

## Initial Experience with Awake Craniotomy In Sudan

Hadab A Mohamed<sup>1,3</sup>, Mohamed AR Arbab<sup>2,3</sup>, Sawsan A Aldeaf<sup>3</sup>.

### Abstract

Resection of brain tumours carries a great risk of functional impairment, especially if the tumour is located in the anterior temporal or frontal lobes, near motor, language, or memory areas of the brain. Awake craniotomy has been proposed aiming for maximum resection with minimum impairment of neurological function. The technique should provide adequate sedation, analgesia, respiratory and haemodynamic stability with an awake and cooperative patient for neurological testing.



Airway management during a wake craniotomy is a crucial part of the anaesthetic technique, but it remains the subject of debate.

In this case, who was the first patient operated upon as awake craniotomy in Sudan; awake craniotomy has been adopted as his cardiac function made surgery under general anaesthesia a potential risk.

The patient's tolerance to the procedure, haemodynamic stability, the incidence of airway obstruction and intraoperative and postoperative neurological status were assessed. The candidate well tolerated the procedure, with haemodynamic stability and a patent airway throughout the procedure. Convenient resection of the tumor was achieved and uneventful post-operative recovery with no neurological deficits was reported.

Key words: awake craniotomy, propofol, fentanyl.

**A**wake craniotomy was first introduced in the 19<sup>th</sup> century for the removal of epileptic foci under local anaesthesia<sup>1</sup>. In the following years, the indications for awake craniotomy have extended to involve resection of brain tumours involving eloquent areas and finally, in more recent years, for removal of supratentorial tumours, regardless of the area involved of the cortex<sup>3</sup>.

In order to determine eloquent cortical areas during brain tumor resection, the patient must be conscious and able to talk during cortical stimulation. The challenge for the anesthetist is to find a technique that provides adequate sedation, analgesia, respiratory and

haemodynamic control, but also an awake and cooperative patient for neurological testing. Different institutes of neurosurgery have established their own anaesthetic techniques for awake craniotomies, but no one has proved to be superior<sup>2-7</sup>.

The goal of all techniques is to render the patient alert, cooperative and able to participate in verbal and motor testing during the procedure.

Also maximum resection should be facilitated, with minimum impairment of neurological function.

All indications for awake craniotomy, as we can see, have only focused on the tumour location without considering the patient's clinical condition which, in some moribund patients, may render the selection of general anaesthesia as a heroic decision.

In this report, we present our first experience with awake craniotomy done with scalp block and sedation with unsupported airway.

1. Department of anaesthesia, faculty of medicine, university of Khartoum –Sudan

2. Department of surgery, faculty of Medicine. University of Khartoum-Sudan

3. National Center for Neurological Sciences- Khartoum-Sudan

The main indication for the awake craniotomy was the patient's clinical condition.

### Case Report:

An 80 years old man, was noted in the last three weeks to have pressure of talk, self neglect and emotionally labile with considerable memory loss and left sided facial weakness. He gave a history of recurrent admissions for congestive cardiac failure which was well controlled for the last 2 years during which he remained mostly symptoms free with good tolerance to daily activities. He denied any other cardiovascular related symptoms.

Clinically, he looked well, fully conscious, a febrile. Psychologically he expressed denial attitude. His pulse was 90 beats per minute irregularly irregular, blood pressure was 131/85, respiratory rate was 12 breaths per minute and temperature was 36.5 C°.

Systemic examination was satisfactory apart from dysphasia and left sided facial palsy (upper motor neuron lesion). No evidence of overt heart failure.

The patient has been since 2 years on regular medication for his cardiac problem.

Investigations showed the followings: Complete blood count was normal. Urine was clear. Blood urea was 73 mg/dl. Serum creatinine was 1.4 mg/dl. Serum sodium was 136 mmol/l. Serum potassium was 3.8 mmol/l. Random blood sugar was 124 mg/dl. Blood group was O-positive. Liver function test, coagulation profile, cholesterol, triglycerides, low and high density lipoproteins were all normal. Chest X-ray revealed unfolded aorta and cardiac shadow enlargement. His ECG confirmed atrial fibrillation, left bundle branch block and frequent premature ventricular complexes. Echocardiography showed poor left ventricular function, with estimated ejection fraction of 36% and without evidence of regional wall motion abnormality.

MRI brain revealed a left temporo-parietal mass, hypo intense with capsular

enhancement and a tumour nodule. There was significant mass effect with midline shift. The picture was suggestive of malignant astrocytoma (fig.1).

The clinical data were evaluated. The fact is that this patient had a space occupying lesion in the dominant hemisphere with notable mass effect, albeit clinically stable, his left ventricular function was poor. The high risk for surgical intervention under general anaesthesia was discussed. Decision was made to carry out surgery while the patient is awake. The details of the procedure and what the patient is expected to hear during surgery (e.g. drilling and instruments sounds) were explained to the patient. The consent was obtained.

A preoperative thorough clinical assessment was made, special attention of the airway was considered to avoid the scenario of difficult intubation at a critical time. An anxiolytic (diazepam 5mg orally) was given the night before surgery.

On arrival to the operating theatre two wide pore intravenous canulae were inserted, dexamethasone 8mg iv, ceftriaxone sodium 1 gm, phenytoin 100 mg iv and ranitidine 50 mg were given. Standard monitoring was applied.

Sedation was started, using a combination of propofol (300-500 µgm/kg) bolus and fentanyl 0.7 µgm/kg. Sedation was maintained by propofol infusion at a rate of 25-75mg/kg/min. Propofol infusion was adjusted in order to achieve a sedation score  $\geq 2$ , respiratory rate  $> 8$ /min, and hemoglobin saturation  $\geq 95\%$ .

A successful skin and bone flaps were made following block of these nerves:

1. Supraorbital and supratrochlear nerves (2 ml above eyebrow).
2. Auriculotemporal and zygomaticotemporal nerves (5 ml 1.5 centimeters anterior to tragus of ear).
3. Posterior auricular branches of greater auricular nerve (2 ml posterior to ear at tragus level).

4. Greater, lesser and third occipital nerves (5 ml along superior nuchal line halfway between occipital protuberance and mastoid process)

Bupivacane without adrenaline was selected for fear of cardiovascular complications.

Oxygen was supplemented through a nasal canula and a condom urinary catheter was applied. A set of laryngeal mask airway was prepared to be used if airway obstruction develops intraoperatively.

The patient was then placed in a left lateral position, with supporting soft pillows. Skin incision and bone drilling were uneventfully tolerated. The craniotomy flap was turned with ease. The dura was installed with 5mls of 2% Lignocaine before incision and the intravenous sedation was then tailored down to facilitate functional assessment. The brain was relaxed; cortical incision was then made using the bipolar. The tumor mass was found gliotic and few pathological vessels were encountered with a small area of necrosis. There was no definite line of demarcation. The tumour was adequately debulked and excised without undue swelling or bleeding. Sedation was restarted upon closure of the dura and was terminated at the start of skin closure. The patient was comfortable, pain free and haemodynamically stable throughout the procedure, which extended for 2.5 hours. No airway obstruction was encountered.

The patient was then referred to the intensive care unit where he spent an uneventful overnight and was discharged home in the fourth postoperative day. No neurological deficits were observed.

### Discussion:

Awake craniotomy requires an adequate level of sedation during the opening and closure of bone flap without producing respiratory depression, full consciousness during brain

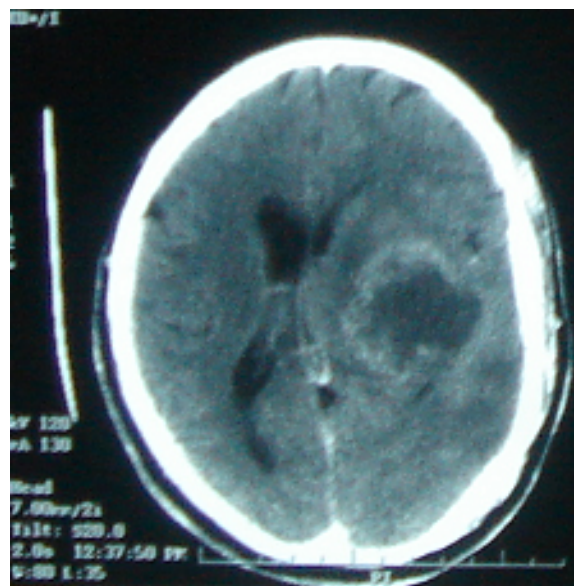


Fig.1: MRI brain showing a left temporo-parietal mass, hypo intense with capsular enhancement and a tumour nodule. There is significant mass effect with midline shift. The picture is suggestive of malignant astrocytoma.

stimulation and maximum comfort of patient throughout the procedure.

Different anaesthetic techniques have developed aiming for tumour resection in an awake patient<sup>2-7</sup>, but no one has proved to be superior.

All techniques aimed for maximum resection with minimum impairment of neurological function.

Brain tumour resection takes long time and some sedation is always required for an awake patient to stay motionless during the procedure. Sedation should be titrated in such a way that the patient remains conscious, alert and cooperative during tumour resection and functional assessment. Success of the surgery will greatly depend on adequate skull block otherwise the patient becomes restless and uncooperative requiring higher doses of analgesics and sedatives which can interfere with functional assessment and airway patency. Bupivacane 0.5% combined with adrenaline 1:200,000 can be used to carry out the block.

Airway obstruction should not be allowed, as it can lead to hypoxia, hypercapnia and increased brain tension. All airway management techniques used for awake craniotomy has their advantages and disadvantages and no technique has proved to be ideal. The most appropriate techniques should be chosen according to each patient's requirements and the available facilities.

Huncke and colleagues<sup>4</sup> kept the trachea intubated during opening and closure of the skull and extubated during cortical mapping. They reportedly managed tracheal intubation, extubation, and reintubation with the patient's head firmly positioned in a three-pin head holder. Lignocaine was continuously delivered to the upper airway via a catheter with multiple holes spiraled around the tracheal tube to avoid coughing and gagging at extubation and reintubation. Although this will provide adequate ventilation, the process of extubation at light planes of sedation is still stimulating and reintubation is difficult with fixed head position. Continuous topical anaesthesia to the upper airway might result in loss of airway reflexes, leading to aspiration postoperatively.

Tongier and colleagues<sup>5</sup> used a laryngeal mask airway, which is easier to insert and less stressful to patients than tracheal intubation. However, the technique has got similar disadvantages to that of endotracheal intubation.

Alternatively awake craniotomy has been conducted without airway support and with

oxygen supplementation through a nasal canula<sup>2, 3, 6-8</sup>.

This technique, although comfortable, carries the risk of depression of ventilatory drive<sup>2, 3, 6-8</sup> transient desaturation and hypercapnia<sup>6-8</sup>. Weiss<sup>9</sup> placed a nasopharyngeal airway, which was then connected to a breathing circuit via a tracheal tube connector: thus enabling patent airway and assisted ventilation.

As shown from this case, reported above, the indication for awake craniotomy was influenced by the patient's critical cardiovascular condition, which seems to be an abnormal indication. However, the technique used adequately met the requirement for a craniotomy to be done in an awake patient, with no incidence of intra or postoperative complications. The

procedure was done in a well sedated patient, but still rousable, with good tolerance and with satisfactory surgical conditions.

Having a patent airway is a crucial part of the surgical procedure. In this case we conducted the awake craniotomy without airway support, but being prepared for airway obstruction with a set of laryngeal mask airway.

We believe that the process of extubation and reintubation during surgery, with the patient's head in a fixed position and with limited area of movement for the anaesthetist, seems to be difficult and equally stimulating to the patient and inconvenient to the surgeon.

Although an unsupported airway technique was used, with nasal oxygen supplementation, saturation and airway patency were well maintained, and the patient remained haemodynamically stable throughout the procedure.

With further training and studies we feel that we have achieved a method of providing good operative conditions, with considerable cost reductions and without compromising patient's safety.

Further studies are recommended to include the patient's clinical condition as part of the indications for awake craniotomy.

**References:**

1. Sahjpaul RL. Awake craniotomy: controversies, indications and techniques in the surgical treatment of temporal lobe epilepsy. *Can J Neurol Sci* 2000; 27 Suppl 1: S55–63.
2. Taylor MD, Bernstein M. Awake craniotomy with brain mapping as the routine surgical approach to treating patients with supratentorial intraaxial tumors: a prospective trial of 200 cases. *J Neurosurg* 1999; 90: 35–41.
3. Blanshard HJ, Chung F, Manninen PH et al. Awake craniotomy for removal of intracranial tumor: considerations for early discharge. *Anesth Analg* 2001; 92: 89–94.
4. Huncke K, Van de Wiele B, Fried I, et al. The asleep– awake–asleep anesthetic technique for intraoperative language mapping. *Neurosurgery* 1998; 42: 1312–6.
5. Tongier WK, Joshi GP, Landers DF et al. Use of the laryngeal mask airway during awake craniotomy for tumor resection. *J Clin Anesth* 2000; 12: 592–4.
6. Gignac E, Manninen PH, Gelb AW. Comparison of fentanyl, sufentanil and alfentanil during awake craniotomy for epilepsy. *Can J Anaesth* 1993; 40: 421–4.
7. Hans P, Bonhomme V, Born JD et al. Target-controlled infusion of propofol and remifentanil combined with bispectral index monitoring for awake craniotomy. *Anaesthesia* 2000; 55: 255–9.
8. Herrick IA, Craen RA, Gelb AW, et al. Propofol sedation during awake craniotomy for seizures: patient-controlled administration versus neurolept analgesia. *Anesth Analg* 1997; 84: 1285–91.
9. Weiss FR, Schwartz R. Anaesthesia for awake craniotomy. *Can J Anaesth* 1993; 40: 1003.