GESA Gastroenterological Society of Australia

Clinical Update: Information for Health Professionals

Surgical Risk in Patients with Cirrhosis

Introduction

Metabolic (dysfunction) associated fatty liver disease, alcohol-related liver disease and an ageing population of people with viral hepatitis have led to a rise in prevalence of advanced liver disease in Australia, with many patients developing surgical indications over time. Liver cirrhosis is known to confer an increased risk of mortality and morbidity after surgery relative to the general population.[1-3] The Child–Turcotte–Pugh (CTP) class, Model for End-stage Liver Disease (MELD), American Society of Anesthesiologists (ASA) Physical Status Classification, Mayo postoperative mortality risk score, hepatic vein pressure gradient (HVPG) predictive model and Veterans Outcomes and Costs Associated with Liver Disease (VOCAL-Penn) Cirrhosis Surgical Risk Score are used for perioperative risk stratification and prediction of prognosis in patients with cirrhosis.[3-6] The optimal management of cirrhosis-related complications in the perioperative period is an important determinant of postsurgical outcome independent of the technical surgical risk. In this clinical update, we review available data on the risk of surgery in patients with liver cirrhosis and explore models for operative risk assessment of these patients.

Abdominal surgery and cirrhosis

For intra-abdominal (e.g. cholecystectomy) and abdominal wall (e.g. hernia) surgery, a retrospective series included 138 surgical cases in 123 patients with cirrhosis, with the aetiology of liver disease being alcohol in the majority of cases (60%), followed by viral hepatitis (21%). In these patients, overall mortality was 28%, with rates of 9% for patients undergoing elective surgery and 47% for emergency surgery. Based on the severity of liver disease, as assessed by the CTP classification, mortality rates were 10% for those with CTP class A, 17% for CTP B and 63% for CTP C. Mortality based on MELD assessment was 9% for patients with a MELD score <10, 19% for a MELD score of 10–15 and 54% for a MELD score of >15. Predictors of mortality in multivariate analysis were CTP class, ASA class, intraoperative blood transfusion and sodium level <130 mmol/L.[7]

Key Points

- There is no single definitive risk stratification system to determine operative risk for all patients with cirrhosis.
- Optimising liver status for all elective surgery patients improves outcomes.
- Evaluate for potential interventions to mitigate postoperative mortality (e.g. TIPS, non-selective beta blockers, nutritional status).
- Useful online risk calculators:
  - Mayo Clinic online tool
  - VOCAL-PENN online calculator

Intra-abdominal surgeries

Laparoscopic cholecystectomy in patients with cirrhosis appears to have advantages over conventional open cholecystectomy in terms of hospital stay and convalescence. A meta-analysis of 44 studies showed that laparoscopic cholecystectomy is associated with shorter operative time, reduced complication rates and reduced length of hospital stay.[8] Similarly, another meta-analysis showed that patients with CTP class A or B liver cirrhosis who undergo laparoscopic cholecystectomy for symptomatic cholecystolithiasis have fewer overall postoperative complications, a shorter hospital stay and resume a normal diet faster than those who undergo open cholecystectomy.[9]

Patients with CTP class B cirrhosis undergoing abdominal surgery are at increased risk of developing postoperative complications such as intractable ascites, which has been reported to occur in about 40% of cases. Other common

complications are wound and pulmonary infection and haemorrhage.[10-12]

The MELD score has been used to predict mortality and morbidity after liver resection for hepatocellular carcinoma (HCC) in patients with liver cirrhosis. In a 2005 study, no mortality was reported in patients with a MELD score of ≤8 after liver resection for HCC, while the mortality rate in patients with a MELD score >8 was 29%. MELD score has also accurately predicted the frequency of liver failure after liver resection, which was zero, 3.6%, and 37.5% in patients with MELD scores of <9, 9–10 and ≥11, respectively.[13-15]

A major determinant of perioperative morbidity is the presence of clinically significant portal hypertension (CSPH). Both invasive measurement of HVPG >10 mmHg and surrogates of CSPH (e.g. varices, ascites) have been correlated with worse outcomes. CSPH can significantly increase the risk of 3- and 5-year mortality and of clinical decompensation after surgery for HCC.[16] The extent of hepatectomy is also a major factor in considering the suitability of surgical candidates.

In patients with portal hypertension, postoperative morbidity may be reduced by preoperative placement of a transjugular intrahepatic portosystemic shunt (TIPS); however, this remains an experimental indication of TIPS, and its efficacy needs to be confirmed in larger series.[17,18]

Combining ASA class and patient's age with MELD score in assessing patients having abdominal surgery improves prediction of mortality. A study by Teh et al showed that patient age >70 years was equivalent to 3 additional MELD points, while 90-day mortality was zero in people aged <30 years. ASA class was a guide to 7-day mortality (all patients with ASA class V died). MELD remained the best predictor of 30-day and 90-day mortality, with the relative risk of each increasing by 14% with an increase of 1 MELD point.[3]

Abdominal wall surgeries: umbilical hernia

Patients with both cirrhosis and ascites have a 20% risk of developing umbilical hernia. Elective umbilical hernia repair is preferred for these patients. Umbilical hernia repair in the presence of ascites and/or oesophageal varices is associated with significant postoperative complication rates. Emergency surgery is associated with higher morbidity rates but not significantly higher mortality rates. Elective repair of umbilical hernia should be avoided for those with predictors of adverse outcomes, such as age over 65 years, MELD score higher than 15 and albumin level less than 30 g/L.[19,20]

Colorectal surgery and cirrhosis

In a study examining the effect of underlying cirrhosis on 138 surgical patients, there were 31 cases of colon surgery, including eight hemicolectomies. Mortality was 8.7% among patients undergoing elective surgery, and 47% for emergency procedures; overall mortality (in hospital) was 27.5%. In this study, the type of surgery was not a significant indicator of mortality. The mortality rate for elective surgery was 11% for patients with CTP A cirrhosis, 3% for CTP B and 17% for CTP C. The CTP score, MELD score, serum sodium level, major versus minor surgery, whether the surgery involved the gastrointestinal tract, and need for intraoperative blood or platelet transfusion were all multivariate predictors of mortality.[7]

A study of 41 cirrhotic patients undergoing colorectal procedures showed that postoperative infection was the greatest risk for mortality, increasing it from 11% to 53%. Ascites was the only significant factor identified that contributed to morbidity.[21]

A recent study showed that 90-day case fatality rates were high for all patients with cirrhosis in both emergency and elective surgery settings, but the greatest mortality risk was seen for those with decompensation after emergency colectomy.[22]

Head and neck surgery and cirrhosis

A study evaluating the association between postoperative complications and mortality and the severity of liver cirrhosis, and the related risk factors, involved 62 patients (CTP A, 42; CTP B, 17; CTP C, 3) with head and neck cancer undergoing tumour ablation, followed by microsurgical free tissue transfer.[23] The mortality among CTP B+C patients was 30%, compared with 4.8% for those with CTP A. Similarly, there were more complications in CTP B+C patients (80% vs 19.1%), including pulmonary complications, acute renal failure and sepsis. A logistic regression model showed that preoperative platelet

count, intraoperative blood transfusion, intraoperative blood loss >500 mL, CTP score, albumin level and prothrombin time were all risk factors for a poor outcome.

Cardiovascular surgery and cirrhosis

Cardiovascular surgery entails a very high risk of complications and mortality in patients with cirrhosis. Analysis of nine clinical studies of cardiac surgery (one prospective) involving 210 adult patients showed that patients with CTP class A had a mortality risk of 5.08%, while the risk for those with CTP B and C was 32.2% and 66.6%, respectively.[24] In addition to an elevated CTP or MELD score, CSPH is a relative contraindication to cardiothoracic surgery. Portal decompression with TIPS placement may make the risk level acceptable if the CTP and MELD scores remain low; however, elevated right-sided cardiac pressures from cardiac dysfunction and pulmonary hypertension are absolute contraindications to TIPS placement.[25-27]

Surgical risk prediction models

The CTP and MELD scores are frequently used for predicting surgical outcomes in people with cirrhosis, but they tend not to include surgery-specific risks.

Mayo postoperative mortality risk score

The only dedicated surgical risk prediction model validated in patients with cirrhosis is the Mayo risk score. This score was developed from a single-centre cohort of patients undergoing major cardiovascular, orthopaedic or abdominal surgery between 1980 and 2004. Predictors in this score include the ASA Physical Status Classification, international normalised ratio (INR), total bilirubin level, creatinine level, age and aetiology of liver disease.[3] The Mayo risk score showed good performance in a Korean cohort of 160 patients with cirrhosis who had surgery, but it was found to overestimate mortality, especially 1 year after surgery.[28] This score can be easily calculated using the Mayo Clinic online tool.

HVPG

The HVPG has been reported to predict 1-year mortality in patients with cirrhosis undergoing elective extrahepatic surgery. HVPG values >16 mmHg, and especially ≥20 mmHg, identified a subgroup of patients at very high risk of death (44%).[29]

VOCAL-Penn Cirrhosis Surgical Risk Score

The lack of surgical procedure type as an input for CTP, MELD/MELD-Sodium and Mayo postoperative mortality risk scores could lead to overestimation of risk for minor or minimally invasive surgeries. Moreover, many of the commonly used prediction models pre-date numerous innovations in surgery that have changed the landscape of patient selection and surgical risk, such as the introduction of advanced endovascular techniques and transcatheter-based valve replacements. These developments have fundamentally altered the risk profile of patients being considered for open procedures. Changes in the demographics of patients with cirrhosis and improved perioperative cirrhosis-related care have also likely altered the dynamics of surgical selection and postoperative outcomes.

The VOCAL-Penn Cirrhosis Surgical Risk Score was developed using a cohort of 3,785 US veterans with cirrhosis who underwent major surgeries to predict 30-, 90- and 180-day mortality.[6] In comparing it to existing prediction tools, VOCAL-Penn had an 87% chance of distinguishing patients who died within 30 days of surgery from those who did not, compared with 77% for the Mayo risk score and 72% for MELD. This score incorporates the type and circumstance of surgery under consideration and uses other important and readily available clinical data. Predictors of mortality include age, preoperative albumin level, platelet count, bilirubin level, surgery category, emergency indication, fatty liver disease, ASA classification and obesity. The developers of VOCAL-Penn showed that the type of surgical procedure is predictive of postoperative mortality, with open abdominal surgery carrying the highest mortality risk. VOCAL-Penn is publicly available as an online calculator for clinical use.

Summary

Surgical risk for patients with liver cirrhosis depends on the type and anatomical site of the proposed surgical procedure, severity of liver disease and presence of comorbid conditions. In patients being considered for

surgery, CTP score, MELD score, Mayo postoperative mortality risk score, HVPG or VOCAL-Penn score can provide reasonable estimations of surgery-related mortality.

Overall, there is no single definitive risk stratification system to determine operative risk for all patients with cirrhosis, and using multiple methods is highly recommended. Beyond assessment of existing surgical risk models, it may be beneficial to evaluate potential interventions to mitigate postoperative mortality risks, such as TIPS insertion, use of non-selective beta blockers and optimising frailty and nutritional status.

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