Vascular Liver Diseases

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This article reviews the primary circulatory liver diseases, which include Budd-Chiari syndrome, obstruction of the hepatic portion of the inferior vena cava, portal vein thrombosis, sinusoidal obstruction syndrome (veno-occlusive disease), nodular regenerative hyperplasia, and peliosis hepatis. In addition, two systemic cardiovascular diseases that impair hepatic circulation, ischemic hepatitis and congestive hepatopathy, are briefly discussed. A characteristic of the primary circulatory liver diseases is that portal hypertension usually precedes liver dysfunction; however, this is not the case with the primary parenchymal liver diseases, in which liver dysfunction always progresses before portal hypertension is manifested. Significant overlap exists among the diseases and risk factors that predispose patients to the primary circulatory liver diseases, though the pathogenesis of individual diseases varies.

Introduction

The primary vascular diseases of the liver are among the less common liver diseases. Their relatively low prevalence may have contributed to the slow progress in uncovering the mechanisms of disease for each of these disorders. The location of the circulatory impairment varies among the diseases in this category. Portal vein thrombosis involves the portal inflow, whereas nodular regenerative hyperplasia may be caused by intrinsic involvement at the level of the portal vein or sinusoids or by systemic diseases that impair liver perfusion. Peliosis hepatis is a primary sinusoidal disease, sinusoidal obstruction syndrome (veno-occlusive disease) is a primary sinusoidal disease that may also involve the hepatic venules, and Budd-Chiari syndrome (BCS) is caused by obstruction at the level of the hepatic veins. Each of these diseases may cause portal hypertension, but the frequency of parenchymal dysfunction varies among the diseases.

Budd-Chiari Syndrome

In South Africa, India, Japan, Nepal, and China, obstruction of the hepatic portion of the inferior vena cava (IVC) is more frequent than classic BCS, the obstruction or occlusion of the hepatic veins caused by thrombus, fibrous obliteration, or tumor invasion, as seen in the West. The symptoms of BCS and obstruction of the hepatic portion of the IVC are the same, but causes and management differ [1]. These two disorders are discussed separately in this review.

Clinical features

The presenting symptoms of BCS may include hepatomegaly, abdominal pain and tenderness, ascites, mild jaundice, and, eventually, liver failure. The presentation is most commonly subacute or chronic, with a history of vague complaints for less than 6 months and onset of ascites. Severity of disease depends on the number of veins involved, the time course over which the obstruction develops, and the duration of untreated disease. If formation of collaterals or involvement of a single hepatic vein is extensive, liver function may remain intact. With slower development of the obstruction there may be formation of collaterals, which alleviate sinusoidal congestion. Acute BCS may present with fulminant hepatic failure with coagulopathy, encephalopathy, and hepatorenal syndrome. Chronic BCS shows features of chronic liver disease, including (near-)normal aminotransferases, low albumin, and prolonged prothrombin time. Up to 25% of patients may be asymptomatic. Serum-ascites albumin gradient in these patients is greater than 1.1 g/dL.

The caudate lobe drains through the right inferior hepatic vein into the IVC, which thromboses less frequently. When two or all three main hepatic veins occlude, the major route of outflow may be through the caudate lobe. This leads to caudate lobe hypertrophy in about half of patients with BCS. Caudate lobe hypertrophy may compress the IVC behind it, complicating decompression by portacaval shunts (which are of course below the level of compression of the IVC).

Risk factors

Most cases of BCS are caused by either hepatic vein thrombosis or mechanical outflow obstruction. The most common risk factors for hepatic vein thrombosis are chronic myeloproliferative diseases and prothrombotic coagulation disorders (Table 1). Approximately 25% to 30% of patients have two or more risk factors [2•,3•]. Myeloproliferative disorders are the major cause in 50% of patients [2•], in particular in those with polycythemia vera.

Table 1. Risk factors for Budd-Chiari syndrome

Increased thrombotic diathesis	Mechanical outflow obstruction
Polycythemia vera	Hepatocellular carcinoma*
Essential thrombocythemia	Renal cell carcinoma*
Factor V Leiden mutation	Adrenal carcinoma*
Protein C deficiency	Leiomyosarcoma*
Antiphospholipid antibodies	Right atrial myxoma*
(Prothrombin *G20210A* mutation)	Hydatid cysts*
Oral contraceptives, pregnancy, puerperium	Amebic or pyogenic abscess*
Hepatocellular carcinoma	Sarcoidosis
Behçet's disease*	Trauma*
Paroxysmal nocturnal hemoglobinuria	Aspergillosis
	Abdominal surgery

*More commonly linked to obstruction of the hepatic portion of the inferior vena cava.

The increased risk for hepatic vein thrombosis is linked to both overt and latent myeloproliferative disease.

One or more prothrombotic risk factors were identified in 87% of patients with hepatic vein thrombosis in one recent case series [2•]. Factor V Leiden is an important risk factor [2•,3•], but whether protein C deficiency is also a risk factor remains unclear. The prevalence rates of antithrombin III deficiency, protein S deficiency, *G20210A* prothrombin gene mutation, and methylene-tetrahydrofolate reductase (*MTHFR*) gene mutation are similar to those in a healthy control population. In chronic BCS complicated by liver insufficiency, impaired hepatic synthesis of anticoagulants confounds the diagnosis of protein C, protein S, or antithrombin III deficiency. Antiphospholipid antibodies are a risk factor for hepatic vein thrombosis. Oral contraceptives and pregnancy are associated with an increased risk of hepatic vein thrombosis, usually in conjunction with a second risk factor. Invasive hepatocellular carcinoma may cause venous thrombosis or mechanical obstruction, usually at the level of the IVC.

If the balance between procoagulants and anticoagulants were the only determinant of thrombosis, a change in the balance would have an impact on all vascular beds. However, a given prothrombotic disorder predisposes to thrombosis in discrete segments of the vasculature, not to random clotting throughout the body. This selectivity for particular vascular beds may be endothelial cell–dependent [4•].

Cancer and infections are the major causes of mechanical outflow obstruction in BCS (Table 1). Some of these disorders may cause BCS, but they are more commonly associated with obstruction of the hepatic portion of the IVC.

Diagnosis

The initial diagnostic workup for patients with possible BCS includes ultrasound imaging, dual-phase CT, or magnetic resonance angiography. Definitive diagnosis requires angiography with pressure measurements and visualization of the hepatic veins and IVC. Alternatively, percutaneous transhepatic venography can be used to measure hepatic vein pressure. Liver biopsy may show necrosis, fibrosis, centrilobular and sometimes midlobular sinusoidal congestion, acute hemorrhage, and liver cell ischemia. Benign regenerative nodules are common. Diagnostic studies should include evaluation of predisposing risk factor(s). Bone marrow biopsy is mandatory to rule out occult myeloproliferative disorders [2•,3•].

Management

Medical therapy is unlikely to alter the outcome of patients with BCS, but symptoms can be alleviated with diuretic agents and paracentesis. Successful use of thrombolytic agents in recent thrombosis has been noted in case reports, but this approach has not been assessed systematically. Increased sinusoidal pressure and decreased liver perfusion may lead to parenchymal necrosis, fibrosis, cirrhosis, and portal hypertension. Patients must be monitored by serial liver biopsies to detect persistent necrosis and early fibrosis because sinusoidal decompression prior to significant fibrosis or liver dysfunction may stabilize disease progression. Variable involvement of the three major hepatic veins leads to heterogeneous involvement of the lobes, so that monitoring with a bilobar liver biopsy is more reliable. Refractory ascites and uncontrollable gastrointestinal hemorrhage also require hepatic decompression with either a transjugular intrahepatic portosystemic shunt (TIPS) or a surgical shunt. TIPS placement may also benefit individuals with fulminant hepatic failure [5,6]. TIPS is particularly useful as a bridge therapy for liver transplantation but is limited as a long-term therapy by the high rate of reocclusion. Surgical shunts decompress the liver by creating hepatofugal flow through the portal vein. The type of surgical shunt to be used depends on the preference of the surgeon and the anatomy of the obstruction. Pressure in the retrohepatic IVC may be higher than in the portal vein if the IVC is compressed by caudate lobe hypertrophy or obstructed by thrombosis or a web. Under these conditions, a shunt proximal to the obstructed IVC (*eg*, mesoatrial shunt) should be considered. Side-to-side port-

acaval shunts have the highest patency rate but may make subsequent liver transplantation more difficult. Mesocaval shunts are technically less demanding and may facilitate surgery at the time of liver transplantation, but when placed with a synthetic graft they have a higher thrombosis rate than a side-to-side portacaval shunt.

Liver transplantation is the treatment of choice for acute BCS with fulminant hepatic failure and for end-stage liver disease after a chronic course. Survival rates for patients transplanted for BCS have improved in recent years, likely because of earlier treatment after onset of symptoms and recognition of the need for lifelong anticoagulation in most patients. Three-year survival rates of 78% to 88% and 5-year survival rates of 75% have been reported [7,8].

When feasible, the predisposing factor(s) should be treated. Phlebotomy alone increases the risk of thrombosis in polycythemia vera, but phlebotomy plus hydroxyurea reduces the risk of thrombosis [9•]. Hydroxyurea reduces the risk of thrombosis by essential thrombocythemia [10].

Obstruction of the Inferior Vena Cava

Membranous obstruction of the hepatic portion of the IVC is frequently seen in South Africa, India, Japan, Nepal, and China but is uncommon in the West. Current thinking is that the membrane is formed as a consequence of thrombus organization. Infectious processes may be among the common predispositions for the initiating thrombophlebitis or thrombosis. Prothrombotic disorders also predispose to thrombosis of the IVC across the hepatic portion, but why that particular section of the IVC is more vulnerable to thrombosis is unknown. Two features of IVC obstruction that differ from BCS are the development of a collateral venous circulation across the abdomen, chest, and back and the predisposition to hepatocellular carcinoma, even in the absence of cirrhosis. Management of IVC obstruction also differs somewhat from that of BCS. If there is a thin occluding membrane, this membrane may be perforated by angioplasty or with surgery. Decompression may be achieved by TIPS placement or by cavoatrial or mesoatrial shunt rather than portocaval shunt.

Portal Vein Thrombosis

Clinical presentation

The course of portal vein thrombosis is usually chronic. Initially patients develop extensive collaterals throughout the upper gastrointestinal tract, portal hypertensive gastropathy, splenomegaly, ascites, and sometimes tender hepatomegaly. In the absence of cirrhosis, ascites resolves over time. Blood flow from the hepatic artery and perihepatic varices is usually adequate to maintain normal liver function. Recanalization of the portal vein leads to formation of small tortuous veins, so-called cavernous transformation. The most common presenting symptom is variceal hemorrhage, though the presenting complaint in patients with cirrhosis may be worsening ascites. Acute portal vein thrombosis may present with abdominal pain, which may signify propagation of the clot into the mesenteric circulation with bowel ischemia or infarction.

Risk factors

Cancer (notably hepatoma and pancreatic cancer) and cirrhosis are common risk factors for portal vein thrombosis. Two recent studies have characterized the population of patients with portal vein thrombosis, excluding those with cancer or cirrhosis [2•,3•]. One or several factors associated with increased risk of thrombosis can be identified in 70% to 80% of patients, and most patients have two or more risk factors. Polycythemia vera and essential thrombocythemia are common risk factors and are often latent (*ie*, not detectable in peripheral blood smears). The prothrombin gene mutation (factor II *G20210*), factor V Leiden, antiphospholipid antibodies, oral contraceptive use, and Behçet's disease are risk factors for portal vein thrombosis. Inherited protein C, protein S, and antithrombin III deficiency need to be distinguished from acquired deficiency caused by liver dysfunction; it is unclear whether the inherited forms occur more commonly than they do in control subjects [2•,3•]. Local precipitating factors include intra-abdominal infection with pylephlebitis, malignancy, abdominal trauma, or surgery, either alone or in concert with other risk factors. Portal vein thrombosis is a rare complication of liver transplantation. Septic portal vein thrombosis can occur in appendicitis, diverticulitis, or *Bacteroides* species bacteremia.

Diagnosis

Doppler ultrasound can detect size, patency, and cavernous transformation of the portal vein. Contrast-enhanced CT can determine patency of the portal vein. Double-helical CT more accurately determines the extent of thrombosis and is preferable for evaluation of patients being considered for orthotopic liver transplantation. Determination of the underlying risk factors often requires a hematology consult. In particular, diagnosis of occult myeloproliferative disorders (polycythemia vera and essential thrombocythemia) requires a bone marrow biopsy.

Management

Acute variceal bleeding, the most common symptom, may be managed along conventional lines. Therapy for acute bleeding should be endoscopic, whereas prevention of recurrent bleeding can be addressed with endoscopic band ligation and/or beta-blockers. Intractable variceal hemorrhage requires decompression by shunt surgery or TIPS. Larger veins should be used for shunt surgery to prevent thrombosis of the shunt [11]. TIPS is technically difficult in this setting but may be an option for acute, intractable bleeding [6].

Portal vein thrombosis complicates vascular reconstruction of liver transplantation. Possible approaches include combined liver and small bowel transplantation, interposition of a venous graft between the donor and recipient portal vein, cavoportal hemitransposition (portal perfusion with inflow from the IVC), or arterialization of the portal vein.

Patients with portal vein thrombosis are at risk for variceal hemorrhage and also for extension of thrombosis. A recent retrospective study of patients without underlying malignancy or cirrhosis found that the benefit of anticoagulation outweighed the risk, but this remains a difficult clinical choice [12].

Sinusoidal Obstruction Syndrome

Sinusoidal obstruction syndrome, also called hepatic veno-occlusive disease, was first reported in South Africa and in Jamaica in 1920 and 1945, respectively. The easily recognizable occlusion of the central veins inspired the name hepatic veno-occlusive disease [13]. However, involvement of the central veins is not essential to the disease [14], and the disease process originates in the sinusoids [15]. Consequently, sinusoidal obstruction syndrome (SOS) has been proposed as more appropriate for the full range of disease, with or without involvement of the veins [16•].

Pathogenesis

SOS presents with features of portal hypertension, whereas liver dysfunction is a subsequent event. This distinction reflects the primary circulatory nature of SOS, in contrast to most intrinsic liver disease, in which liver dysfunction precedes portal hypertension. In vitro studies of drugs that may cause SOS suggest that the sinusoidal endothelial cell is the initial target of these drugs [15,17–19]. In vivo studies have shown that gaps form within and between sinusoidal endothelial cells as an early event, permitting blood to enter the space of Disse [15]. Involvement of the hepatic veins by subendothelial edema occurs in more severe disease and compounds the obstruction of the microcirculation. Indeed, involvement of the hepatic veins is correlated with more severe disease [14]. In late SOS, the nature of the circulatory obstruction changes from hemorrhage and edema to sinusoidal fibrosis and phlebosclerotic and periadventitial fibrosis of the hepatic veins. Whether clotting occurs and contributes to the circulatory obstruction remains unclear.

Clinical presentation

SOS caused by ingestion of herbal teas or foodstuffs contaminated with pyrrolizidine alkaloids ("bush tea disease") occurs particularly in protein-malnourished individuals. Ingestion of pyrrolizidine alkaloids is still the major cause of SOS in most of the world. In North America and Western Europe, SOS is mainly a complication of myeloablative therapy for hematopoietic stem cell transplantation (bone marrow transplantation) [20–23]. SOS less frequently complicates cancer therapy with such drugs as actinomycin D, dacarbazine, cytosine arabinoside, 6-thioguanine, urethane, and gemtuzumab ozogamicin. Long-term immunosuppression with azathioprine for kidney or liver transplantation may occasionally cause SOS.

Table 2. Clinical criteria for diagnosis of sinusoidal obstruction syndrome

Seattle criteria [50]	Baltimore criteria [23]
Diagnosis requires two of three criteria within 20 days of transplantation Bilirubin >2 mg/dL Hepatomegaly or pain of liver origin >2% Weight gain caused by fluid retention	Hyperbilirubinemia (>2 mg/dL) plus at least two of the following three findings (Tender) hepatomegaly >5% Weight gain Ascites

The classic features of SOS are hyperbilirubinemia, tender hepatomegaly, and weight gain. SOS caused by chronic ingestion of pyrrolizidine alkaloids has a chronic course, whereas SOS after stem cell transplantation has a (sub)acute course. Onset of SOS associated with a cyclophosphamide-containing conditioning regimen is within 10 to 20 days of initiation of treatment [21]. In other myeloablative regimens, SOS may occur later, and there may be a biphasic course with early mild disease that seems to resolve followed by later more severe disease [24].

Diagnosis

In stem cell transplantation, the diagnosis is usually based on clinical features after other conditions common to stem cell transplantation have been ruled out. Two sets of slightly different clinical diagnostic criteria are most commonly used (Table 2). The differential diagnosis includes (hyper)acute graft-versus-host disease, sepsis, medication-induced cholestatic hepatitis, congestive heart failure, and tumor infiltration. No definitive diagnostic features have been established on imaging, but imaging studies can document hepatomegaly and ascites and exclude biliary obstruction and tumor invasion. Liver biopsy is particularly useful if (hyper)acute graft-versus-host disease needs to be ruled out.

Prevention

The major preventive strategy for SOS is to identify patients who are at high risk. The major risk factors are hepatitis, hepatic fibrosis, previous exposure to a myeloablative regimen, and a previous episode of SOS. Individuals at high risk may then be limited to lower-risk treatments, such as nonhepatotoxic, nonmyeloablative regimens; lower dose of total body irradiation; reversing the order of drugs in the busulfan-cyclophosphamide regimen [25]; or avoidance of cyclophosphamide-containing regimens. Whether adjustment of busulfan dosing based on plasma concentrations

reduces the risk of SOS is somewhat controversial. The benefit of dosage adjustment may depend on such factors as age, underlying disease, and other drugs in the chemotherapeutic regimen, as reviewed by McCune *et al*. [26]. Prophylactic pharmacologic approaches have included use of heparin, low-molecular-weight heparin, prostaglandin E, pentoxifylline, and ursodeoxycholic acid, but none of these drugs have been shown to reduce the incidence of fatal SOS, as reviewed by DeLeve *et al*. [16•].

Treatment

The majority of patients with SOS recover spontaneously. Ascites may be treated with sodium restriction, diuretics, and therapeutic paracentesis. Multiorgan failure in severe SOS may be treated with hemodialysis and mechanical ventilation, but these approaches are unlikely to affect the outcome. Tissue plasminogen activator (t-PA) plus heparin should be considered in patients with a predicted significant risk of death from SOS, those without increased risk for hemorrhage, and those who have not yet developed multiorgan failure [27]. Just under 30% of patients with severe SOS treated with t-PA plus heparin may show improvement [27–29].

Defibrotide is a single-stranded polydeoxyribonucleotide with antithrombotic, anti-ischemic, and thrombolytic effects that reduces leukocyte accumulation and has shown promise in a variety of vascular diseases. Uncontrolled clinical trials with defibrotide in moderate to severe SOS have shown promising results.

TIPS placement relieves portal hypertension but does not improve the outcome of SOS [30–32]. Liver transplantation is rarely a consideration, particularly if the stem cell transplantation was done for a malignancy, but transplant should be considered in patients who have a good prognosis for their underlying disease.

Prognosis

Published case fatality rates range from 0% to 67% [20,21,23,33–35]. Some of the variation in these rates may reflect differences in diagnostic criteria. Recovery rates from SOS caused by cyclophosphamide-containing regimens are reported to be around 70% [21,33], with an 84% recovery rate reported recently in a study of SOS from a regimen without cyclophosphamide [24]. Graphs have been published that may help predict the risk of SOS based on bilirubin level and weight gain, but they have only been validated for use in cyclophosphamide-containing regimens [36].

Nodular Regenerative Hyperplasia

Clinical features

Nodular regenerative hyperplasia (NRH) is usually asymptomatic and is most commonly diagnosed as an incidental finding at autopsy. Two large autopsy studies have reported prevalence rates of 2.1% and 2.6% [37,38]. When symptomatic, NRH presents with evidence of portal hypertension, including variceal hemorrhage, ascites, splenomegaly, and/or hypersplenism. Rarely, NRH may present as end-stage liver disease.

Table 3. Risk factors for nodular regenerative hyperplasia

Rheumatoid arthritis
Scleroderma
Systemic lupus erythematosus
Polyarteritis nodosa
Glomerulonephritis
Polycythemia vera
Essential thrombocythemia
Agnogenic myeloid metaplasia
Chronic myeloid leukemia
Lymphoma
Multiple myeloma
Cryoglobulinemia
Antiphospholipid syndrome
Myasthenia gravis
Anabolic steroids
Azathioprine
Oral contraceptives
Chemotherapy for stem cell transplantation
Thoratrast
Toxic oil syndrome
6-Thioguanine

The 2- to 5-mm nodules associated with NRH are not visualized by imaging. Diagnosis is established by biopsy, which shows scattered nodules of hyperplastic hepatocytes surrounded by atrophic parenchyma and the absence of fibrotic septa around the nodules.

No treatment is needed for the liver disease itself in most patients. Complications of portal hypertension are managed by standard approaches, and the underlying predisposing condition or precipitating factor may require therapy.

Causes

The generally accepted hypothesis for NRH is that it results from impaired perfusion of areas of the liver [39]. In areas of hypoperfusion, hepatocytes become atrophic or apoptotic [40], and reactive hyperplasia of the parenchyma occurs in areas where perfusion is maintained. This hypothesis seems reasonable but remains unproven.

A wide range of diseases and risk factors predispose to NRH, including collagen vascular diseases, hematologic malignancies, immunologic disorders, drugs, and toxins (Table 3). These factors share a predisposition to impair the circulation at the level of the portal vein or sinusoids, caused by phlebitis, thrombotic diathesis, or endothelial damage. For example, inflammation of the hepatic artery in collagen vascular diseases may cause inflammatory destruction of adjacent portal veins. Drugs may damage sinusoidal endothelial cells, as in long-term azathioprine administration in renal or liver transplanta-

Table 4. Risk factors for peliosis hepatis

AIDS (*Bartonella* bacilli)	Anabolic steroids
Tuberculosis	Oral contraceptives
Myeloproliferative diseases	Azathioprine
Leukemia	6-Thioguanine
Lymphoma	Arsenic
Multiple myeloma	Thoratrast
Macroglobulinemia	Vinyl chloride

tion patients or myeloablative therapy for stem cell transplantation [14,18,41,42].

Peliosis Hepatis

Peliosis hepatis is a rare liver disease characterized by blood-filled cavities scattered irregularly throughout the liver. The peliotic cysts range in size from less than 1 mm to several centimeters. Peliosis occurs most commonly in the liver, but it can occur in any part of the reticuloendothelial system (*ie*, spleen, abdominal lymph nodes, or bone marrow). Risk factors for peliosis include chronic wasting illnesses such as AIDS, tuberculosis, and cancer and drugs such as androgenic anabolic steroids and azathioprine (Table 4).

Causes

In AIDS, peliosis results from infection with *Bartonella* species bacilli, which can be detected by electron microscopy in sinusoidal endothelial cells [43]. This infection leads to disruption of the sinusoidal endothelial cell lining, sinusoidal dilation, and subsequent development of cavities that lack sinusoidal endothelial cells [44,45]. Eventually endothelial lining may be restored in parts of the peliotic cavities. Interestingly, *Bartonella* organisms cause bacillary angiomatosis in the skin, an organ with a continuous endothelial lining, but peliosis occurs in the reticuloendothelial system, which has a discontinuous endothelium [45].

A common link between SOS, NRH, peliosis hepatis, and sinusoidal dilation is that all four are liver diseases that may occur after damage to sinusoidal or venular endothelial cells [41,46]. Interestingly, a number of drugs have been linked to two or more of these diseases, and in some patients all four lesions have been described within the same liver. The drugs linked with these diseases are azathioprine (all four lesions), urethane (peliosis and SOS), 6-thioguanine (peliosis, NRH, and SOS), thorotrast (peliosis and NRH), oral contraceptives (sinusoidal dilation, peliosis hepatis, and NRH) and anabolic steroids (peliosis and NRH) [37,41,47,48].

Systemic Circulatory Disease

Ischemic hepatitis

Systemic hypotension, particularly in the presence off hypoxemia, may cause ischemic hepatitis. Hepatic venous congestion secondary to right-sided heart failure may predispose or even be a prerequisite for hypotension-induced ischemic hepatitis [49]. This diagnosis is based on the presence of systemic hypotension and severe, rapidly reversible elevation of serum aminotransferarases and lactate dehydrogenase (LDH). A low ratio of serum aminotransferase to LDH is characteristic and is helpful in distinguishing ischemic hepatitis from acute viral hepatitis. Serum aminotransferases are 20 or more times the upper limit of normal in patients with systemic hypotension, and lesser elevations suggest the need for further confirmation of diagnosis. Concomitant renal hypoperfusion with elevated creatinine and blood urea nitrogen are usually present. The classic histologic feature is centrilobular necrosis.

Congestive hepatopathy

Congestive hepatopathy may be caused by chronic right-sided heart failure, constrictive pericarditis, or pulmonary hypertension. Its clinical features are a dull right-upper-quadrant ache, hepatomegaly, increased jugular venous pressure, and hepatojugular reflux. Liver tests are usually normal. There is sinusoidal dilation in the centrilobular sinusoids with preservation of normal architecture in the periportal areas, the so-called "nutmeg" appearance. Long-standing disease may lead to centrilobular fibrosis, but frank cardiac cirrhosis is rare.

Conclusions

The primary circulatory liver diseases are caused by obstruction of the hepatic circulation, albeit in different portions of the circulatory bed for the different diseases. Patients with these diseases most commonly present with symptoms of portal hypertension; in milder cases parenchymal dysfunction is never manifested. Most of these diseases are relatively uncommon, and large case series have been difficult to accumulate. Nevertheless, progress has been made in the past decade in our understanding of the pathogenesis of most of these disorders.

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