

GERIATRIC CARDIAC SURGICAL PATIENTS: MONITORING AND OUTCOMES

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INTRODUCTION

The United States Census Bureau has projected that by 2030, the population of that country will increase by 32%, with a 76% increase occurring in the group over the age of 65 (1). With this change in age distribution of the United States population coupled with the decreases in adult mortality seen in the last few decades, it has been reported that the increased demand for surgery, cardiac surgery included, may exceed the rate of population growth. The implications of an aging population for the practice of anesthesiology are profound. Age-related changes in physiology and pharmacology can affect every aspect of perioperative care, and changes in surgical demographics will compel the anesthesiologist to become familiar with the physiology and clinical care of the aged.

PHYSIOLOGIC CHANGES RELEVANT TO AGING

Physiologic studies of aging conclude that while the organ basal function remains intact by the aging process, functional reserve and the ability to compensate for physiologic stress are reduced.

Cardiovascular. There is a linear increase in systolic blood pressure from age 30 to 84 yr (2), due to both an increase in arterial stiffness and an increase in systemic vascular resistance (3). Increased sympathetic nervous system activity and decreased peripheral β -adrenergic responsiveness further contribute to the hypertension of aging (4). Age-related changes to the myocardium compromise the heart's ability to buffer changes in circulatory volume, resulting in a disposition to either congestive heart failure or hypotension (5).

Pulmonary. With aging, the work of breathing is increased, residual volume and functional residual capacity are increased, and the forced expiratory volume in 1 s is reduced. The respiratory response to hypoxia also diminishes with aging (6), there is a decrease in ciliary function, and cough is reduced (7). Finally, pharyngeal sensation and the motor function required for swallowing are diminished in the elderly (8).

Neurologic. Both the central and peripheral nervous systems are affected by aging (9), and the combination of many changes serves to limit the ability of the older patient to understand and process information in the perioperative period. These changes are probably important contributors to postoperative delirium, drug toxicity, and falls. In

addition, neuronal loss in the autonomic nervous system is associated with impairment of cardiovascular reflexes.

MONITORING

To date, there are no published studies which support the need for more intense monitoring in older cardiac surgical patients, other than that appropriate to the patient's clinical status and comorbidities. There may be subclinical, age-related changes which may alter outcomes of anesthesia and surgery. In cardiac surgery, the acute physiologic changes exceed those seen with any other type of surgery. Despite that, it has been difficult to demonstrate a direct relationship between physiologic management and outcome. The baseline patient risk factors as well as procedure-specific technical issues primarily determine how well the patient does. In perspective, the lack of an independent effect of anesthetic choice or physiologic management on major outcomes is not surprising. In very large studies of perioperative morbidity and mortality, the actual anesthetic episode appears to have little effect on longer term outcomes (10,11).

Anesthetics and resulting alterations in autonomic function make it more difficult for older patients to maintain their body temperature, and because postoperative hypothermia increases the risk of adverse outcomes (12), temperature control in elderly surgical patients will continue to require attention. Other areas of intraoperative care outside of anesthetic choice are the appropriate role for prophylactic antiplatelet drugs and histamine-2 blockers in elderly surgical patients. Some important areas which have not been studied in enough detail are the immunosuppressive effects of blood transfusion, musculoskeletal and nerve injury, and perioperative thrombotic complications. Similarly, fluid intake and hydration status and their relationship to renal insufficiency, hypovolemia, and aspiration risk in the elderly would be an area of research with a large potential effect on practice.

OUTCOMES

Most surgical morbidity and mortality occur after surgery. Respiratory complications are the most common morbidity after noncardiac surgery. Because the age-related changes in respiratory mechanics and control are accentuated by pain, anesthetics, neuromuscular blockers, atelectasis, fluid shifts, and other postoperative physiologic changes, the elderly have a disproportionate number of respiratory complications. Despite this, clear guidelines for perioperative respiratory monitoring in the elderly have not been developed (13).

With recent data linking adequacy of analgesia with the magnitude of the stress response and cardiopulmonary complications, postoperative analgesia issues require attention in the elderly. The relative benefit of patient-controlled analgesia (PCA) (14) versus an as-needed or scheduled analgesic administration may be of greater importance in the elderly surgical patient. The same might be true regarding the route of administration (IV,

epidural, or intrathecal) for analgesics (15). In addition, the influence that acute pain management may bear on rehabilitation to functional status is of great importance (16).

Postoperative delirium and cognitive decline affect 5%–50% of elderly patients (17), typically presenting on the third postoperative day, and sustained for up to a week (18). Cognitive dysfunction, a deterioration of psychomotor capacities such as memory, central processing time, and acquisition of new information, is also common after surgery and has been well described in both cardiac and noncardiac surgical patients (19-20). These studies also indicate that preoperative cognitive deficit is a strong predictor of the likelihood of delirium during the hospitalization (21).

SUMMARY AND CONCLUSIONS

Perioperative care of the geriatric patient is complex. Older patients are at increased risk for many complications compared to younger people undergoing similar procedures. This increased risk is due to a combination of decreased functional physiologic reserve, diminished response to stress, and the number of preexisting comorbidities.

Outcome is determined by the interaction of patient factors and the issues introduced by surgery. Development of comprehensive care strategies for the cardiac surgery perioperative period in the elderly is indicated. These approaches would most successfully be defined and initiated by multidisciplinary care teams so that preoperative, intraoperative, and postoperative management could be integrated, taking into account prevention of delirium and pneumonia, pain management, and improving functional status on discharge. Because of the significant contribution to preoperative assessment and postoperative patient management, the anesthesiologist has a unique role in development of such comprehensive care strategies.

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