

Anesthesia for Interventional Neuroradiology: Part II: Preoperative Assessment, Premedication

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Citation

A Rosas. *Anesthesia for Interventional Neuroradiology: Part II: Preoperative Assessment, Premedication*. The Internet Journal of Anesthesiology. 1996 Volume 1 Number 2.

Abstract

PREOPERATIVE ASSESSMENT

Particular emphasis should be placed on the following aspects of the patient's history:

ALLERGIES

Dangerous reactions can occur with radiologic contrast media, and protamine. Contrast media are associated with a 5% to 8% incidence of untoward systemic reactions that can range from nausea to anaphylaxis and death.(32) Reactions can be due to the hypertonicity of the substance, direct cardiac depression, or idiosyncratic anaphylactoid reactions.(33) Older hypertonic, hyperosmolar, ionic contrast media are especially associated with intravascular volume problems, such as initial hypervolemia followed by diuresis and dehydration. The newer nonionic low osmolarity agents, although more expensive, seem to be safer and can be used in greater volumes,(34) but the incidence of serious idiosyncratic reactions (2 to 3 percent) is no different when compared with older agents. Because these substances contain iodine to increase their density, allergies to iodine and shellfish may predispose to a contrast reaction. Patients that have a history of reactions to contrast media should be pretreated orally with steroids (e.g., prednisone 50 mg PO q6h for 18 hours prior to the study) and antihistamines (e.g., diphenhydramine 50 mg PO or IM 1 hour prior to the study), or with intravenous infusions of steroids and antihistamines the night before and the morning of the study.(35)

Severe reactions can occur when administering protamine. These can be due to rapid administration, immunologically mediated anaphylaxis, or anaphylactoid reactions, and range from rash and urticaria to severe pulmonary hypertension and death.(36) (37) A diabetic on protamine insulin may have an increased risk of developing a protamine reaction.

Other weakly predisposing factors reported include prior vasectomy, a history of fish allergy, and previous protamine administration.(38) (39) (40)

Treatment of contrast media reactions

- Adrenergic agonists
- Epinephrine 3-5 mg/Kg IV bolus
- Epinephrine 1-4 mg/min IV infusion
- Methylxanthines
- Aminophylline 5-6 mg/kg/20 min., initial dose
- Aminophylline 0.5 - 0.9 mg/kg/h., maintenance
- Anticholinergics
- Atropine 0.5 - 2 mg IV
- Antihistamines
- Diphenhydramine 25 - 50 mg IV
- Steroids
- Methylprednisone 100 - 1000 mg IV
- Dexamethasone 4-20 mg IV

From Goldberg M: Systemic reactions to intravascular contrast media: a guide for the anesthesiologist. *Anesthesiology* 60:46-56, 1984.

MEDICATIONS

In order to avoid bleeding complications during these invasive procedures, the coagulation system must be evaluated preoperatively, particularly in patients taking

anticoagulants. Oral anticoagulants should be stopped at least 48 hours prior to the procedure. If there is a continued need for anticoagulation, the patient may be treated with heparin, which can be easily reversed with protamine.(41)

-blockers are often used intraoperatively to control blood pressure in these cases, and bradycardia can occur when calcium channel blocking agents or digitalis are given concurrently with them.(42) Nevertheless, patients should continue taking their antihypertensive and cardiac medications with the exception of diuretics, right up to the time of the procedure.(43)

Diabetics on insulin pose special problems in addition to the systemic effects of end organ disease. Optimal anesthetic management aims to avoid extremes of glucose concentration, since both hyperglycemia and hypoglycemia have a negative impact. Hyperglycemia in the presence of cerebral ischemia has been associated with a poor neurologic outcome.(44) (45) In view of the potential for neurologic injury in INR, blood sugar must be closely monitored and controlled perioperatively in these patients. We aim to keep the blood sugar between 150 and 200 mg percent. In poorly controlled insulin-dependent diabetics, altered neurologic status after an invasive procedure may be due to ketosis or hypoglycemia.(46)

In patients taking anticonvulsants, seizure activity, postictal states and many drug interactions may also occur. A patient's altered neurological status after an invasive procedure may also be due to a postictal state.

Therefore, to avoid perioperative seizures, patients must continue taking their anticonvulsants up to the time of the procedure, unless undergoing a Wada-Rasmussen test (described later).

CARDIOVASCULAR AND PULMONARY HISTORY

A history of coronary disease, carotid artery disease, or congestive heart failure, may place narrow limits on fluid administration and limit the use of induced hypertension or hypotension. The use of -blockers to induce hypotension may not be indicated in patients with a history of heart failure or bronchospastic disease. In this case, nitroglycerin, sodium nitroprusside, or another vasodilator may have to be used instead. Since large amounts of contrast media and catheter flush solution are often used, a susceptible patient can be easily overloaded with fluid. Conversely, contrast media can also induce an osmotic diuresis leading to

dehydration.

Patients with long-standing hypertension must be identified. Hypertension must be controlled prior to induction to avoid wide oscillations in blood pressure during the procedure. Preoperative diastolic pressures above 115 mm Hg

increase perioperative morbidity and, unless the procedure is emergent, the case should be postponed until the hypertension is controlled.(47) In hypertensive patients, autoregulation of cerebral blood flow is shifted to the right; therefore, during induced hypotension, cerebral ischemia will occur at a higher level of blood pressure when compared with normal patients.(48)

NEUROLOGIC HISTORY

Preoperatively, the anesthesiologist should take a brief baseline neurologic history and perform a short neurologic exam to compare it with the patient's postoperative neurologic status.

This evaluation also helps to determine the level of perioperative invasive monitoring required, the need for intracranial pressure monitoring, and overall risk.

Important items in the neurologic exam

1. State of consciousness, orientation,
2. Glasgow coma scale, Hess and Hunt scale
3. Respiratory pattern, pupil size and symmetry.
4. Handiness, abnormal movements
5. Cranial nerve deficits
6. Visual field defects
7. Motor or sensory deficits

The nature, location, and size of the lesion; AVM, aneurysm, or fistula, and previous treatment results or complications must be known. The score of the Hunt and Hess(49) subarachnoid hemorrhage scale, which has prognostic value and determines treatment, should be noted in cases of ruptured aneurysm.

As the intracranial pressure increases and cerebral autoregulation fails, the grade of the Hunt and Hess scale worsens. Patients with grades I and II have little increase in ICP, whereas those with grades III through V have elevated ICP and failed cerebrovascular autoregulation and CO₂

responsiveness.

Hunt and Hess Classification for aneurysms

1. Grade I: Asymptomatic or with slight headache
2. Grade II: Moderate to severe headache and nuchal rigidity but no focal or lateralizing signs
3. Grade III: Drowsiness, confusion, and mild focal deficits
4. Grade IV: Stupor, hemiparesis, early decerebrate rigidity and vegetative disturbances
5. Grade V: Deep coma and decerebrate rigidity

Global cerebral dysfunction secondary to elevated intracranial pressure is assessed with the Glasgow coma scale. The presence of increased intracranial pressure (ICP) or arterial vasospasm will place limitations on the ventilatory and

circulatory manipulations that the radiologist requests, and may alter the approach used. As the intracranial pressure increases, the patient becomes progressively more confused, lethargic, stuporous, and eventually comatose. Patients with a GCS score of 8 or less should have direct monitoring of ICP. (50)

GLASGOW COMA SCALE

Test finding score

- Eye opening no response 1
- Response to pain 2
- Response to voice 3
- Spontaneously 4
- Verbal response No response 1
- incomprehensible sounds 2
- inappropriate words 3
- Disoriented conversation 4
- Oriented and appropriate 5
- Motor Response
- No Response 1

- decerebrate posturing 2
- Decorticate posturing 3
- Flexion withdrawal 4
- Localizes Pain 5
- Obeys Commands 6
- Maximum total score 15

Glasgow coma scale, and Hunt and Hess scales; with permission from: Kirsch JR, Diringer MN: Evaluation of the patient with Neurologic disease in: Rogers MC, Tinker JH, et al, eds. Principles and Practice of Anesthesiology. St. Louis, 1993, Mosby.

PREMEDICATION

The primary goals of premedication are anxiolysis, sedation, amnesia, and a decrease in autonomic adrenergic discharge. Additional goals are a reduction of gastric acidity and volume, an antisialogogue effect, and a reduction in nausea and vomiting.(51) The primary goals can usually be met by benzodiazepines alone. These agents produce relatively little respiratory or cardiac depression(52), and can be safely used in most patients undergoing INR procedures. Midazolam, when used in doses of 0.05 to 0.1 mg/Kg IM, or titrated intravenously, provides close to ideal sedation of short duration. Benzodiazepines must be used cautiously in patients with elevated ICP since they can cause respiratory depression in this setting. Unless a patient is experiencing significant preoperative pain, narcotic premedication is not needed, and is contraindicated in cases with elevated ICP.(53)

In patients with subarachnoid hemorrhage, the obese, and those with gastroesophageal reflux, H2 receptor antagonists, such as cimetidine or ranitidine are used in order to decrease the risk of pulmonary aspiration.(54) Glycopyrrolate is an effective and frequently used antisialogogue, but it does not alter gastric pH or volume, and is seldom used for this indication.(55) Metoclopramide, which decreases gastric volume due to a gastrokinetic action and has antiemetic effects, is used most effectively when combined with H2-receptor antagonists, to decrease the risk of aspiration.(56)

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