Anesthesia for the Patient with Concomitant Hepatic and Renal Impairment

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KEYWORDS

• Acute versus chronic hepatic failure • Acute versus chronic renal failure
• RIFLE criteria • Intraoperative organ protection • Model for end-stage liver disease
• Liver and kidney transplantation

KEY POINTS

- Hepatic and renal disease are prevalent in the general population and must be managed appropriately by anesthesiologists.
- Preoperative optimization, intraoperative end-organ protection, and an anesthetic plan to control physiologic derangement are the cornerstones of an effective management strategy.
- Evaluation of these patients must include an understanding of their current disease pathophysiology (with pharmacologic and nonpharmacologic treatment), risk stratification, and a detailed preoperative evaluation.
- The ultimate treatment of end-stage hepatic or renal disease is organ transplantation.

INTRODUCTION

Hepatic and renal disease are becoming common comorbidities in patients presenting for intermediate and high-risk surgery. Reasons for this development are an aging population, better long-term survival of patients, and continuously improving outcomes after surgery, and with critical care medicine.[1] With the evolution of perioperative medicine, anesthesiologists are encountering more patients who have significant hepatic and renal disease, acute and chronic in nature. Acute hepatic failure is usually defined as deterioration of liver function in an 8- to 28-day time period, whereas chronic liver disease is defined as more than 6 months in duration. Similarly, acute renal failure and acute kidney injury are defined as a decrease in function over 7 days, and chronic renal failure presents over months to years. Renal disease has been further defined by the RIFLE criteria (**Table 1**).[2]

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Table 1
RIFLE criteria

Stage	GFR Criteria	Urine Output Criteria
Risk	Increased Cr × 1.5 or GFR decrease >25%	UOP <0.5 mL/kg/h × 6 h
Injury	Increased Cr × 2 or GFR decrease >50%	UOP <0.5 mL/kg/h × 12 h
Failure	Increased Cr × 3 or GFR decrease >75% OR Cr >4 mg/dL or acute rise >0.5 mg/dL	UOP <0.3 mL/kg/h × 24 h OR Anuria × 12 h
Loss of function	Persistent ARF × 4 wk	
ESRD	ESRD for >3 mo	

Abbreviations: ARF, acute renal failure; Cr, creatinine; ESRD, end-stage renal disease; GFR, glomerular filtration rate; UOP, urine output.
Data from Wagener G, Brentjens T. Renal disease: the anesthesiologist's perspective. Anesthesiol Clin 2006;24:523–47.

It is important that anesthesiologists have an in-depth understanding of the physiologic derangements seen with hepatic and renal disease to evaluate and manage these patients appropriately. Perioperative management requires an understanding of the physiologic perturbations associated with each disease process. This article elucidates the goals in the management and treatment of this complex patient population.

PATIENT EVALUATION OVERVIEW

Etiologies, Clinical Signs, and Systems-Based Physiology of Hepatic and Renal Disease

Hepatic and renal disease have different etiologies, clinical signs, and physiologic characteristics. Causes of acute liver failure are most commonly acetaminophen toxicity followed by acute viral hepatitis, whereas chronic hepatic disease is most commonly secondary to hepatitis B or C and alcoholism. Rare causes include primary biliary cirrhosis, Wilson disease, and hemochromatosis.[3] Acute renal failure is usually classified as prerenal (caused by a state of hypoperfusion, such as hypovolemia or sepsis), intrarenal (nephrotoxic substances, such as contrast, aminoglycosides, or nonsteroidal anti-inflammatory drugs), or postrenal (obstruction caused by kidney stones, benign prostatic hypertrophy, or bladder neck obstruction). Chronic kidney disease is secondary to systemic conditions, such as diabetes mellitus, hypertension, or rare glomerular diseases.[2] **Box 1** reviews the clinical signs of both diseases.

The physiologic characteristics of hepatic disease involve several perturbations to multiple organ systems. The cardiovascular system develops a hyperdynamic state caused by low systemic vascular resistance secondary to the lack of hepatic clearance of vasodilatory substances. Another comorbidity of significance is portopulmonary hypertension, found in 0.4% to 2.5% of patients with cirrhosis. This is

Box 1
Clinical signs of hepatic and renal disease

Hepatic Disease
Jaundice, fatigue, asterixis, ascites, gynecomastia, spider angiomata, palmar erythema

Renal Disease
Fatigue, numbness, nausea, abdominal pain, hypertension, edema, difficulty urinating, discoloration of urine