Q: What risks does a history of pulmonary hypertension present for patients undergoing noncardiac surgery?

ROOP KAW, MD
Department of Hospital Medicine, Cleveland Clinic, Cleveland, OH

PRIYANKA SHARMA, MD
Department of Hospital Medicine, Cleveland Clinic, Cleveland, OH

OMAR A. MINAI, MD
Department of Pulmonary, Allergy, and Critical Care Medicine, Cleveland Clinic, Cleveland, OH

A: The potential perioperative complications of pulmonary hypertension include a substantially higher rate of death, right ventricular failure, persistent postoperative hypoxia, and cardiac arrhythmias.

Scarcity of data in the noncardiac surgery setting

Patients with pulmonary hypertension are often counseled against undergoing elective surgery because early and sudden postoperative death has been reported in these patients.[1,2] In a retrospective study of 2,066 patients undergoing cardiopulmonary bypass surgery, a preoperative mean pulmonary artery pressure greater than 30 mm Hg was the only baseline variable that was independently predictive of perioperative mortality (odds ratio = 2.1).[3] However, few data are available on patients undergoing noncardiac surgery, although increased mortality has been reported in patients with pulmonary hypertension undergoing orthotopic liver transplantation.[4]

Perioperative complications in patients with pulmonary hypertension

The most significant study to assess outcomes of patients with pulmonary hypertension undergoing noncardiac surgery included 145 such patients and was published by Ramakrishna et al in 2005.[5] The incidence of early mortality (≤ 30 days after surgery) in these patients was 7% (10 patients), and among those who survived surgery, the incidence of morbidity was 42%. The most frequent contributors to early death were respiratory failure (60%) and right ventricular failure (50%). The most common morbid events were respiratory failure (including pneumonia, hypoxia requiring oxygen, or prolonged intubation), which occurred in 28% of the group, cardiac arrhythmias (12%), and congestive heart failure (11%).

In a retrospective series of 21 patients with pulmonary hypertension (mean pulmonary artery pressure, 53.0 ± 14.4 mm Hg) undergoing 28 noncardiac procedures, Minai et al[6] reported 18% postoperative mortality and a 19% incidence of right ventricular failure.

All authors reported that they have no commercial affiliations or financial interests that pose a potential conflict of interest with this article.

Predictors of increased risk after noncardiac surgery in patients with pulmonary hypertension

Unfortunately, the 2002 guideline update on perioperative cardiovascular evaluation for noncardiac surgery from the American College of Cardiology and American Heart Association[7] does not include criteria for risk-stratifying patients with pulmonary hypertension.

Ramakrishna et al[5] identified several predictors of short-term morbidity after noncardiac surgery:

- New York Heart Association functional class of II or greater
- Intermediate-risk or high-risk surgery
- History of pulmonary embolism
- Anesthesia lasting longer than 3 hours.

Univariate analysis suggested that the following were also associated with short-term mortality: right ventricular hypertrophy (P = .04), a ratio of right ventricular systolic pressure to systolic blood pressure of 0.66 or greater (P = .01), and a right ventricular index of myocardial performance greater than or equal to 0.75 (P = .03).

When these authors stratified risk by type of surgery, they found that 17% of patients undergoing low-risk procedures experienced morbid events compared with 48% of patients undergoing orthopedic surgery and 62% of those undergoing thoracic surgery.[5]

Minai et al[6] reported higher mortality in the patients in their series who had pulmonary artery catheter (PAC) monitoring during surgery than in those without PAC monitoring, although the difference was not statistically significant (P = .17). The authors hypothesized that patients with more severe pulmonary hypertension may have been more likely to have PAC monitoring.

Conclusions

Based on limited available data, pulmonary hypertension confers substantial risks for death and cardiac morbidity in the perioperative period. Although data suggest that features from the clinical history and parameters from the electrocardiogram and two-dimensional echocardiography may help identify patients at highest risk of complications and death, there are currently no specific risk-assessment tools available for objectively categorizing this increased risk.

REFERENCES

1. **Burrows FA, Klinck JR, Rabinovitch M, Bohn DJ.** Pulmonary hypertension in children: perioperative management. Can Anaesth Soc J 1986; 33:606–628.
2. **Roessler P, Lambert TF.** Anaesthesia for caesarean section in the presence of primary pulmonary hypertension. Anaesth Intensive Care 1986; 14:317–320.
3. **Reich DL, Bodian CA, Krol M, et al.** Intraoperative hemodynamic predictors of mortality, stroke, and myocardial infarction after coronary artery bypass surgery. Anesth Analg 1999; 89:814–822.
4. **Krowka MJ, Plevak DJ, Findlay JY, et al.** Pulmonary hemodynamics and perioperative cardiopulmonary-related mortality in patients with portopulmonary hypertension undergoing liver transplantation. Liver Transplant 2000; 6:443–450.
5. **Ramakrishna G, Sprung J, Ravi BS, Chandrasekaran K, McGoon MD.** Impact of pulmonary hypertension on the outcomes of noncardiac surgery: predictors of perioperative morbidity and mortality. J Am Coll Cardiol 2005; 45:1691–1699.
6. **Minai OA, Venkateshiah SB, Arroliga AC.** Surgical intervention in patients with moderate to severe pulmonary arterial hypertension. Conn Med 2006; 70:239–243.
7. **Eagle KA, Berger PB, Calkins H, et al.** ACC/AHA guideline update for perioperative cardiovascular evaluation for noncardiac surgery—executive summary. A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee to Update the 1996 Guidelines on Perioperative Cardiovascular Evaluation for Noncardiac Surgery). Circulation 2002; 105:1257–1267.

Correspondence: *Roop Kaw, MD, Department of Hospital Medicine, Cleveland Clinic, 9500 Euclid Avenue, S70, Cleveland, OH 44195; kawr@ccf.org.*