

Anesthesia problems in geriatric neurosurgical patients

Is age really important for the anesthesiologist?

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The population is rapidly aging – and in our society the oldest old (> 85 years) represent the most rapidly growing section of the population.

In Italy thirty percent of surgeries are performed on patients over the age of 65 years.

In our neurosurgery department patients aged 67-75 accounted for 25% of all procedures in general anaesthesia and patients over 75 accounted for 11%.

There are no specific papers about neurosurgical elderly patients and anesthesia, but due to the increasing proportion of elderly patients undergoing surgical procedures, geriatric anesthesia is emerging as a sub-specialty of today's general anesthesia .

To prevent intraoperative and postoperative complications a careful preoperative anesthesia examination of elder patients is essential and two principles must be kept in mind: aging is a universal and progressive physiological process resulting in a steady decline of functional reserve in all organ systems; and the onset of these changes vary from individual to individual. It is therefore a very heterogeneous population.

Physiological changes in the cardiovascular system with decreased contractility and increased myocardial stiffness associated with morphological changes of vascular system, and changes in autonomic system response (decrease in response to β -receptor stimulation and increase in sympathetic nervous system activity) make the heart more susceptible to cardiac failure. Recent data suggest that older patients often have impaired diastolic function with a preserved ejection fraction; diastolic dysfunction is well tolerated in daily activity but is associated with an increase in mortality. As a result of all these changes the elderly heart depends on diastolic filling.

In the respiratory system, in addition to the structural changes, the control of respiration is also altered, leading to a impaired gas exchange with progressive reduction of paO_2 with increasing age.

Renal mass decreases and the renal blood flow also decreases with aging but there is a concomitant decrease in muscle mass, so creatinine is a poor predictor of renal function in elderly patients. In any case these changes in renal mass impact on the elimination of drugs requiring renal clearance.

Likewise, liver volume and hepatic blood flow decrease and consequently this impact the pharmacokinetics of drugs.

Changes in plasma protein binding, in the lean/fat mass ratio, and in receptor number or sensitivity have an impact on the pharmacokinetic and pharmacodynamic responses of elderly patients to administered drugs.

The overall result is that elderly patients need a downward adjustment in medication dosage.

Laboratory and diagnostic studies, history, physical examination and determination of functional capacity should attempt to evaluate the functional reserve, but only the ASA (American Society of Anesthesiologists) status is significant in predicting adverse outcome. The ASA status considers the specific organ diseases that may coexist and overlap.

The most frequent comorbidities in elderly patients are cardiologic. To evaluate the risk of cardiac complications (cardiac death or major cardiac complications in postoperative period) in accordance with ACC/AHA 2007 guidelines, we consider the history and clinical condition of the patient, the patient's functional capacity (i.e. metabolic equivalent or exercise duration) and the surgery-specific risk. For neurosurgery the surgery-specific risks is intermediate (reported risk of cardiac death or non fatal MI generally 1-5 percent) .

In case of pulmonary risk - i.e. the possibility of having a pulmonary clinical abnormality that ranges from atelectasis and infections to respiratory failure in prolonged mechanical ventilation, older patients undergoing neurosurgery or a procedure > 3 hours have an intermediate risk of postoperative pulmonary complications.

In light of the recent data on the occurrence of postoperative delirium and postoperative cognitive dysfunction, a preoperative cognitive assessment should also be introduced for elderly patients involving multiple cognitive domains such as attention, memory and psychomotor speed.

On the basis of what previously discussed, the preoperative evaluation requires an integrated multidisciplinary approach across specialties (anesthesiologist, cardiologist, internist, pulmonologist, and geriatrician surgeon) and the entire process must be coordinated by the anesthesiologist simply because of his/her expertise in establishing the risks specific to each scheduled surgical procedure.

Data suggest that preoperative comorbid diseases are a greater determinant of postoperative complication than anesthetic management.

When planning the intraoperative conduct, it is essential to consider the alteration of pharmacological responses, and in general it seems more prudent to use drugs with a short duration of action or easier to titrate in regard to both opioids and curares.

The optimal physiological management producing the best surgical outcome is yet undetermined.

There is also no clear evidence with regard to the minimum hemoglobin level that must be maintained.

During surgery, attention should be paid to avoiding a drop in temperature: elderly patients are prone to deeper and more prolonged hypothermia than younger patients and anesthetics inhibit the normal compensatory mechanisms up to 2 - 3° below normothermia; hypothermia exposes the patients to cardiac complications, induces an alteration in the coagulation processes (with documented increased blood loss and consequent increase in transfusions) and correlates with an increased risk of surgical wound infection.

Perioperative complications in the elderly are associated with greater mortality.

In postoperative settings, attention should be paid to the fact that common postoperative complications in older patients may arise with nonspecific symptoms: infection may occur with no fever or myocardial infarction may be without pain.

The most frequent age-related complications are postoperative delirium and postoperative cognitive dysfunction. Postoperative delirium is characterized by an acute change in cognitive function and can result in longer hospital stays, higher morbidity rates, and more frequent discharges to long-term care facilities.

Postoperative cognitive dysfunction is characterized by a change in cognitive test performance largely reversible within 3 months in most cases.

Rooke GA: Cardiovascular aging and anesthetic implications. *J Cardiothorac Vasc Anesth* 2003; 17:512-523.

Nunn J: *Nunn's Applied Respiratory Physiology*, 4th ed. Oxford, Butterworth-Heinemann, 1995

Dzankic S, Pastor D, Gonzalez C, Leung JM: The prevalence and predictive value of abnormal preoperative laboratory tests in elderly surgical patients. *Anesth Analg* 2001; 93:301-308.

Canet J., Gallart L., Gomar C., et al, Prediction of post operative pulmonary complications in a population-based surgical cohort. *Anesthesiology* 2010; 113:1338.

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