Anaesthetic management for the elderly patient

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The number of anaesthetic services provided to the elderly is constantly increasing. In order to provide the best services possible, the anaesthetist must be familiar with the special characteristics of the elderly. There is no ideal type of anaesthesia. The strategy for management must be based on a thorough medical evaluation and must aim at correcting, if possible, any detected abnormality. The older patient must be constantly monitored during anaesthesia, medication administration must be adjusted, based on his individual response, and he must be monitored closely during the postoperative period.

Surgical risk

Age plays an important role in the assessment of surgical risk because of both the physiologic alterations and the pathologic conditions associated with aging. Physiologic changes, always associated with old age, are characterized by a decreased response of the organism to stress. In their evaluation of cardiac risk factors during the preoperative period, Goldman *et al.*[1] assigned five points to patients over 70 years of age versus ten points if there had been a myocardial infarction within the last six months. Steen *et al.*[2] observed that age was not a determining factor in the rate of recurrence of myocardial infarction after surgery. Djohvonic *et al.*[3] noted a mortality rate within one month following surgery of 6.2 per cent in 500 patients over age 80, myocardial infarction being the most frequent cause. Other studies report comparable mortality rates which are ten times the operative mortality encountered in patients 20–30 years old.

In addition to age, other factors significantly increase the mortality rate. These factors are enumerated in Table I. Denney *et al.*[4] reported a mortality rate of 29 per cent among elderly patients with disease in one organ compared to 4.9 per cent in a healthy group. These same studies show that emergency surgical procedures represent a higher risk, emphasizing the importance of carefully evaluating these patients. Abdominal and thoracic surgery represent a higher risk than surgery of the extremities. Operations which take more than two hours represent an increased risk and are often associated with an increased blood loss.

Risk as influenced by the type of anaesthesia

Since the beginning of modern anaesthesia, the general question of the superiority of regional anaesthesia over general anaesthesia has been debated. In the early days of anaesthesia and until recently, local and regional anaesthesia was often safer for the patient because of the lack of monitoring during surgery and the poor quality of postoperative care. Some anaesthetists and surgical and medical consultants still believe that the elderly, like many other patients who are seriously ill, would benefit from one form or another of regional anaesthesia. These opinions are based solely on impressions and on tradition, for no prospective study has been published to corroborate them.

Two types of surgery can be used to compare different types of anaesthesia. First is surgery of the

TABLE I Factors influencing the postoperative mortality rate among elderly patients

Factors	*References*
Aging	3, 4
Associated diseases	3, 4
Elective vs urgent surgery	10, 11
Site of operation	3, 10
Length of operation	2, 10

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TABLE II Spinal and general anaesthesia: comparison in surgery of the hip[6]

	Spinal	*General*	*Difference*
Number	64	68	NS
Age (years)	81	78	NS
Fracture-surgery interval (hours)	24	25	NS
Duration of anaesthesia (min)	104	104	NS
Operative blood loss (ml)	304	468	<0.05
Postoperative blood loss (ml)	209	246	NS
Venous thrombosis (%)	46	76	<0.05
Mortality	3	9	<0.1

hip; the report by Davis *et al.*[5] is representative of such studies and summarizes the question. The authors compare spinal anaesthesia and general anaesthesia in patients with hip fractures (Table II). Spinal anaesthesia was shown to be superior with respect to operative blood loss, and to be associated with a lower incidence of venous thrombosis and consequently, of pulmonary embolism, the most common cause of mortality. A PaO_2 <60 mmHg was more frequent in the general anaesthesia group, but after 24 hours the difference was no longer significant. Other studies show similar figures: venous thrombosis, if considered separately, is less frequent when regional anaesthesia is used. Most studies emphasize the importance of a thorough preoperative evaluation and a high quality of postoperative care.

In the longer term, there are no differences between mortality rates:[6] the difference between the studies are explained by the difference in the length of the studies. In the immediate postoperative period, regional anaesthesia is superior. This difference disappears later.

One of the often mentioned advantages of regional anaesthesia, the absence of psychological changes, depends more on postoperative care aimed at avoiding regressive and depressive behaviour in the older patient.

In the case of prostatic surgery, in particular trans-urethral resection (TURP), regional anaesthesia has also been considered superior. Published reports show that other factors are more important than the type of anaesthesia. In a study of more than 2000 patients, Melchior *et al.*[7] reported that the following factors increased morbidity and mortality rates: age >80 years old, resection time >150 minutes, an amount of excised tissue greater than 60 grams, the surgeon's experience and the presence of renal failure. The type of anaesthesia was not considered to be a significant factor.

Preoperative evaluation

Evaluation of the geriatric patient is of the utmost importance, considering the frequent occurrence of illnesses associated with aging and the normal deterioration of the body's various functions. The best way to illustrate the importance of preoperative evaluation is to examine the complications encountered in geriatric patients during the preoperative period. Stephen[8] reported the abnormalities encountered in 1000 patients over 70 years old (Table III). Hypertension and renal failure are the most frequent. The rate of postoperative complications was 36.4 per cent, with hypertension and ECG changes being most common. The mortality rate was 5.8 per cent; 84 per cent of the patients who died had more than three complications present during the preoperative period.

When evaluating the elderly patient, one must keep in mind the normal physiological changes and

TABLE III Preanaesthesic complications encountered in 1000 elderly patients[8]

Complications	*Incidence (per cent)*
Hypertension	46.6
Atherosclerosis	26.9
Myocardial infarction	18.5
Cardiomegaly	13.6
Congestive heart failure	7.5
Angina	6.4
Cerebrovascular accident	5.8
Chronic obstructive pulmonary disease	14.0
Diabetes	9.2
Renal disease	31.4
Liver disease	8.5

TABLE IV Preoperative evaluation; variables influenced by aging[9]

Pulmonary function	Glycemia
Blood pressure	Hearing
Haemoglobin	Eyesight
Serum albumin	Muscle strength
Creatinine clearance	

the various abnormal conditions frequently associated with aging. The anaesthetist should try to determine the patient's biological age. One must not forget that in general, the patient who looks older is often biologically older; the patient's lifestyle often reflects the biological age more than the chronological age. Table IV lists nine variables which can be observed or measured and which reflect the patient's biological age.[9]

Choice of anaesthesia/Anaesthetic management

There is no such thing as the ideal form of anaesthesia. Only a prospective study could provide an objective answer and it is not likely that either regional or general anaesthesia would clearly prove superior. Whichever type of anaesthesia is used, it must be accompanied by a thorough preoperative evaluation, careful monitoring during surgery with the objective to maintain function at a level as normal as possible for the patient, and by good postoperative care.

It is important to understand the elderly patient's particularities regarding his response to medication. The geriatric patient has an altered response to medication, caused by changes in absorption, distribution, metabolism and excretion. His response to most drugs is modified quantitatively and/or qualitatively. Altered responses to drugs found in older patients, and recommendations for the most frequently used agents are summarized in Table V.

Premedication

Premedication must be administered with caution, keeping in mind that geriatric patients show a higher sensitivity to central nervous system depressants. When visiting the patient, the anaesthetist should tell him what to expect in the operating room, what type of anaesthesia has been selected, and what kind of monitoring equipment will be used.

TABLE V Pharmacologic changes and recommendations

Agent	*Changes in elderly*	*Clinical recommendations*
Thiopentone	↓ ED_{50}.	Reduce dose by ⅓ to ½
	Highly lipid soluble: longer half-life.	Limit total dose
	Highly albumin bound	↓ dose with other drugs
Benzodiazepine	Elderly more sensitive	Limit dose, ↑ dose intervals
	Prolonged activity	
Morphine	↑ sensitivity	↓ dose
	↑ plasma levels	↓ dose
	↑ terminal elimination half-life	Longer dose intervals
Fentanyl	↑ terminal elimination half-life, ↓ clearance	Longer dose intervals
Ketamine	Hypertension and tachycardia	Be prepared to treat side effects
	Hallucinations	
Droperidol	Extra pyramidal effects	Contraindicated in Parkinson's disease
	Alpha-blocking effects may lead to hypotension	↓ dose
	Prolonged duration of action	
Lidocaine	↑ half-life	Longer dose intervals
	↓ clearance	↓ infusion rates
Pancuronium	↓ plasma clearance	↓ dose
	Prolonged elimination half-life	↑ dose intervals
D-Tubocurare	↓ plasma clearance	↓ dose
	↑ elimination half-life	↑ dose intervals
Atropine	↓ clearance	↓ dose
	↑ half-life	↑ dose intervals
Halothane	↓ MAC (25% at 80 years)	↓ dose
Isoflurane	↓ MAC (22% at 80 years)	↓ dose

Monitoring

The use of monitoring devices allows the early detection and correction of abnormalities occurring during the operation. This is even more true with older patients whose physiologic responses are decreased. Basic monitoring should include: ECG, blood pressure, temperature and use of a nerve stimulator. The blood pressure should be monitored constantly with a device capable of indicating changes within a few seconds or with an arterial catheter which will also allow measurement of blood gases. When central vascular monitoring is indicated, catheterization of the pulmonary artery is preferred to that of the vena cava because of the poor correlation between central venous pressure and left heart pressures. Furthermore, measurement of the cardiac output is an important element in the evaluation of the elderly patient's cardiovascular system.

Induction and maintenance

The choice of agent and technique must be based on the patient's condition and on the observations resulting from constant monitoring. The anaesthetist should also be familiar with the expected response in the elderly patient to the drugs he is using.

Ideally, the monitoring devices should be installed when the patient is awake, using local anaesthesia as necessary, always making sure that the patient is comfortable. Whatever the type of anaesthesia used, major variations in the blood pressure, PaO_2 or $PaCO_2$ must be avoided. Normal ventilation should be maintained because of the adverse effects of hyperventilation on the cerebral circulation.

Postanaesthesia maintenance

It is essential to consider the period immediately following the operation as being part of the anaesthetic and as being the anaesthetist's responsibility. During this period, the patient's monitoring must be maintained in order to detect any abnormality: hypertension or hypotension, hypoxia or hypercarbia, muscle weakness.

The geriatric patient should not be left to suffer under the pretence that his level of tolerance to pain is high. The judicious use of analgesics or of regional anaesthesia must be part of proper post-anaesthesia management. In summary, the best way to minimize complications is to prevent them. This holds particularly true for the anaesthesic management of the elderly patient.

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