Anesthesia For The Elderly

Yasser Sakawi, M.D.
Associate Professor
Anesthesiology Department

UAB
Topics of Discussion

- General concepts and definitions
- Aging and general organ function
- Cardiopulmonary function
- Hepato-renal and immune function
- Nervous system
- Anesthetist management and outcome
General Concepts

- Aging is a universal progressive degenerative changes in structure and function of organs
- Chronologic age versus physiologic age
- No clear consensus over the cutoff off age for being old
- Generally age 65 and older has been arbitrarily accepted to define human subjects as elderly or geriatric
General Concepts

Advances in medical science and health care has prolonged the life expectancy of human beings, but failed to prolong the life span of our species which continues to be around 110-115 years over the past 20 centuries.
Aging and General Organ Function

- The first apparent decline in organ function usually starts around the fourth decade of life, then become more dramatic around the seventh decade of life.
- Organ system functional reserve represent a safety margin of organ capacity to meet additional demands at times of stress.
Figure 45-2. Differences in the rate at which maximal organ system functions decline with increasing age, and, to a lesser extent, differences in initial functional levels explain the inevitable variability seen in geriatric patients commonly described as physiologically "younger" or "older" than average.
Figure 45-3. For any organ system "functional reserve" represents the difference between basal (minimal) and maximal organ system function. The age-related decline in functional reserve may not be clinically apparent until demands made upon the organ system are increased by stress, disease, polypharmacy, or surgical intervention.
Cardio-pulmonary Physiology of Aging

- Aging usually produces progressive depression of cardiac output and index.
- In healthy elderly this usually correlates well with the drop in metabolic demands resulting from atrophy of skeletal muscles and loss of tissue mass in major organs.
Aging usually results in diastolic dysfunction, due to stiffer and less compliant myocardium.

Elderly patients are more dependent on sinus rhythm for proper filling of the ventricles.

Any modest decrease in venous return can compromise the stroke volume.
Cardio-pulmonary Physiology of Aging

- Loss of elastic tissue in the lungs results in some deleterious effects on gas exchange.
- An emphysema like picture develops over time in elderly patient.
- The closing volume and capacity moves closer to the FRC leading to alveolar collapse even in sitting position.
Cardio-pulmonary Physiology of Aging

- Elderly patients are more susceptible to the respiratory depressant effects of both narcotics and benzodiazepines.
- Chest wall rigidity is more prevalent in elderly patients after narcotics.
- Less sensitivity of vocal cord closure reflex results in more susceptibility to aspiration.
Hepato-renal and Immune Function

- Liver tissue mass and hepatic blood flow declines about 40% by age 80.
- That might explain the delayed biotransformation of narcotics and other drugs.
- Should avoid hypotension, low cardiac output states and hypothermia to prevent hepatic injury.
Hepato-renal and Immune Function

- By eighth decade there is loss of 30% of renal tissue mass and renal blood flow decreases by 50%.
- Despite compromise of renal functional reserve the creatinine level stays WNL due to declining skeletal muscle mass.
- Diminished thirst, poor diet and use of diuretics predisposes elderly patients to intravascular and intracellular dehydration.
Brain mass at age 80 is 20% less than values measured postmortem in young adults.

Rapid reduction in gray matter tissue mass with compensatory increase in CSF after the sixth decade.

Aging in effect produces a form of low pressure hydrocephalus.
Nervous System

- The blood-brain barrier remains intact as well as the autoregulation of the cerebrovascular resistance
- General knowledge base, comprehension, and long-term memory are well maintained in active and fit older adults
- There is decline in short-term memory, visual and auditory reaction time
Figure 45-12. The age-related decline in relative anesthetic requirement (MAC or ED<sub>50</sub>) in unsedated human subjects is a consistent characteristic reported for a wide variety of inhaled and injected anesthetic agents.
Perioperative Management and Outcome

- Overall, perioperative mortality and major morbidity increase with advancing age.
- However, age related disease, not aging itself, largely determines the morbidity and mortality.
Figure 45-15. The probability of adverse postoperative outcome increases only gradually with age across middle adulthood. Analyzed prospectively from a large series of randomized patients, pre-existing cardiovascular or pulmonary disease and physical status (solid lines) were found to be the primary determinants of perioperative morbidity, although the widening of the separation between physical status lines shown here suggests that age itself may further amplify the negative prognostic value of impaired physical status in surgical patients who are well into the geriatric era.
Morbidity and mortality are higher in elderly surgical patients because this patient population has greater incidence and severity of concurrent disease and greater exposure to invasive medical interventions.
The high incidence of polypharmacy associated with chronic disease produces an age related increase in adverse drug reaction and complicate the perioperative management of the elderly.

Probability of serious pulmonary or hemodynamic complication is determined by site of surgery and physical status of pt.
Perioperative Management and Outcome

- Adverse outcomes in geriatric patients show relative predominance of cardiac and hemodynamic complications.
- Other complications like pulmonary, sepsis, and renal failure contribute significantly to morbidity in the elderly.
Perioperative Management and Outcome

- Even when elderly patients are cleared for surgery by consultants they might still have mild to severe cardiopulmonary functional deficits.
- Adequate time for diagnosis, treatment and preparation for the anesthetic plan is essential for reducing the severity of complications.
Perioperative Management and Outcome

- It is not possible to determine if there is a single best anesthetic for the elderly with regards to survival and outcome.
- All anesthetic techniques are appropriate and in widespread use.
- From perspective of major adverse outcome and mortality, a brief intraoperative exposure to anesthesia is insignificant component of a prolonged, difficult and complex hospital course.
Neither regional nor general anesthesia has clearly demonstrable superiority of outcome in the elderly.

One or the other technique may be preferred for use in specific procedures for other medical reasons.
The use of newer intravenous agents like remifentanil and cisatracurium minimizes dependence upon organ system functional reserve for drug elimination.

New inhalational agents like desflurane and sevoflurane provide rapid recovery of consciousness in the elderly.

Well conducted GA is safe.
Recent large scale prospective studies of outpatients showed less postoperative nausea and vomiting in elderly

Sinclair DR, Anesthesiology, 1999;91:109

Prompt and complete recovery of mental function is important in elderly patients because mentation is already compromised by age related disease and drug therapy.
Perioperative Management and Outcome

- After GA there is greater incidence of postoperative confusion in the elderly outpatient population
  - Yzabar Y, Br J Anesthe, 1996;76:194

- The most common cause of failure to emerge promptly from GA is simply the use of too much anesthesia and too many anesthetic agents
Perioperative Management and Outcome

- Full return of cognitive function to preop levels with properly conducted uncomplicated GA, may take up to 5-10 days after prolonged GA.
- Psychometrically defined post op cognitive dysfunction could be demonstrated for up to 3 months in 10-15% of uncomplicated surgery with HLOS 4 or more days. Moller JT, Lancet 1998;351:857
- The exact neurophysiologic and pharmacologic mechanism remains unknown.
Chronic medication, drug interaction, disorientation due to sensory deprivation or the disruption of normal routine needed to maintain implicit memory may explain such high incidence of delirium in the elderly population.

GA or the drugs used to produce it may produce residual neurotransmitter injury.
Perioperative Management and Outcome

- Local anesthesia or regional anesthesia, if can be comfortably performed without need for heavy sedation, may significantly improve postoperative mental function.

- However, there is no evidence of any long-term benefit to this approach.

  - Chung FF, Can J Anesth, 1989;36:382

- Complications of RA like nerve palsies, neuropraxias, and residual parasthesia are more common in the elderly population.
Perioperative Management and Outcome

- Intraoperative management require gentle and expert routine care
- The aged skin is very thin, bones are fragile, joints are stiff and the range of motion is limited
- Proper padding, positioning and warming is important
- Avoid direct contact of heat with poorly perfused skin or pressure points, it can produce ischemic lesions
Postoperative bleeding diathesis or hypercoagulable states, and infection are more common in elderly patients. Diastolic dysfunction results in elderly patients more prone to congestive heart failure from modest I/V rates.
Major surgery and the resultant tissue injury produce extensive neuroendocrine and sympathoadrenal stress.

Suppression of excessive sympathetic activity appears to promote rewarming and healing, reduce cardiovascular and pulmonary demands.
Perioperative Management and Outcome

“Ageism” may influence caregivers to withhold adequate analgesia for fear of opioid side effects.

Untreated pain and related emotional stress may impair immune response and increase the risk of postoperative infection.

Esterling BA, Psychosom Med 1996;58:264
Therefore, a postoperative anesthetic plan than include postoperative epidural analgesia and sympathectomy or a sympathetic modulator like dexmedetomidine (precedex) may be of special value in elderly patient
Summary

- Elderly patients do not require special type of anesthetic
- Their perioperative care simply requires the highest standards of preparation and diagnosis and control of pre-existing disease, vigilance, and meticulous execution of all details of the planned anesthetic and postoperative management
Questions?