Preoperative assessment of neurosurgical patients

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Abstract

The aims of the preoperative assessment of neurosurgical patients include exchange of information, reassuring the anxious patient, establishing whether raised intracranial pressure is present and optimizing any co-existing medical problems, which may or may not be related to the neurological condition. The patient's neurological status must be assessed and documented preoperatively as it will impact on the anaesthetic and is vital for assessing the patient in the postoperative period. Any increase in intracranial pressure must be identified. Patients are commonly taking hypoglycaemic, anticonvulsant, anticoagulant, antihypertensive and corticosteroid medication, all of which may impact on the conduct of anaesthesia. Fluid and electrolyte disturbances are common as a result of the underlying condition or of the treatment received. It is important that these are identified and corrected preoperatively. Difficult airways are encountered frequently (e.g. in patients with cervical spine abnormalities or acromegaly) and it is therefore particularly important to carry out a detailed airway assessment and construct a plan for airway management. The preoperative assessment and consideration of the underlying neuropathology allows formulation of an appropriate and safe plan for induction, airway management, maintenance of anaesthesia and postoperative care.

Keywords Glasgow Coma Score; intracranial pressure; neurosurgical patients; preoperative assessment

General anaesthetic history

Visiting neurosurgical patients preoperatively not only allows anaesthetists to assess the history and preoperative condition of the patient but also provides an opportunity to reassure an anxious patient. In addition, as well as planning the conduct of anaesthesia, the visit allows planning of the most appropriate destination for the patient postoperatively (bed level 1, 2 or 3). For example, patients who have had procedures near the brainstem or neurovascular procedures require high-dependency care postoperatively, whereas those who have had minor spinal surgery can be safely nursed in the general ward.

As with all surgery, it is important to take a full general anaesthetic history, with an emphasis on the particular areas outlined below.

Neurological status: an assessment of a patient's neurological status by the anaesthetist is vital. The Glasgow Coma Score (GCS) is an integral part of this assessment and should be documented preoperatively in all patients. It allows assessment of the patient's level of consciousness and gives an indication of the urgency of surgery as well as being a useful tool in comparing the patient's gross neurological condition at different time points.[1] The GCS should be documented as a breakdown of the three modalities assessed (e.g. best eye response 2; best verbal response 2; best motor response 4; rather than simply GCS 8) as this gives more information on the patient's condition. A GCS of 8 or lower indicates a conscious level that may result in significant risk of hypoxaemia and hypercarbia, both of which may cause an increase in intracranial pressure (ICP). To preserve cerebral perfusion and protect the airway these patients should undergo early tracheal intubation and mechanical ventilation. A rapidly decreasing GCS suggests progression of the underlying condition, or a new cerebral event, warranting urgent investigation and management. Pupil size and reaction should also be documented – this becomes particularly important in a patient with increased ICP, who is due to have or has had anaesthesia.

Most patients presenting for urgent or elective surgery will have a normal GCS. However, it is important to note and document any pre-existing sensory and motor deficits and more subtle symptoms and signs of raised ICP (Table 1). Also of importance to the anaesthetist are bulbar and respiratory motor function and the presence of autonomic dysfunction.

Radiological images should be carefully examined for signs of raised ICP and to characterize the lesion responsible (Table 2).

Fluid and electrolyte disturbances: patients presenting for neurosurgery are at particular risk of developing fluid and electrolyte

Signs and symptoms of raised intracranial pressure

- Headache – postural, worse in morning or on coughing, sneezing
- Vomiting
- Papilloedema
- Unilateral/bilateral pupillary dilatation
- Cranial nerve III or VI palsy
- Drowsiness/loss of consciousness
- Absent brainstem reflexes
- Arterial hypertension
- Bradycardia
- Abnormal respiration

Table 1

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Radiological signs indicating raised intracranial pressure

CT/MRI scans

- Mass
- Hydrocephalus
- Cerebral oedema
- Midline shift
- Obliteration of CSF cisterns around brainstem
- Effacement of ventricles and cortical sulci

Table 2

disturbances for many reasons. A decreased conscious level, vomiting, bulbar dysfunction or pending surgery often results in poor oral intake, leading to dehydration. Subsequent overzealous intravenous rehydration may cause fluid overload and electrolyte imbalance. Furthermore, the patient may have received osmotic or loop diuretic therapy as part of the management of raised ICP. The neurological pathology itself can also be associated with disturbances of sodium/water balance (i.e. syndrome of inappropriate antidiuretic hormone secretion (SIADH), cerebral salt wasting (CSWS) and diabetes insipidus (Table 3).

Finally, many neurosurgical patients will receive corticosteroids, which may cause hyperglycaemia and changes in fluid/electrolyte balance. The former may require intravenous insulin perioperatively. Electrolyte/fluid disturbances should be corrected as far as possible before surgery to optimize cerebral perfusion and to minimize the risk of cerebral oedema.

Drug therapy: patients presenting for neurosurgery often receive corticosteroid, antihypertensive, and anticonvulsant drugs as well as aspirin, warfarin, analgesic and antiglycaemic drugs.

Most of these drugs should be continued into the perioperative period. However, anticoagulants such as warfarin and clopidogrel should be stopped at the appropriate time to allow clotting and platelet function to return to normal. Aspirin is also often stopped, but the decision to do so requires consideration of the risks and benefits and should involve an anaesthetist, surgeon and cardiologist.

Patients taking drugs for chronic pain generally have their analgesics/adjuncts continued perioperatively, which allows better control of postoperative pain.

Patients with diabetes usually have their oral hypoglycaemic drugs omitted on the morning of surgery and, unless undergoing a short minor procedure, should receive an insulin sliding scale to optimize glycaemic control in the perioperative period. This may reduce the incidence of wound infection and improve outcome in ischaemic brain injury. Patients taking corticosteroids should have their blood glucose measured regularly.

Antihypertensive agents, with the exception of angiotensin-converting enzyme inhibitors and angiotensin II receptor antagonists,[2] which can cause refractory hypotension intraoperatively, should be continued throughout the perioperative period.

Similarly, it is vital that anticonvulsant agents are continued perioperatively whilst remembering that they can cause induction of hepatic enzymes and thus influence the pharmacokinetics of many anaesthetic drugs.

Airway: certain groups of neurosurgical patients can present an anaesthetist with airway difficulties and it is vital that these difficulties are recognized and documented preoperatively. These groups of patients include those with cervical spine disease or instability (e.g. following head trauma) and patients with acromegaly.

If a fibre-optic tracheal intubation, either awake or under sedation, is planned, a full explanation should be given to the patient and the use of an anticholinergic premedication considered and prescribed accordingly.

Co-existing disease: co-morbidity is common in the neurosurgical population. Hypertension is a risk factor for, or associated with, carotid artery stenosis and cerebral aneurysms, and so is frequently encountered in this population of surgical patients. Chronic hypertension causes a right shift of the cerebral autoregulation curve and therefore episodes of hypotension are more likely to cause cerebral hypoperfusion. Blood pressure should be controlled perioperatively where possible; furthermore, if intraoperatively controlled hypotension is to be used, accepted limits must be adjusted accordingly.

Diabetes, ischaemic heart disease and epilepsy (discussed in more detail elsewhere) are also commonly encountered in neurosurgical patients. All co-existing medical problems should be assessed, investigated appropriately and optimized preoperatively.

Premedication

Sedative premedication should be avoided in patients with a reduced GCS or raised ICP. They may further obtund a patient,

Fluid and electrolyte disorders associated with neurological pathology

Condition	Serum sodium concentration	Plasma volume	Serum osmolality	Urine sodium concentration	Urine osmolality	Treatment
SIADH	Low	Normal or increased	Low	High	High	Fluid restriction
CSWS	Low	Decreased	Normal or high	High	Normal or high	Isotonic or hypertonic saline
DI	High	Decreased	High	Normal	Low	Hypotonic saline + vasopressin

CSWS, cerebral salt wasting; DI, diabetes insipidus; SIADH, syndrome of inappropriate antidiuretic hormone secretion

Table 3