

thinning skin over the hernia or leakage of ascites warrant close observation and consideration of emergent repair to avoid rupture (101).

Ascites control is also of particular importance in patients with cirrhosis undergoing elective hernia repair as inadequate control increases risk of wound complications and hernia recurrence that may drive morbidity and mortality. Despite the importance of adequate preoperative ascites control, there is a paradoxical risk of hernia incarceration with rapid ascites reduction because of decompression and reduction of the abdominal wall defect. The approach to ascites control should follow standard management algorithms for patients with decompensated cirrhosis (102), which may include sodium restriction, loop and anti-mineralocorticoid diuretics, and large volume paracentesis as indicated. As noted above, TIPS may also be considered to reduce portal pressures on a case-by-case basis in appropriate patients. For patients with persistent ascites despite these measures, perioperative drainage can be used to temporarily divert ascites away from the operative site. There is insufficient evidence to support use of drains in the postoperative period after umbilical hernia repair; however, patients with perioperative drains should be closely monitored for hypovolemia and electrolyte imbalance because of fluid shifts (102).

Cholecystectomy

Key concepts

24. In patients with cirrhosis and indications for cholecystectomy, laparoscopic cholecystectomy is generally favored in CTP A and B cirrhosis, whereas most patients with CTP class C cirrhosis have prohibitive cholecystectomy risk and may benefit from supportive care and alternative drainage procedures (e.g., percutaneous cholecystectomy, endoscopic drainage, gallbladder aspiration) if available. The VOCAL-Penn score may be used to provide individualized estimates of postoperative risk in cases of high concern or uncertainty.

The prevalence of cholelithiasis is approximately 2-fold higher in patients with cirrhosis (103); however, consistent across all populations is the consensus that patients with asymptomatic cholelithiasis should not be treated. In patients with CTP A and B cirrhosis, indications for elective cholecystectomy are the same as in patients without cirrhosis (e.g., symptomatic cholelithiasis, high-risk gallbladder polyps, etc.) and laparoscopic cholecystectomy remains the procedure of choice (104,105). Although medical therapies exist for symptomatic cholelithiasis, they have not been shown to be effective in patients with cirrhosis and reduced gallbladder motility (106).

Antibiotics and cholecystectomy are the standard of care for acute cholecystitis. As noted, laparoscopic cholecystectomy is generally safe in CTP A and B cirrhosis, but is associated with significantly higher rates of postoperative complications and mortality in CTP class C disease (107). In cases of high concern or uncertainty, estimation of postoperative mortality using the VOCAL-Penn Score may help to inform decision-making given that patients undergoing laparoscopic and open abdominal cholecystectomy were included in the derivation of this model (10). Patients with prohibitive surgical risk should be initially treated with antibiotics, and in the case of failed medical management, percutaneous cholecystostomy, transpapillary drainage, and endoscopic ultrasound-guided transmural gallbladder drainage are alternative procedural options (108).

Percutaneous gallbladder aspiration has also shown to be effective (109). For patients with cirrhosis with cholecystitis and common bile duct stones, endoscopic sphincterotomy or balloon extraction is preferable to laparoscopic or open common bile duct exploration. However, risks of postsphincterotomy bleeding and pancreatitis are elevated in patients with cirrhosis and more so in patients with decompensated disease (110). Patients with a MELD score of ≥ 15 are additionally nearly 3 times more likely to develop acute decompensation after endoscopic retrograde cholangiopancreatography relative to those with lower MELD scores (111) although it should be noted in the general population that endoscopic retrograde cholangiopancreatography may reduce risks of hospital readmission in patients with choledocholithiasis-related complications who do not undergo cholecystectomy (112). Thus, decision-making must incorporate RRs and benefits associated with different therapeutic approaches. Finally, although data are limited, cholecystectomy after endoscopic sphincterotomy has been demonstrated to reduce major complications such as recurrent choledocholithiasis, ascending cholangitis, and gallstone pancreatitis as compared with endoscopic sphincterotomy alone, including in patients with advanced liver disease (113). Thus, this option should be considered in patients with acceptable surgical risk after recovery from the index biliary event.

Cardiac surgery

There are very little data related to cardiac surgery in patients with cirrhosis although operative risk in this setting increases with severity of liver disease. A recent systematic review of 13 studies evaluated postoperative complications and long-term outcomes in patients with cirrhosis who underwent cardiac surgery (114). Postoperative mortality rates were 0%–11%, 18%–50%, and 67%–100% in CTP A, B, and C patients, respectively. However, high degrees of study heterogeneity prevented analysis of specific surgical indications or the role of various anesthetic or surgical techniques in mitigating adverse outcomes. In the CASTER study, a retrospective observational cohort study of 144 adults with CTP A or B cirrhosis who underwent cardiac surgery, procedures included coronary artery bypass grafting (36%), valvular surgery (50%), and aortic procedures (14%). Both perioperative complications and in-hospital mortality were higher in CTP B vs A cirrhosis (20% vs 13%).

The European system for cardiac perioperative risk evaluation (EuroSCORE) predicts mortality after cardiac surgery; however, liver function is not included in the score (115). A retrospective cohort study of 218 adults with liver cirrhosis who underwent cardiac surgery investigated the predictive power of EuroSCORE II. Perioperative mortality rates were 8.9% in patients with Child A, 52.9% in patients with Child B, and 100% in patients Child C. EuroSCORE II showed a poor predictive value for patients with Child B and C cirrhosis (116). Ascites is also a poor prognostic sign, consistent with other surgeries. A retrospective cohort study of 69 patients with liver cirrhosis who underwent cardiac surgery between 2009 and 2018 examined the influence of preoperative ascites on postoperative complications and 30-day mortality. Transfusion requirement (78.6% vs 40.0%), acute kidney injury (78.6% vs 45.5%), ICU stay greater than 72 hours (57.1% vs 23.6%), and need for tracheostomy (28.6% vs 3.6%) were all higher in patients with ascites, who also experienced longer ICU stay (8 vs 3 days). The 30-day mortality rate was significantly higher in the ascites group than in the nonascites group (35.7% vs 5.5%, $P = 0.002$) (117).