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Original Research Article

A Retrospective Study on the Anaesthetic Management of Awake Craniotomy

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Abstract

Background: Awake craniotomy includes awake brain surgery. Awake Craniotomies started in the 1800s. This procedure requires a comprehensive preoperative analysis and patient counselling.
For tumor excision and brain mapping in Alzheimer's and Parkinson's, awake craniotomies are recommended. This therapy often lowers post-operative morbidity. This study aims to evaluate the success of awake craniotomy in the cases included in it.
Method: This is a retrospective study conducted on the cases for which awake craniotomies were performed at **BJ Medical College in Gujarat, India**. The anaesthetic management procedure was carried out, the procedure conducted was evaluated for various parameters, and an analysis of the outcomes was performed.
Results: The awake craniotomy conducted on 8 patients was successful, with certain complications during the procedure that were later managed. The average stay of the patients post-operatively was reduced to 3 days. The surgeon's satisfaction score ranged from fair to excellent.
Conclusion: Awake craniotomy reduces the number of days of hospital stay, decreases the risk of postoperative morbidity, and decreases the chances of complications. The evolution of the awake craniotomy can result in a successful operative procedure with increased patient satisfaction.
Recommendation: Awake craniotomy can give successful outcomes if the patients are cooperative during the procedure. So patient counseling before the procedure is mandatory for an awake craniotomy.
Keywords: awake craniotomy, tumor removal, scalp block

Introduction

Performing brain surgery while the patient is intentionally kept awake is known as an awake craniotomy. The first craniotomy was conducted back in the 1800s [1]. However, the nature of this procedure requires meticulous preoperative analysis and counselling of the patients. The benefits of awake craniotomy over craniotomy conducted under anaesthesia are listed in various studies conducted in this area [2, 3]. The indication of awake craniotomy includes the removal of tumor mass from the functional areas of the brain.

The surgery conducted on the brain without anaesthesia requires the patient to perform certain tasks, which help the surgeon identify the areas of the brain that are stimulated and prevent its resection. The careful selection of the patient and the counselling of the patient as per the requirements of the surgery play a crucial role [4]. Although the brain tissues do not require analgesia, the scalp has to be anaesthetized so that the pain does not occur during the surgery.

Awake craniotomy is recommended not only for excision of the tumor but also for mapping of the brain in cases of neurological disorders such as Alzheimer's and Parkinson's. The basic condition is the consent of the patient for this surgery, as it requires the patient's consent during the surgery. Studies have demonstrated that this procedure decreases post-operative morbidity in a significant number of cases [5, 6]. This study aims to evaluate the management techniques, that is, the sedation to be given, the anaesthesia to be given on the scalp, the counselling of the patients to be done, and to identify the challenges associated with the awake craniotomy. The

outcomes of the surgeries performed during the study are analyzed to define the success of the procedure.

Method

Study design: This is a retrospective study conducted on the cases for which awake craniotomies were performed at **BJ Medical College in Gujarat, India.**

Participants: The cases included underwent an awake craniotomy for tumor excision, and the diagnosis of the tumor demonstrated the tumor to be present near the functional area. Awake craniotomy was not conducted on patients who were diagnosed with tumors in the functional areas of the brain but had respiratory disorders, sleep disorders or were obese.

Ethical consideration: The patients who consented to the study and agreed to cooperate with the surgeons during the surgery were included in the study.

Eight cases of patients who underwent awake craniotomies were included in the study. The following was the anaesthetic management procedure conducted in the study. In preoperative management, patients were counselled on the types of anaesthesia, the level of cooperation expected, potential risks, safety measures, stages of the procedures, and intraoperative discomforts. Plan of anaesthesia was "MONITORED ANAESTHESIA CARE (CONSCIOUS SEDATION + SCALP BLOCK)." The patient was monitored with an ECG, NIBP, pulse oximeter, temperature, and IBP. The IV fluid started as per the case. Pre-medication given were Inj. Ondansetron 0.15 mg/kg IV, Inj. Glycopyrrolate 0.004 mg/kg IV, Inj. Fentanyl 1 to 2 microgram/kg, Inj. Dexamethasone 16 mg IV, Inj. Cefosulbactum 1 gm IV, Inj. Levetiracetam 1 gm IV, and Inj. Mannitol 40g IV stat. Followed by sedation in the form of Inj. Propofol 1-1.5 mg/kg IV (bolus), Inj. Propofol 50-100 mcg/kg/min (infusion), and Inj. Fentanyl 0.01 mcg/kg/min (NS).

The nasopharyngeal airway was inserted and connected to Bain's circuit with an O2 flow of 4-6 L/min. Careful monitoring of the respiration was done with ETCO2 (range: 24–35 mmHg). Inj. Dexmedetomidine 1 mcg/kg (0.5 mcg/ml) in 100 ml NS started as an when required. Ten minutes before neurocognitive testing, infusions of dexmedetomidine and propofol were titrated and stopped if needed. Once the dura was opened, the brain was found to be relaxed. During manipulation and excision of the tumour, intermittently, patients underwent neurocognitive testing as per the pre-operative questionnaire. Patients were adequately sedated but easily arousable on call for the same. Patients remained hemodynamically stable throughout the procedures. They were shifted to the neuro ICU for post-procedure monitoring and a post-operative course.

Scalp block was given with Inj. Bupivacaine 0.25% (30 cc) inj. Lignocaine 1% (20 cc) 4-5 ml at each of the six sites as well as at 4 pin insertion sites. inj. Lignocaine-adrenaline (5 mcg/ml, 1:200,000) infiltrated at the incision site.

Statistical analysis: The data obtained in the study was tabulated and arranged on an Excel sheet. The data was analyzed thoroughly to determine the success of the procedure.

Result

There were five patients with an age less than 50 years and three patients with an age greater than 50 years. Most of the patients were male; there was only one female in the study. Six patients were diagnosed with glioma; one patient had meningioma, and the remaining patient had Lennox-Gustout syndrome. Table 1 illustrates the patient's diagnosis and symptoms in detail.

Table no. 1: Diagnosis and symptoms of the patient

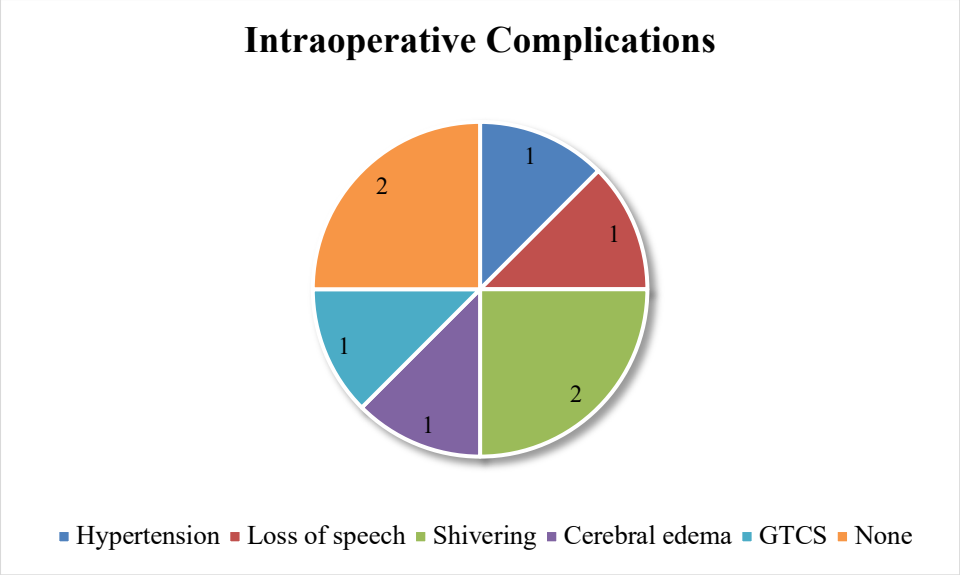
Sr no.	Age / sex	Presenting symptoms	Diagnosis
1	37 year / male	Left. Facial Weakness, right Upper limb Tingling, Headache	Sol involving – meningioma ! Left post. Basal lobe , left ant. Temporal lobe, Left insular Cortex
2	62 year / male	Headache, Personality Changes, Increased Aggression and Irritation, Strange smell	High grade Glioma involving Left parito Temporal lobe With perilesional Vasogenic edema
3	48 year /	Headache, right Body weakness,	Glioma Involving left

	Female	Irritative Behavior	Fronto temporal Lobe and insular Cortex
4	55 year/ Male	Convulsion, Headache, Nausea, right Upper limb Weakness	Left frontal Lobe high Grade Glioma
5	53 year / male	Convulsion , Progressive Hearing loss, Difficulty in Speaking, Right facial Weakness	Left frontal Glioma Involving Left Paracentral Gyrus
6	39 year/male	Convulsion, Headache	Left temporo Parietal glioma involing left fronto parietal region with Midline shift of 5 mmtowards rt side
7	39 year/male	Headache followed by sudden loss of consciousness ,headache sine 2-3 months	Right parieto temporal glioma with midline shift of 11 MM towards left side
8	43 year / male	Head injury , loss of conscious-ness Convulsions Agitative behaviour,	Left fronto temporal lgs

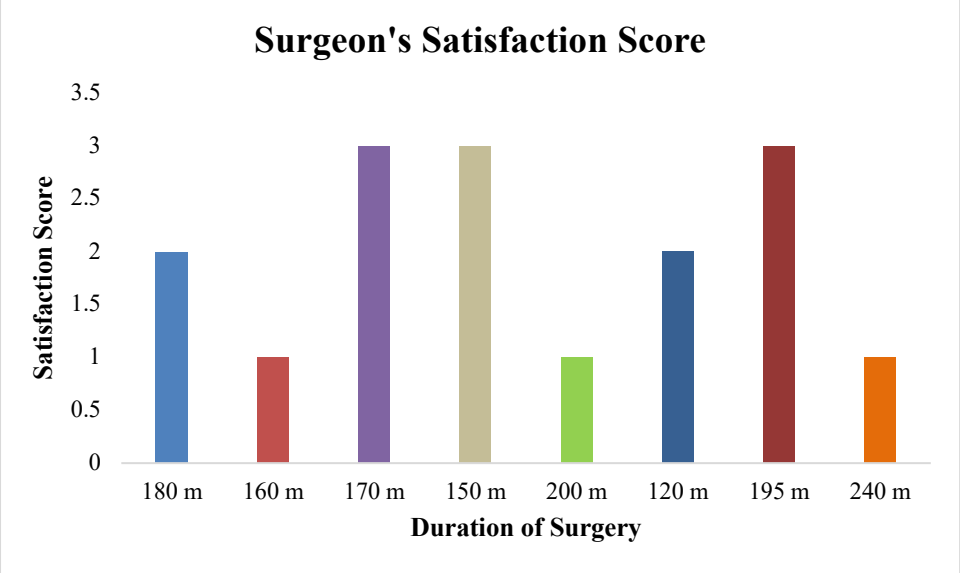
The duration anesthesia, dose of anesthesia, duration of surgery, opening of the eye after sedation, complication during the procedure, stay in the hospital after the procedure, and the statisfaction score of the surgeon were recorded for each patient and the analysis was performed on the data obtained. The table no. 2 illustrates the findings of the study for each patient.

Parameters	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5	Patient 6	Patient 7	Patient 8
Duration of Anesthesia	3 hr	2 hr 40 min	2 hr 50 min	2 hr 30 min	3 hr 20 min	2 hr	3 hr 15 min	4 hr
Duration of Surgery	3 hr 10 min	3 hr	3 hr 5 min	2 hr 50 min	3 hr 30 min	2 hr 30 min	3 hr 30 min	4 hr 10 min
Total dose of anesthesia	710 mg	620 mg	650 mg	580 mg	680 mg	700 mg	680 mg	720 mg
Eye opening after seda-tion stopped	10 min	20 min	18 min	16 min	18 min	15 min	30 min	30 mins
Intra opera-tive Compli-cation	Hyper-tension	Loss of speech	Shiver-ing	-	Cerebral edema	Shiver-ing	-	GTCS
Post-op ICU stay	2 day	3 day	3 day	2 day	4 day	2 days	4 days	4 days
Surgeon's satisfaction score	Good	Fair	Excel-lent	Excellent	Fair	Good	Excel-lent	Fair

The duration of anaesthesia, the dose of anaesthesia, the duration of surgery, the opening of the eye after sedation, complications during the procedure, and stay in the hospital after the procedure varied from case to case. However, the patient satisfaction score ranged from fair to excellent.



Graph 1: Intraoperative complications faced by patients



Graph 2: Surgeon's satisfaction score for each patient

Discussion

The present study had all the cases of successful awake craniotomies, although the surgeon satisfaction score varied on the basis of the complications encountered during the surgery and the management of the complications. The major challenges faced during the surgery included maintaining hemodynamic stability and respiratory stability, apart from those indicated in Table 2. Another study conducted in this domain reported similar types of complications [7].

The complications that arose during the surgery were carefully managed, and the craniotomy was successful in all of the cases. The average stay in the ICU postoperatively was 3 days, which is significantly less than the number of days in craniotomy with general anaesthesia. This was in accordance with a study conducted on awake craniotomies [8]. In a study, same-day discharge was reported after the conduction of an awake craniotomy [9].

A study demonstrated a significant decrease in nausea, vomiting, and pain after awake craniotomy [10]. This was observed in this study as well; patient's requirements for antiemetics and analgesics decreased significantly. The surgeons reported that accurate pre-operative counselling, accurate regional anaesthesia, accurate dosing of anaesthesia, early identification of the complication, and set protocols for its management made the procedure accessible.

A team of neurologists, surgeons, and anaesthetists should have clear communication with the patient during the procedure, which can ease the progress of the procedure. Preoperative counselling should include a questionnaire that the patient is prepared to

answer during sedation [5, 6]. The superiority of awake craniotomy over craniotomy under general anaesthesia demonstrates its significance in neurological diseases where surgery is inevitable.

Conclusion

Awake craniotomy reduces the number of days of hospital stay, decreases the risk of post-operative morbidity, and decreases the chances of complications. The evolution of the awake craniotomy can result in a successful operative procedure with increased patient satisfaction.

Limitation

The sample size for this study was limited. Prospective studies should be carried out to identify the complications and outcomes of the procedure.

Recommendation

An awake craniotomy can give successful outcomes if the patients are cooperative during the procedure. So patient counseling prior to the procedure is mandatory for an awake craniotomy.

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