portal hypertension can develop due to prehepatic, intrahepatic and posthepatic obstruction to the flow, secondary to variety of causes. Diagnosis can be established by a combination of non-invasive imaging or portal vasculature and clinical or serological markers for the cause underlying cirrhosis. Development of gastro-oesophageal varices and ascites are the most important clinical manifestation of portal hypertension. Non-selective beta-blockers and endoscopic band ligation are effective in primary and secondary prevention of variceal bleeding. Active variceal haemorrhage is managed using a combination of vasoactive drug (e.g. terlipressin) and endoscopic band ligation. If these measures fail, transjugular intrahepatic portosystemic shunt (TIPS) insertion achieves haemostasis. Diuretic therapy with spironolactone and furosemide are the mainstays of management of ascites. If ascites becomes refractory, repeat large volume paracentesis and TIPS in selected cases help to control symptoms. Development of ascites is an important landmark in the natural history of cirrhosis and liver transplantation should be considered definitive treatment.

Keywords Ascites; cirrhosis; TIPS; varices

Definition

Portal pressure is the product of the portal flow and intrahepatic resistance. Conditions that cause an increase in flow or resistance increase portal pressure. Portal hypertension is a portal venous pressure of >5 mmHg.

Aetiology and pathogenesis

Portal hypertension is classified according to the site of the obstruction to blood flow into prehepatic, intrahepatic and post-hepatic causes (Box 1). Cirrhosis is the most common cause of portal hypertension. In cirrhosis, increased sinusoidal pressure due to fibrosis and regenerative nodules is amplified by reduced concentrations of vasodilators (e.g. nitric oxide). In contrast, vascular sheer stress and gut-derived endotoxemia increase concentrations of nitric oxide in splanchnic and systemic circulation. These haemodynamic changes eventually lead to the clinical manifestations of portal hypertension (Figure 1).

Clinical features

History taking should be directed towards determining the cause and complications of portal hypertension (Box 2). The physical signs of chronic disease of the liver (e.g. spider naevi, red palms, gynaecomastia) suggest cirrhosis as a cause of portal hypertension. Ascites in portal hypertension rarely develops in the absence of cirrhosis and is detected in only 10% of patients with thrombosis of the portal vein. Weight gain may be the early sign of fluid accumulation before ascites becomes clinically detectable. Ascites indicates decompensated liver disease and is a marker of poor prognosis.

Investigations

Evaluation should be individualized depending on the presentation. Investigations should aim to confirm liver disease and to

Causes of portal hypertension

Prehepatic portal hypertension

- Thrombosis of the portal vein
  - Intra-abdominal sepsis
  - Chronic pancreatitis
  - Pancreatic neoplasia
  - Prothrombotic state
- Thrombosis of the splenic vein
  - Chronic pancreatitis
  - Pancreatic neoplasia
- Splanchnic arteriovenous fistula

Intrahepatic portal hypertension

- Predominantly pre-sinusoidal involvement
  - Cirrhosis (alcoholic liver disease, viral hepatitis, non-alcoholic fatty liver disease, primary biliary cirrhosis, primary sclerosing cholangitis, autoimmune hepatitis, haemachromatosis)
  - Schistosomiasis
  - Nodular regenerative hyperplasia
  - Polycystic liver disease
  - Myeloproliferative disease
  - Hepatic metastasis
  - Granulomatous (sarcoidosis, tuberculosis)
- Predominantly post-sinusoidal involvement
  - Budd-Chiari syndrome
  - Veno-occlusive disease

Posthepatic portal hypertension

- Constrictive pericarditis
- Obstruction of inferior vena cava
- Right heart failure
- Tricuspid regurgitation

Box 1

Naaventhan Palaniyappan *MRCP BMBS is a Clinical Research Fellow in Hepatology at NIHR Biomedical Research Unit in Gastrointestinal and Liver Diseases at Nottingham University Hospitals NHS Trust and the University of Nottingham, UK. Conflicts of interest: none declared.*

Guruprasad P Aithal *FRCP PhD is Professor of Hepatology at NIHR Biomedical Research Unit in Gastrointestinal and Liver Diseases at Nottingham University Hospitals NHS Trust and the University of Nottingham, UK. Conflicts of interest: none declared.*

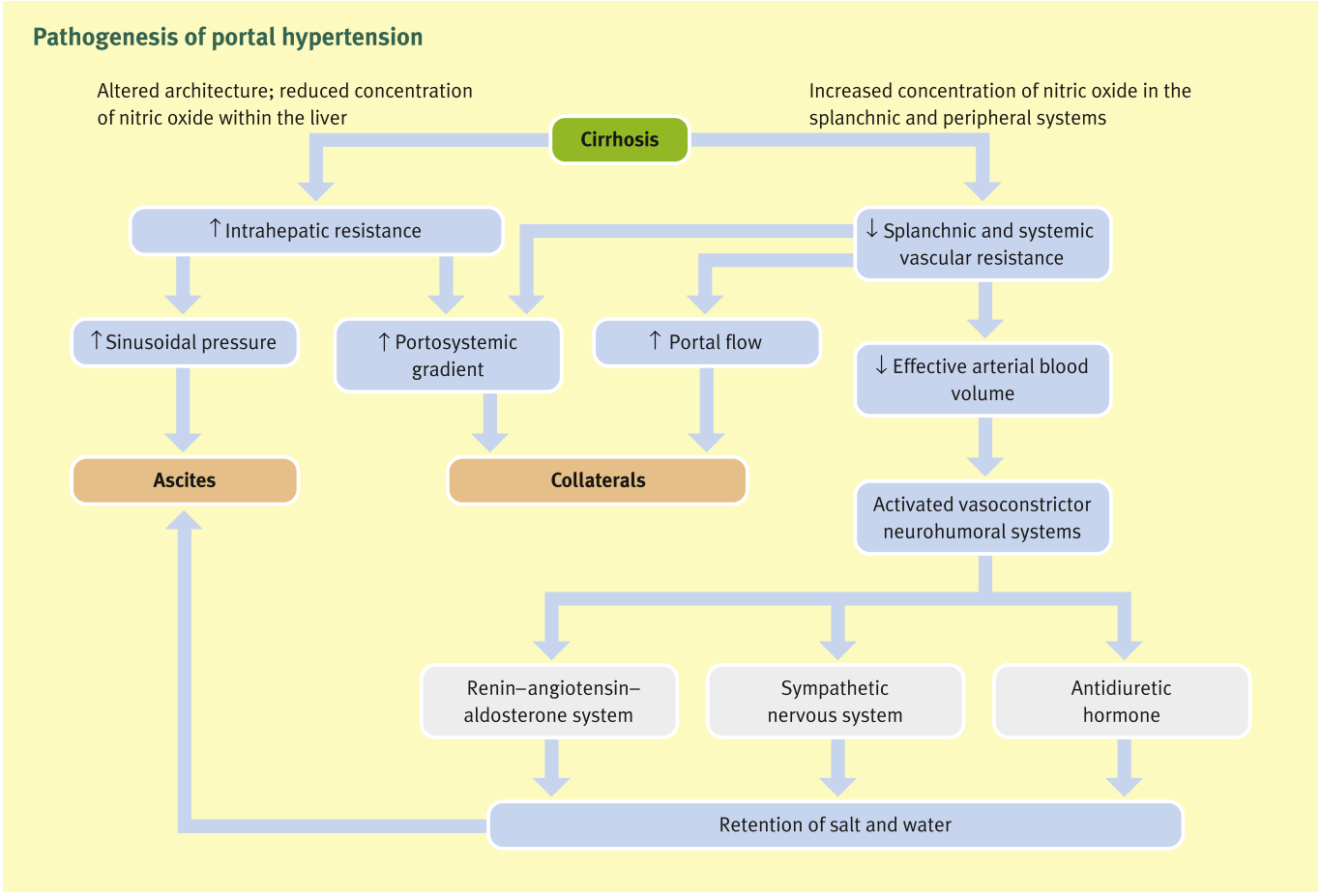

Figure 1

identify the underlying cause (Box 3). Sequestration associated with splenomegaly usually leads to pancytopenia and cirrhosis is associated with an abnormal clotting profile. Chronic viral hepatitis can be diagnosed using hepatitis B and C serology. Autoantibody and immunoglobulin profiles point towards the diagnosis of autoimmune liver diseases. Diagnosis of haemachromatosis can be established with raised iron indices and HFE genotyping. Metabolic syndrome predisposes to non-alcoholic fatty liver disease and is a cause of cirrhosis.

Imaging: abdominal ultrasound can establish ascites and splenomegaly. Duplex Doppler ultrasound allows imaging of the portal vein and its major tributaries, as well as the hepatic veins. Imaging and flow patterns in the hepatic veins are particularly important to exclude thrombosis of the hepatic vein. Portal circulation can be evaluated using CT and MRI if Doppler studies are inconclusive. MRI angiography can detect portosystemic collaterals and obstruction and portal vascular structure. Selective angiography of the superior mesenteric artery or splenic artery may be indicated in certain instances if other tests are inconclusive.

Hepatic venous pressure gradient (HVPG): which is the difference between the wedged and free hepatic venous pressure (HVP), is the gold standard for defining and assessing the severity of portal hypertension. Transjugular hepatic venous catheterization is used to measure the free (with balloon deflated) and wedged (with balloon inflated) hepatic venous pressures. In cirrhosis, HVPG gives an accurate estimate of the portal pressure. HVPG of greater than 10 mmHg predicts the development of complications of portal hypertension and signifies clinically significant portal hypertension (CSPH). HVPG also predicts the clinical outcomes in patients undergoing resection for hepatocellular carcinoma.

Non-invasive assessment of portal hypertension: as HVPG is a fairly invasive procedure, several non-invasive techniques have been proposed to measure portal hypertension. This is either based on evaluating the elements relating to the pathogenesis of portal hypertension or evaluating the clinical consequences of portal hypertension. Serum markers and transient elastography (measurement of liver stiffness) assess the degree of hepatic fibrosis and the increased hepatic vascular resistance, thus reflecting the degree of portal hypertension. Magnetic resonance elastography (MRE) has a theoretical advantage over ultrasound-based transient elastography as stiffness of the whole liver is assessed. Spleen stiffness, in isolation or in combination with other clinical parameters, has been studied as a potential marker of the development of CSPH but further clinical studies are needed before being adopted into clinical practice.