Deep *vs* awake extubation for craniotomies

Craniotomies are high-risk procedures, and postoperative complications can lead to death or severe disability. Major complications after intracranial surgery can occur in 13–27% of patients and anaesthetists are key in preventing these. Using techniques that allow control of factors influencing cerebral blood flow, cerebral metabolism and intracranial pressure increases the likelihood of a good outcome. These must include an extubation plan which facilitates smooth emergence from anaesthesia, avoids abrupt increases in intracranial pressure and allows early postoperative neurological assessment.

Deep extubation

Emergence and tracheal extubation is a period of intense physiological stress for patients and can elicit undesirable cardiovascular and airway reflexes. Hypertension during emergence has been reported in 70–90% of patients (Lim et al, 2000). Postoperative intracranial haematoma is strongly associated with hypertension (Basali et al, 2000). Tracheal extubation is associated with a 10–30% increase in arterial pressure and heart rate lasting 5–15 minutes (Miller et al, 1995; Karmarkar and Varshney, 2008).

Agitation, increased oxygen consumption, catecholamine secretion, hypercapnia, systemic hypertension and exaggerated airway reflexes during awake extubation may exacerbate cerebral hyperaemia and lead to cerebral oedema and haemorrhage. Even brief periods of coughing and hypertension can increase intracranial pressure and result in adverse postoperative outcomes which can be mitigated by a deep extubation (Karmarkar and Varshney, 2008).

This technique requires a balance between an adequate anaesthetic depth and a spontaneous minute ventilation sufficient to avoid postoperative hypoxia and hypercarbia, both of which have deleterious effects on intracranial pressure. This can be facilitated by ensuring patients are given 100% oxygen and are extubated in the semi-upright position, improving diaphragmatic expansion and increasing functional residual capacity. To prevent laryngospasm, careful suctioning of the posterior pharynx is essential before attempting to extubate with this technique.

Awake extubation

Continued suppression of laryngeal reflexes induced by general anaesthesia is a major disadvantage of deep extubation. This prevents coughing and may result in aspiration of foreign material. The incidence of respiratory complications is greater after deep extubation than awake extubation, regardless of the type of operation (30.9% *vs* 8.6% in neurosurgery)(Asai et al, 1998; Karmarkar and Varshney, 2008).

Patients are at risk of partial or total airway obstruction after deep extubation, although most improve after basic airway manoeuvres and use of simple airway adjuncts. Failure to recognize this may cause disastrous complications, so the presence of an anaesthetist or an airway trained recovery nurse is vital postoperatively. Deep extubation should generally not be practiced in the context of difficult bag mask ventilation and/or intubation at the time of induction of anaesthesia. Awake extubation is generally safer here as the return of airway tone, reflexes and respiratory drive allows the patient to maintain his/her own airway. Local anaesthetics, vasodilators, short-acting beta-blockers and opioids can be given to obtund the haemodynamic response to awake extubation.

Neurosurgical patients who are extubated awake can be neurologically assessed earlier than patients extubated in a deep plane. This is significant, as important complications such as seizures and haemorrhage are best detected through repeated neurological observations.

The ongoing eCRANIO trial (NCT01987648) may in the near future shed light on the significance of early extubation in elective neurosurgical patients.

Conclusions

The evidence base for extubation practice is limited and further studies are required to establish the effects of deep and awake extubation on outcomes in elective craniotomies. In the absence of robust evidence, it appears that most patients undergoing craniotomies can be extubated awake with intact airway reflexes by default (Karmarkar and Varshney, 2008). This is associated with fewer respiratory complications, facilitates early neurological assessment and is not associated with worse outcomes than deep extubation. Deep extubation should only be practiced by experienced personnel in centres with trained recovery staff familiar with looking after unconscious neurosurgical patients. It should be reserved for patients in whom airway management would be easy and who are not at increased risk of aspiration. **BJHM**

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