Awake Craniotomy for Tumour Excision

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Abstract

Background: Craniotomy and excision of tumours can produce neurological deficits if the tumour is located close to eloquent areas of the brain. One technique of overcoming this problem is to keep the patient 'awake' during surgery.

Methods: Eight patients with intra cranial space occupying lesions (ICSOL) were operated 'awake', using a combination of skull block with sedation and analgesia. A mixture of 0.125% bupivacaine and 0.5 % lignocaine was used for various nerve and field blocks. Midazolam, fentanyl and propofol in titrated doses were used to achieve conscious sedation.

Result: The procedure was successful in all the patients. They tolerated the procedure well and were able to follow the commands intraoperatively as desired. There were no significant complications.

Conclusion: Awake craniotomy with skull blocks with sedation and analgesia is a well established procedure. It requires a good rapport between surgeon, anaesthesiologist and the patient.

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Key Words : Awake craniotomy; Skull block; Sedation; Analgesia

Introduction

Awake craniotomy literally means performing a craniotomy on an awake patient. It allows intraoperative assessment of the patient's neurological status. It is mainly used for mapping the resection margins during epilepsy surgery, accurate location of electrodes in surgery for movement disorders, and excision of tumours from eloquent areas of the cortex [1]. Eloquent areas are specialized areas of brain which control important functions, like movement, sensation, speech etc. Intraoperative neurological testing allows optimal tumour resection with minimal postoperative neurological dysfunction. Different anaesthetic techniques for awake craniotomy have been described in the literature [2-7]. Some have used conscious sedation, while others have used 'asleep-awake-asleep' technique. This is the first case series of awake craniotomies published from the Indian armed forces.

Material and Methods

This procedure was carried out in Command Hospital (SC), Pune during the ten month period. The inclusion criteria were supra tentorial, intra-axial tumours located close to eloquent areas of the brain and patients willing to co-operate. The exclusion criteria was posterior fossa tumours, non-willing patients, large tumours with midline shift and raised intracranial tension. Confused, demented or agitated patients are poor candidates. Patient was assessed for his fitness and psychological make up to undergo awake craniotomy. After

history and physical examination the patient was subjected to detailed counselling. Patient was explained about the advantages of remaining awake during operation and the sequence of events in the operation theatre. Patient was educated about different tasks like moving the toes/ fingers on command, identification of picture cards, speaking etc. which he was supposed to perform during the surgery. It was re-emphasized that he will be conscious and he had to lie down still during the surgery. Option of general anaesthesia was also kept open and an informed consent was taken.

In the operation theatre intravenous line was started and sedation in the form of injection midazolam 1-2 mg and injection fentanyl 50-75 mcg was given. The scalp was painted with 10% betadine lotion. The supraorbital, supratrochlear, auriculotemporal, zygomaticotemporal, greater occipital and lesser occipital nerves (Fig. 1) were blocked bilaterally with local anaesthetic (LA) solution.

We used a mixture of 20 ml of 0.5% bupivacaine, 20 ml of 2% plain lignocaine, 0.4 ml (400 mcg) of adrenaline and 40 ml of saline adding upto a total of 80 ml of solution. This solution has a concentration of 0.125% bupivacaine, 0.5% of lignocaine and 5 mcg/ml of adrenaline. Adrenaline helps in hemostasis, reduces absorption of LA, thereby reducing its toxicity and prolongs the duration of action. About 25- 30 ml of this solution was used for the nerve blocks. A band (Fig. 2) of subcutaneous and subfascial injection was given with 20-25 ml of this solution, around the head passing above the ears through forehead and occiput [8]. The remaining solution was used to infiltrate along the line of scalp incision right upto the periosteum. This gives a block for almost five hours.

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All the patients were placed in supine position with the head on a 'head ring' in neutral position or turned to one side with sand bag under the shoulder. All the pressure points were padded and the patient was kept warm. We did not use three point fixator for fixing the head. Draping was done in such a way that eye to eye contact could be maintained with the patient. Monitoring included electrocardiography (ECG), non-invasive blood pressure, pulse oximetry and capnography. We catheterized the patients as mannitol 0.5 to 0.75 gm/kg was given to achieve a relaxed brain. All patients were provided with supplemental oxygen through mask. Antibiotics, antiemetics, dilantin and steroids were given at the start of surgery. Initial sedation is required to reduce anxiety and pain during skull block. We gave 20-30 mg propofol bolus followed by infusion @ 25-75mcg/kg/min during drilling and cutting of bone flap. As the brain is not pain sensitive, sedatives can be switched off after the dura is opened and restarted during closure of wound. Constant communication was maintained to keep the patient aware of the surgery (Figs. 3,4). The hand/ foot movements and speech were monitored. In case of any weakness or slurring of speech, the surgeon was informed to avoid resecting that area of brain, thereby achieving maximum cytoreduction with minimal neurological deficit.

Results

Eight patients underwent awake craniotomy at Command Hospital (SC) Pune during the 10 month period, the details of which are given in Table 1. The procedure was successful in all the patients. Except for initial discomfort during skull block, they did not have any pain intraoperatively. 30 to 40 ml (10 mg/ml) of propofol was used in a three to four hour period. We did not have electrocorticogram (ECoG) recording facility,

Fig. 1 : Shows various nerves to be blocked in a 'skull block'.

Fig. 2 : Band (A-A1) of local anaesthetic infiltration all around the head.

Table 1

Patient characteristics and type of surgery

Age (year)/ Gender/Wt (Kg)	Diagnosis	Surgery	Justification for awake craniotomy
44 /M/ 56	Left posterior frontal glioma	Frontal craniotomy and excision of tumour	Near motor area
15 /F/ 45	Low grade glioma anterior temporal lobe (left)	Left temporal craniotomy and excision of tumour	Near speech area
40 /F/ 60	Left frontal lobe tumour? Astrocytoma	Frontal craniotomy and excision of tumour	Near motor area
22 /M/ 53	Right frontal space occupying lesion	Frontal craniotomy and excision of tumour	Near motor area
68 /F/ 65	Metastatic tumour frontal lobe	Frontal craniotomy and excision of tumour	Near motor area
30 /M/ 69	Right frontal glioma	Frontal craniotomy and excision of tumour	Near motor area
55 /M/ 58	Right frontal glioma	Frontal craniotomy and excision of tumour	Near motor area
24 /F/ 80	Tubercular abscess left temporal region	Temporal craniotomy and drainage	Near speech area

hence we relied on intraoperative clinical assessment. Two patients had discomfort while handling the dura which was managed by placing pledgets soaked in lignocaine on middle meningeal artery. There was no significant intraoperative complication like tight brain, respiratory depression, seizures, excessive sedation etc. There was no conversion to general anaesthesia (GA). Analgesia was good, brain was relaxed and team was satisfied with the technique. Patients were able to sit up and take oral fluids in immediate postoperative period. Post operatively motor weakness was observed in two cases which recovered in few days. One patient was re-explored as she developed weakness due to hematoma formation, while another had refractory seizures.

Discussion

Traditionally awake craniotomy has been performed for epilepsy surgery, which helps in better ECoG localization of the seizure focus without the influence of general anaesthetic agents. Varying anaesthetic techniques for awake craniotomy have been described in the literature [2-7]. One is using skull block along with conscious sedation. Another is 'asleep-awake-asleep' technique, in which GA is used for the craniotomy, then patient woken up for cortical mapping and then again GA is induced for tumour resection and closure. Either inhalation agents or intravenous anaesthetics with or without controlled ventilation have been used. Nowadays laryngeal mask airway (LMA) with propofol and remifentanyl infusions are used for rapid emergence. In this, the patient is fully awakened and LMA is removed in the middle of surgery for cortical mapping [9]. Advantages include increased patient comfort and tolerance during craniotomy and a secured airway with the ability to hyperventilate. The advantage of remifentanyl is a rapid reversal of narcosis when intraoperative consciousness is required [10]. Advantages of propofol include short duration of action, amnesia, antiemetic action, reduced incidence of seizures, minimal effects on ECoG recordings and minimal effects on ventilation in low doses. Recently dexmedetomidine is gaining popularity which is used in combination with nitrous oxide and sevoflurane for bone flap removal and alone for brain mapping of the cortical speech area [11]. Dexmedetomidine is a highly specific

Fig. 3 : Craniotomy in progress.

α_2 adrenoreceptor agonist with sedative, analgesic, and anesthetic-sparing effects. It does not suppress ventilation and the sedated patient would be easily arousable.

In the United States, majority of these procedures are performed under local anaesthesia with sedation and it is considered as standard approach to certain supratentorial tumours [12]. A shorter hospital stay results in considerable cost reduction and some centres advocate day-case procedures [13]. The term conscious sedation has been used widely, however it is such an amorphous term that the term 'sedation and analgesia' is recommended [14]. Intraoperative problems could be nausea, vomiting, restless patient, seizures, airway obstruction and inadequate analgesia [15]. Seizures can be managed with midazolam and/or propofol or conversion to GA. Sometimes cold saline irrigation of brain helps. Postoperatively patient is monitored in the intensive care unit to observe for any neurological deterioration due to cerebral edema, intracranial hemorrhage and seizures.

In conclusion, awake craniotomy with skull blocks and sedation-analgesia is a well established procedure, which requires a good rapport between the patient, anaesthetist and the surgeon.

Conflicts of Interest

None identified

Intellectual Contribution of Author

Study Concept : Lt Col K Prabhakaran, Brig PK Sahoo

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Fig. 4 : Awake patient while tumour excision is in progress.

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