Liver biopsy is still the gold standard for evaluation of acute and chronic liver diseases, despite achievements regarding noninvasive diagnosis and staging in liver diseases. Transjugular liver biopsy (TJLB) has proved a good option when ascites and/or significant coagulopathy precludes a percutaneous approach. Because diagnostic hemodynamic procedures can be performed during the same session, it is useful in many clinical settings, regardless of the absence of percutaneous contraindications. TJLB is a safe technique able to provide good-quality specimens with a low rate of complications. This article presents an overview of TJLB that discusses the technique, applicability, indications, contraindications, complications, and diagnostic accuracy.

Portal pressure is estimated through measuring the hepatic venous pressure gradient (HVPG). The main clinical applications of HVPG measurements include diagnosis, classification, and monitoring of portal hypertension, risk stratification, identification of candidates for liver resection, and monitoring efficacy of β-adrenergic blockers. Clinically significant portal hypertension is defined as an HVPG of 10 mm Hg or greater. Patients who experience a reduction in the HVPG of 20% or greater or to lower than 12 mm Hg in response to β-blocker therapy have a markedly decreased risk of bleeding (or rebleeding), ascites, and spontaneous bacterial peritonitis, resulting in improved survival rates.

Patients with portal hypertension and esophageal varices are at risk of bleeding due to a progressive increase in portal pressure that may rupture the variceal wall. Appropriate treatment with initial general measures such as resuscitation, a restrictive transfusion policy, antibiotic prophylaxis, pharmacologic therapy with vasoconstrictors, and endoscopic therapy with endoscopic band ligation are mandatory. However, 10% to 15% of patients fail initial endoscopic therapy, and, thus rescue therapies are needed. This article reviews the current endoscopic strategies with band ligation and esophageal stents for patients with acute variceal bleeding.
Endoscopic Treatment of Gastric Varices 809

Shiv K. Sarin and Awinash Kumar

Gastric varices (GV) are present in one in 5 patients with portal hypertension and variceal bleeding. GV bleeds tend to be more severe with higher mortality. High index of suspicion, early detection and proper locational diagnosis are important. An algorithmic approach to the management of GV bleeding prevents rebleeds and improves survival. Vasoactive drugs should be started with in 30 minutes (door to needle time) and early endotherapy be done. Cyanoacrylate injection in experienced hands achieves hemostasis in >90% patients. A repeat session is sometimes needed for complete obturation of GV. Transjugular intrahepatic portosystemic shunt and balloon retrograde transvenous obliteration are effective rescue options. Secondary prophylaxis of GV bleeding is done with beta-blocker and endotherapy.

Endovascular Management of Gastric Varices 829

Wael E. Saad

Bleeding from gastric varices is a major complication of portal hypertension. Although less common than bleeding associated with esophageal varices, gastric variceal bleeding has a higher mortality. From an endovascular perspective, transjugular intrahepatic portosystemic shunts (TIPS) to decompress the portal circulation and/or balloon-occluded retrograde transvenous obliteration (BRTO) are utilized to address bleeding gastric varices. Until recently, there was a clear medical cultural divide between the strategy of decompressing the portal circulation (TIPS creation, for example) and transvenous obliteration for the management of gastric varices. However, the practice of BRTO is gaining acceptance in the United States and its practice is spreading rapidly. Recently, the American College of Radiology has identified BRTO to be a viable alternative to TIPS in particular anatomical and clinical scenarios. However, the anatomical and clinical applications of BRTO were not defined beyond the conservative approach of resorting to BRTO in non-TIPS candidates. The article discusses the outcomes of BRTO and TIPS for the management of gastric varices individually or in combination. Definitions, endovascular technical concepts, and contemporary vascular classifications of gastric variceal systems are described in order to help grasp the complexity of the hemodynamic pathology and hopefully help define the pathology better for future reporting and lay the ground for more defined stratification of patients not only based on comorbidity and hepatic reserve but on anatomy and hemodynamic classifications.

Transjugular Intrahepatic Portosystemic Shunt 853

Kavish R. Patidar, Malcolm Sydnor, and Arun J. Sanyal

Transjugular intrahepatic portosystemic shunt (TIPS) is an established procedure for the complications of portal hypertension. The largest body of evidence for its use has been supported for recurrent or refractory variceal bleeding and refractory ascites. Its use has also been advocated for acute variceal bleed, hepatic hydrothorax, and hepatorenal syndrome. With the replacement of bare metal stents with polytetrafluoroethylene-covered stents, shunt patency has improved dramatically, thus, improving outcomes. Therefore, reassessment of its utility, management of its complications, and understanding of various TIPS techniques is important.
Transarterial Chemoembolization and Yittrium-90 for Liver Cancer and Other Lesions

Jeet Minocha, Riad Salem, and Robert J. Lewandowski

Transarterial chemoembolization (TACE) is the recommended treatment of intermediate stage hepatocellular carcinoma (HCC). Radioembolization with yttrium 90 has overcome the shortcomings of external beam radiation in the treatment of liver cancer. TACE and radioembolization have led to encouraging response, survival, and quality of life outcomes, with reduced toxicity profiles. This result has led to the use of these therapies in patients with hepatic metastases, most commonly from colorectal cancer. This article reviews the current state of the practice of TACE and radioembolization and presents recent scientific data that support their role in the treatment of HCC and hepatic metastatic disease.

Endoscopic Retrograde Cholangiopancreatography for Cholangiocarcinoma

Todd H. Baron

Cholangiocarcinoma is an increasingly common malignancy. Patients usually present with biliary obstruction. The role of endoscopic retrograde cholangiopancreatography (ERCP) is almost exclusively for drainage of the biliary tree, although diagnostic ERCP is still performed at the time of drainage to obtain a tissue diagnosis using brush cytology and intraductal biopsies. Peroral cholangioscopy may facilitate tissue diagnosis by allowing for directed biopsies. Biliary drainage is achieved by endoscopic stent placement. Careful preprocedural planning is necessary to select the ideal areas for drainage and to minimize contrast injection and subsequent cholangitis in hilar lesions.

Endoscopic Retrograde Cholangiopancreatography for Primary Sclerosing Cholangitis

Nirav Thosani and Subhas Banerjee

Although there are no randomized, controlled trials evaluating the efficacy of endoscopic retrograde cholangiography (ERC) in primary sclerosing cholangitis (PSC) patients, substantial indirect evidence supports the effectiveness of ERC in symptomatic PSC patients with a dominant stricture. Currently cumulative evidence supports the role of ERC with endoscopic dilation with or without additional short-term stent placement for symptomatic PSC patients with a dominant stricture. Differentiating benign dominant strictures from cholangiocarcinoma (CCA) remains difficult; however, newer endoscopic techniques and advanced cytologic techniques are likely to improve sensitivity for the diagnosis of CCA over that achieved by traditional cytology brushing alone.

Endoscopic Retrograde Cholangiography for Biliary Anastomotic Strictures After Liver Transplantation

Alejandro Fernández-Simon, Alvaro Díaz-Gonzalez, Paul J. Thuluvath, and Andrés Cárdenas

Biliary complications after liver transplantation (LT) are an important cause of morbidity and mortality. In most cases, an anastomosis of the bile duct is performed as a duct-to-duct reconstruction, which makes endoscopic
therapy with endoscopic retrograde cholangiography (ERC) feasible. Biliary anastomotic strictures (AS) are the most common cause of biliary complications. The early detection of an AS, which can sometimes be challenging given that its clinical presentation is often subtle, is of key importance to obtain high treatment success. In this review, we focus on the management of AS after LT with a special emphasis on ERC.

Cholangioscopy in Liver Disease
Brian C. Brauer and Raj J. Shah

Since its introduction, cholangioscopy has been used diagnostically and therapeutically. The working channel size has increased, permitting direct visualization for tissue sampling and to guide application of lithotripsy for difficult stones. Cholangioscopy utilizes endoscope and catheter-based systems. The application of slim gastrosopes for direct cholangioscopy provides better image resolution than conventional systems. Cholangioscopy has proven effective in the management of large biliary stones and for the diagnosis and exclusion of biliary tumors. Commercially available cholangioscopes are fiberoptic; those with digital video technology remain in a prototype development phase. This review covers available cholangioscope technologies, indications, technique, efficacy, and complications.

Molecular Adsorbent Recirculating System and Bioartificial Devices for Liver Failure
Rafael Bañares, Maria-Vega Catalina, and Javier Vaquero

Acute liver failure and acute-on-chronic liver failure remain clinical problems with unacceptable morbidity and mortality. The development of extracorporeal liver support systems that replace the detoxification, synthetic, and regulatory functions of the native liver represent a long-sought potential solution, but all the devices currently available are still far from ideal. In general, artificial (cell-free) and bioartificial liver support devices have shown their ability to decrease some circulating toxins, to ameliorate hepatic encephalopathy and other intermediate variables, and to be relatively safe. Their effects on the survival of patients with ALF or ACLF, however, have not been conclusively shown.

Intensive Care Unit Management of Patients with Liver Failure
M. Shadab Siddiqui and R. Todd Stravitz

Acute liver failure (ALF) and acute-on-chronic liver failure (ACLF) usually mandate management within an intensive care unit (ICU). Even though the conditions bear some similarities, precipitating causes, and systemic complications management practices differ. Although early identification of ALF and ACLF, improvements in ICU management, and the widespread availability of liver transplantation have improved mortality, optimal management practices have not been defined. This article summarizes current ICU management practices and identifies areas of management that require further study.

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