

THE CCU CORNER

Noninvasive Ventilation in Patients With Respiratory Distress

The Problem

Patients with respiratory failure account for a significant percentage of admissions to the intensive care unit. These patients often require endotracheal intubation and mechanical ventilation, and have a significant risk of morbidity, mortality, and prolonged hospitalization.

The Patient

A 65-year-old woman presented to Boston Medical Center with acute respiratory distress and was found to be in heart failure. She had tachypnea, hypoxia (oxygen saturation of 88%), and mild hypercarbia (carbon dioxide partial pressure of 50). She received intravenous diuretics and was placed on noninvasive positive-pressure ventilation (NPPV). She had rapid improvement in her respiratory status, did not require endotracheal intubation, and was weaned from respiratory support within 24 hours.

The Theory

Ventilatory support of patients with respiratory distress can be administered through noninvasive means. These methods avoid the need for endotracheal intubation and thus may decrease associated morbidity, including ventilator-associated pneumonia, mechanical airway trauma, and prolonged hospitalization.

The Evidence

Noninvasive ventilation encompasses two modalities: continuous positive airway pressure (CPAP) and NPPV, also

known as bilevel positive airway pressure. CPAP provides a constant level of positive airway pressure during both inspiration and expiration, thereby decreasing the work of breathing. NPPV provides biphasic pressure: a basal expiratory pressure similar to CPAP, and a higher inspiratory pressure aimed at fur-

The Protocol

Both CPAP and NPPV are delivered through a tight-fitting facial or nasal mask with the patient's head elevated at least 30 degrees. In general, the mask is well tolerated, but mild sedation in agitated patients can be considered. In patients with heart failure and pure hypoxemic respiratory failure, CPAP is the noninvasive modality of choice. However, in patients with COPD, or in patients with heart failure that is associated with both hypoxemia and hypercarbia, NPPV is the preferred mode, as it improves not only oxygenation but also gas exchange. Although standard settings for noninvasive ventilation have not been defined, we usually start CPAP at 5 cm H₂O, and initiate NPPV with an inspiratory pressure of 10 cm H₂O and an expiratory pressure of 5 cm H₂O. The inspiratory pressure can be gradually up-titrated to 15-20 cm H₂O as needed to reduce dyspnea and tachypnea. Supplemental oxygen should be administered to maintain the O₂ saturation above 90% and blood gases should be assessed within 1-2 hours of initiating therapy to assess efficacy.

ther reducing respiratory work. Both modalities increase intrathoracic pressure, resulting in a decrease in preload and also a decrease in effective afterload.

A recent meta-analysis of 15 trials comparing either NPPV or CPAP to usual care in patients with acute pulmonary edema showed a significant benefit of this therapy. Overall, the use of noninvasive ventilation decreased mortality by about 45% and the need for intubation by more than 50%. The effect appears to be greater with CPAP than

with NPPV; however, benefit is seen with both modalities. Individual trials, as well as several meta-analyses, have also revealed a beneficial effect of NPPV in patients with exacerbated chronic obstructive pulmonary disease (COPD). These studies demonstrate a significant reduction in mortality (10%-50% risk reduction) and need for endotracheal intubation (30%-50% risk reduction) with NPPV, as well as significant reductions in complications of treatment and duration of hospitalization. Additionally, a meta-analysis of trials comparing traditional methods of weaning from mechanical ventilation to early extubation and transition to NPPV demonstrated a shorter course of mechanical ventilation, a reduction in the rate of ventilator-associated pneumonia, and a lower mortality than that associated with the use of NPPV.

Discussion

The effect of NPPV and CPAP is usually rapid; improvements in hypoxemia, hypercarbia, and acidosis are seen within 1-2 hours. Patients should be intubated and placed on mechanical ventilation if the respiratory rate fails to fall, if mental status declines, or if oxygenation and ventilation do not improve within this time period. Attempting to avoid intubation by the prolonged use of CPAP or NPPV in a patient who does not rapidly improve with the therapy is associated with worsened outcomes and should be avoided. Noninvasive ventilation should not be attempted in patients

who require emergent intubation, and should be avoided in patients with altered mental status, inability to clear secretions, or who are at a high risk of aspiration. There are few data to support its use in patients with adult respiratory distress syndrome, and it should be used with caution in patients with an initial pH below 7.20 or a Glasgow Coma Scale score lower than 11, given the higher failure rate in this setting. Patients who are successfully treated with noninvasive ventilation should be gradually weaned from support, usually by progressive prolongation of periods of spontaneous breathing.

Summary

Noninvasive ventilation is a safe and effective method of supporting many patients with respiratory distress, especially those with acute heart failure or COPD exacerbation. It should be considered early in the course of treatment as a method of reducing the need for endotracheal intubation and mechanical ventilation in appropriate patients.



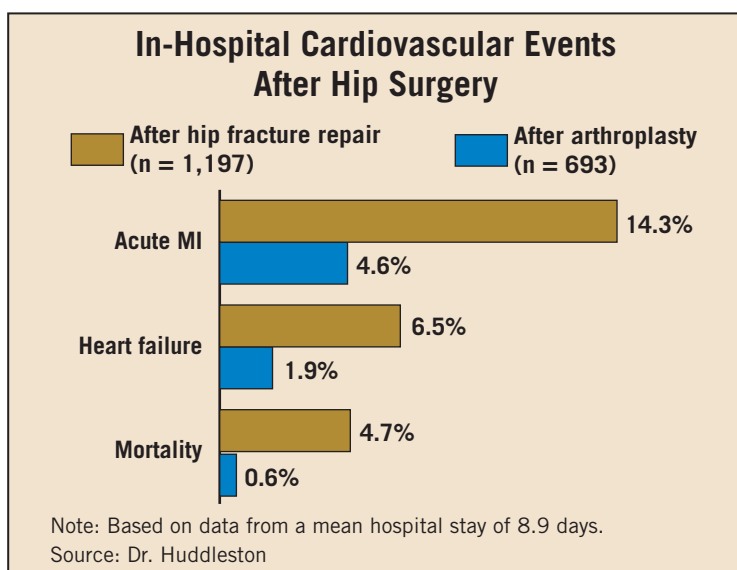
DR. AWTRY is assistant professor of medicine and director of education at Boston Medical Center. DR. PHILIPIDES is assistant professor of medicine and director of the Coronary Care Unit at BMC. To respond to this column or suggest topics for consideration, e-mail us at cardnews@elsevier.com.

Hip Fracture Repair Tied to High Risk of Cardiac Events

BY BRUCE JANCIN
Denver Bureau

DALLAS — Surgical repair of hip fracture in the elderly is associated with an extremely high risk of postoperative MI or death—a reality not reflected in current American College of Cardiology/American Heart Association preoperative cardiovascular evaluation guidelines, Dr. Jeanne Huddleston said at the annual meeting of the Society of Hospital Medicine.

The ACC/AHA guidelines lump together all orthopedic surgical procedures into a single intermediate-risk category, meaning their combined risk of postoperative MI or death is expected to be less than 5%. While that's true of elective total hip arthroplasty, hip fracture repair is another matter entirely, accord-



ing to Dr. Huddleston, a hospitalist at the Mayo Clinic, Rochester, Minn., and a former society president.

She presented a population-

based retrospective study in 1,197 patients who underwent urgent repair of a fractured hip and 693 who had an elective hip replacement operation at the clinic.

During a mean hospital length of stay of 8.9 days, the incidence rates of postoperative MI, heart failure, and mortality were markedly lower in the elective hip arthroplasty group (see box).

Moreover, the combined 1-year rate of MI and all-cause mortality was 34.2% in patients undergoing hip fracture repair, compared with 7.5% in the arthroplasty group. After statistical adjustment for patient age, gender, and American Society of Anesthesiologists physical status classification, the hip fracture repair patients were 3.6-fold more likely to have an MI or die within a year following surgery.

"We recommend that future updates to the ACC/AHA guidelines for preoperative cardiovascular evaluation for noncardiac surgery establish elderly hip fracture patients as a special subgroup

of orthopedic surgeries whose perioperative risk of death or MI is tremendous, and requires special consideration for optimizing pre- and postoperative medical care," the physician said.

Hip fracture repair is typically done on an urgent basis, but it doesn't fall within the definition of "emergency" surgery described in the guidelines. Thus, physicians can take up to 48 hours postfracture to optimize cardiac status and other aspects of the patient's medical condition prior to surgery—and that's a sound strategy given the high cardiovascular risk associated with the surgery, according to Dr. Huddleston.

Hip surgery is the second most frequently performed type of surgery in patients older than 65, behind only coronary artery bypass graft surgery. ■