

Anaesthesia for awake craniotomy

Cally Burnand BMedSci BMBS FRCA

Joseph Sebastian BSc MBBS MRCP FRCA



Key points

Awake craniotomy is an important technique for increased lesion removal and minimizing damage to eloquent cortex.

An important aspect of an awake craniotomy is the preoperative patient selection and preparation by the multi-disciplinary team.

There is no recognized consensus on the best anaesthetic approach to an awake craniotomy. This is because the anaesthetist varies the technique dependent on the surgeon, pathology, length of surgery, and patient factors.

Cortical mapping and clinical monitoring aim to localize eloquent brain areas.

The role of the awake craniotomy has increased recently; however, technology that allows functional brain mapping are being developed.

The awake craniotomy is an important technique used for brain tumour excision from eloquent cortex, epilepsy surgery, and deep brain stimulation surgery. It has been used, less commonly, in the management of mycotic aneurysms and arteriovenous malformations near critical brain areas.

The benefits are considered to be of increased lesion removal, with growing evidence of improved survival benefit,¹ whilst minimizing damage to eloquent cortex and resulting post-operative neurological dysfunction. Other advantages include a shorter hospitalization time, hence reduced cost of care, and a decreased incidence of postoperative complications such as nausea and vomiting.

The concept of an awake craniotomy pre-dates the existence of anaesthesia and in ancient times, trephining of the skull was used to get rid of 'evil air'.² It is a procedure that has gained in popularity because of advances in diagnosis, intra-operative functional neurosurgical technology, developments in anaesthetic agents and monitoring, and the patient's expectations.

The term 'awake craniotomy' is misleading as the patient is not fully awake for the entirety of the procedure. The more surgically stimulating parts of the procedure require varying levels of sedation, or anaesthesia. The patient is fully awake during the mapping procedure during which lesion resection takes place.

The common anaesthetic techniques used are sedation only or general anaesthesia, and awaking the patient for cortical mapping and resection, with the option of re-anaesthetizing for closure. The patient has a scalp block inserted for pain relief usually for all anaesthetic approaches. Occasionally the anaesthetic technique of awake with a scalp block alone is utilized, this can be useful in elderly patients.

The anaesthetic considerations for an awake craniotomy can make it challenging, and this article will consider the issues involved.

and psychological prerequisites to avoid failure intra-operatively. All patients should have consultations with the neurosurgeon and the anaesthetist.

These consultations allow the assessment of patient suitability (see Table 1 for absolute and relative contraindications), and preparation of the patient for the procedure. This involves a full assessment of the patient's co-morbidities, which should be optimized before operation, in order to decrease intra-operative failure of the awake technique. It is also important to be aware of how the patient's presenting problem for surgery affects them, for example, seizure type and frequency or the presence of preoperative neurological deficits.

Preoperative preparation includes providing detailed information to the patient. The patient must know what to expect and the anaesthetic risks involved. This usually includes verbal and written information. Occasionally the patient is helped by visiting the theatre and visualizing the environment and equipment involved.

Patients may be seen by the neuropsychologist before operation if the lesion involves speech and language centres, and their baseline responses to picture cards are assessed and recorded.³ In some neurosurgical centres, the neuroanaesthetist performs the role of functional assessment in theatre.

These preoperative visits provide an invaluable opportunity for the multidisciplinary team to create a rapport with the patient and therefore encourage trust and familiarity.

Theatre preparation

It is vital that communication between the anaesthetist and surgeon is effective and this is often aided by ensuring familiarity and discussion of the operative plan in detail. It is imperative that the plan for anaesthesia and surgery is well communicated to all the members of the theatre team.

As in all surgical cases, equipment should be checked and patient scans should be available before commencing. The operating table must be made as comfortable as possible as the patient may be lying in one position for several

Cally Burnand BMedSci BMBS FRCA

Consultant Anaesthetist
Salford Royal Foundation Trust
Stott Lane
Salford
M6 8HD
UK
E-mail: callyburnand@srft.nhs.uk
(for correspondence)

Joseph Sebastian BSc MBBS MRCP
FRCA

Consultant Anaesthetist
Salford Royal NHS Foundation Trust
Stott Lane
Salford
M6 8HD
UK

Table 1 Anaesthetic contraindications

Absolute
Patient refusal
Inability to lay still for any length of time
Inability to co-operate, for example confusion
Relative
Patient cough
Learning difficulties
Inability to lay flat
Patient anxiety
Language barriers
Obstructive sleep apnoea
Young age

hours. The temperature of the operating theatre should be comfortable for the patient, and staff numbers should be minimized to alleviate unneeded noise and patient anxiety.

Consideration should be given to the operating theatre layout and position of the patient. The ability to communicate with the patient should be maintained at all times and of equal importance is access to the patient during adverse incidents.⁴

The patient position is dictated by the location of the lesion. This is usually a lateral or supine position, but with occipital lesions and testing the visual cortex, a sitting position may be used. In any position, it is important that when the patient is fully awake during mapping that they are able to see and communicate with the

anaesthetist or neuropsychologist. Sterile drapes used must not encroach over the patient's face as this can cause patient claustrophobia and difficulty communicating.

A typical operating theatre layout is shown in Figure 1.

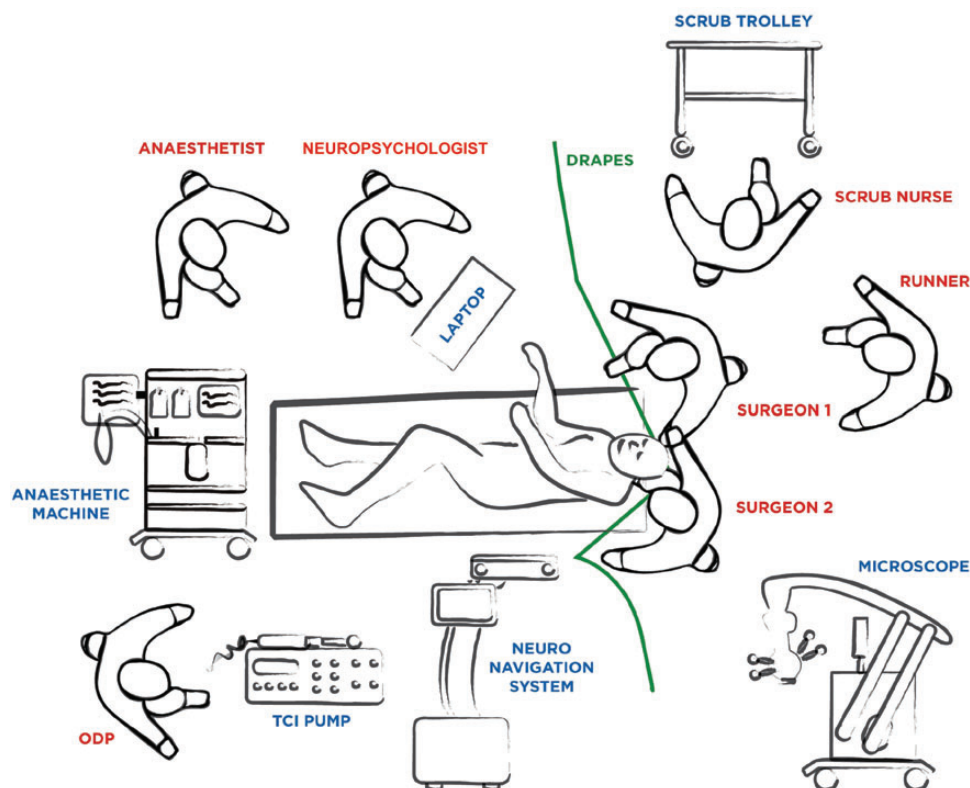
General anaesthetic principles

Premedication is not common, but consideration must be given to acid reflux prophylaxis, and patients must take their usual steroid, anti-epileptic, or anti-hypertensive medication. Some neurosurgical centres may load the patient with anti-convulsants on the day of surgery or check for therapeutic plasma levels of anti-convulsants if patients are already on them.

Standard anaesthetic monitoring is applied as according to the Association of Anaesthetists of Great Britain and Ireland guidelines. Large-bore intravenous access is gained and the majority of anaesthetists insert an arterial line, usually sedated or asleep.

The use of other forms of monitoring is variable. Depth of anaesthesia monitors, for example bispectral index monitoring (BISTM), is sometimes utilized and there is some suggestion that its use reduces the amount of anaesthetic agents administered, and hence the time taken for patient emergence and co-operation for cortical mapping.⁵

Urinary catheterization can cause discomfort and intolerance of the procedure; some centres use urinary convenes.⁶ When urinary

**Fig 1** Theatre layout for an awake craniotomy.

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