Q: What is the appropriate means of perioperative risk assessment for patients with cirrhosis?

BRIAN HARTE, MD*
Section of Hospital Medicine
Department of General Internal Medicine
Cleveland Clinic, Cleveland, OH

A: There are no prospective data to answer this question definitively, but the body of available evidence suggests that the model for end-stage liver disease (MELD) score offers the most prognostic information.

Data are from small, retrospective studies

Although only a small minority of patients undergoing surgery suffers from cirrhosis, patients with clinically significant chronic liver disease do have a higher rate of perioperative morbidity and mortality than the general population, due to an excess of bleeding episodes, infection, encephalopathy, and renal failure, among other causes.[1] Complications of chronic liver disease, including gastrointestinal bleeding, ascites, and thrombocytopenia, also may worsen outcomes.

Intuitively, more advanced liver disease should be accompanied by worse perioperative outcomes. While multiple studies have found this to be true, the available data are from small, retrospective studies with heterogeneous populations, and thus offer limited data from which to extrapolate.

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Two common scoring schemes

Two commonly used clinical scoring schemes have both been found to correlate with postoperative mortality.

The Child-Turcotte-Pugh (CTP) classification categorizes patients into three groups (A, B, and C) based on points assigned according to five clinical and laboratory measures (Table). Multiple studies have shown the CTP classification to correlate with perioperative mortality. A retrospective study from 1984 reported postoperative mortality rates of 10%, 31%, and 76% among patients in classes A, B, and C, respectively, after various abdominal surgeries.[2] A 1997 study of 92 patients yielded similar results,[3] leading to a general conclusion that surgery is reasonably safe for patients in CTP class A and all but contraindicated for patients in class C. Class B constitutes a group of patients at substantially increased risk of mortality.

The CTP scheme has a number of limitations, however. Most notably, it is derived from clinical experience, it is subject to "floor" and "ceiling" effects (values at one extreme of a range are grouped with values at the other extreme), and it uses subjective criteria (ascites and encephalopathy).

The MELD score was developed to predict mortality in patients with chronic liver disease undergoing transjugular intrahepatic portosystemic shunting,

TABLE
Child-Turcotte-Pugh scoring system and classification

Scoring system	**1 Point**	**2 Points**	**3 Points**
Ascites	Absent	Slight	Moderate
Encephalopathy	None	Grade I/II	Grade III/IV
Bilirubin	1–2 mg/dL	2–3 mg/dL	> 3 mg/dL
Prothrombin time	1–4 s > control	4–6 s > control	> 6 s > control
Albumin	> 3.5 g/dL	2.8–3.5 g/dL	< 2.8 g/dL

Classification

Class A: 5–6 points Class B: 7–9 points Class C: 10–15 points

but it has since been found to have predictive value in other clinical settings. The score relies solely on objective measurements—creatinine, bilirubin, and the international normalized ratio—but its formula is cumbersome (Figure). Fortunately, online MELD score calculators (such as www.unos.org/resources/MeldPeldCalculator.asp?index=98) obviate the need to perform the calculations.

A number of studies have examined the predictive value of the MELD score in the perioperative setting, although these studies have been small and retrospective. The largest assessed 131 patients who underwent 140 inpatient procedures, including 67 intra-abdominal and 29 orthopedic surgeries.[4] Fifty-nine of the surgeries were considered "nonelective." Mortality at postoperative day 30 was correlated with MELD score and was higher in general surgical patients than in the cohort as a whole. The authors presented a "rule of thumb" in which each 1-point increase in the MELD score up to 20 points is associated with a 1% increase in mortality, and each 1-point increase beyond 20 points is associated with a 2% mortality increase.

This study looked at the MELD score upon admission; no study has assessed whether intervening upon the individual components of the MELD score to improve the score changes surgical outcomes.

Another retrospective study (N = 53) concluded that patients with a MELD score greater than 14 have substantially poorer outcomes after abdominal surgery than do patients with lower scores.[5] However, the small numbers of patients in studies such as this result in wide confidence intervals for the outcomes.

MELD score vs CTP classification

A number of studies have compared the MELD score with the CTP classification. However, accurate retrospective calculation of the CTP score is probably very difficult, and comparisons based on such calculations may be imprecise. A higher score in both scoring systems is accompanied by excess and increasing mortality, but because the MELD score is based on objective data and provides a more continuous assessment of liver disease, it may be a superior method of risk stratification.

$$\text{MELD score} = 3.78 \times \log_e(\text{bilirubin in mg/dL}) + 11.2 \times \log_e(\text{international normalized ratio}) + 9.57 \times \log_e(\text{creatinine in mg/dL}) + 6.43$$

Round to nearest integer; bilirubin or creatinine < 1.0 mg/dL is rounded to 1.0; creatinine > 4.0 mg/dL is rounded down to 4.0.

Calculators for this formula are available online (see text).

FIGURE. Formula for calculating the model for end-stage liver disease (MELD) score.

Factors beyond scoring systems also matter

The likelihood of complications is also affected by nonclinical factors. Emergent operations, abdominal surgeries, certain types of anesthesia, and biliary obstruction all increase patient risk, while laparoscopy is associated with lower risk. Appropriate measures should also be taken to optimize the patient's status before surgery, although little evidence exists to suggest that the postoperative course is improved by interventions such as paracentesis or plasma transfusion. Furthermore, while cirrhosis may be a patient's most prominent clinical issue, clinicians must not overlook the possibility of heart disease, lung disease, or other comorbidities that would independently alter the patient's risk profile.

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Address: *Brian Harte, MD, Section of Hospital Medicine, Department of General Internal Medicine, Cleveland Clinic, 9500 Euclid Avenue, S70, Cleveland, OH 44195; harteb@ccf.org.*