Case Report

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Awake Craniotomy for Resection of Insular Astrocytoma

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Abstract

Awake Craniotomy has been evidenced as an efficient surgical technique for brain tumor resection while preserving eloquent areas of the brain. However, the challenges faced with this range from patient cooperation to the expertise of the management team. In our case report, we present a 34-year-old gentleman with a local recurrence of insular astrocytoma. Concerning his otherwise insignificant health and stable psychological state, an awake craniotomy was suggested, for which the patient consented. He was prepared for over a month with psychological support, theater experience, and anticipated intra-operative tasks. The surgery was a success with no post-operative complications.

Keywords: *Awake Craniotomy, Neurosurgery, Intraoperative cortical mapping*

INTRODUCTION

Diffuse Astrocytoma is a locally invasive malignant tumor in the brain, which has the ability to invade and destruct the surrounding brain parenchyma. Pertaining to this, complete surgical excision of the tumor while preserving the functional areas of the brain is extremely challenging. To achieve this, the sophisticated technique of awake craniotomy is being practiced by the neurosurgical field around the globe. This allows the surgeon to assess functionally important areas of the brain employing intraoperative cortical mapping, so that

they would not be compromised during resection[1].

The anesthesiologists play a crucial role by bringing forth a special type of sedation-analgesia, which do not interfere with intraoperative assessing of motor and higher functions of the brain by the surgeons[2].

We report a case of Diffuse Astrocytoma, for which a tumor resection surgery through awake craniotomy was successfully performed for the first time in the government sector in Sri Lanka.

CASE REPORT

A 34-year-old gentleman, who had previously undergone right pterional craniotomy and excision of right insular low-grade glioma one year back, was referred to our neurosurgical unit with one episode of breakthrough seizure. The patient had defaulted treatment following the surgery. A magnetic resonance imaging (MRI) of the brain was compatible with a local recurrence of the

tumor at the same region (Fig.1). Subsequently, a regular antiepileptic was started. The patient had no other comorbidities, and his ASA score was 2, with >4 METS functional capacity. His neurological examination, as well as the mental state examination, were not significant. Considering the suitability, the neurosurgical team favored an awake craniotomy to be performed on this patient, provided he consents.

Figure 1: Coronal sections of MRI demonstrating tumor in the insular region.

The complete surgical procedure with the possible outcomes was explained to the patient and family in detail. After agreeing to cooperate with this surgical method, informed written consent was given by the patient. Over one-month period, he was prepared and assessed by a multi-disciplinary team; including anesthetic and psychiatric teams and was mentally prepared for the novel experience. He was rehearsed on expected intra-operative tasks, such as identifying colors, shapes, and objects. A theater visit was arranged to familiarize him with the theater environment.

In order to prevent an anticipated intraoperative complication, seizures, oral levetiracetam dose

was increased to 1.5g twice a day, from one-day pre-operative to 7-days post-operative. In addition, a loading dose of 1g of phenytoin sodium was injected one hour prior to the surgery. The patient was sedated with midazolam 2mg, following which bilateral scalp block was achieved using 0.5% Bupivacaine 100mg, 2% Lignocaine 3ml, and 50% MgSO₄ 500mg. The sedation was maintained by Dexmedetomidine (1ng/ml) (site concentration) using target central infusion pump. The patient was placed in the semi-lateral position, and the Mayfield head fixation device was applied. Surgical drapes were adjusted so that the airway and face were accessible during the surgery (Fig.2).

Figure 2: Patient communicating during the awake throughout craniotomy

When the surgical resection was initiated, the patient was exiting the effects of sedation. Hence, he was able to respond to the motor, sensory, and higher function assessments, which were carried out throughout the surgery. The mapping was done with electrical stimulation using monopolar short train technique with 3-10mA. No subcortical

mapping was performed. A near-total excision of the tumor was accomplished, and at the end of the resection, he was again sedated (Fig.3). The patient remained in the recovery area until he was fully conscious and later was transferred to the neurosurgical Intensive Care Unit for continued observation.

Figure 3: Axial sections of MRI demonstrating post-op near-total excision

The whole procedure was uneventful, with the patient recovering without any complication. Complete resection of the tumor was evident in the post-operative MRI, while the histology of the resected tumor revealed diffuse astrocytoma (WHO grade2). Therefore, he was discharged from the hospital the following day with a proper follow-up plan.

DISCUSSION

The Awake craniotomy technique is a globally accepted method in identifying eloquent cortical sites during brain tumor resection. In addition to tumor resection, this technique is widely used to treat epileptic seizures [3,4].

The selection of a suitable patient is imperative in this method, as the patient should be co-operative during the procedure. Hence, patient refusal is considered an absolute contraindication. Secondly, it requires the patient to be fit for the surgery both physically and mentally, making conditions like obstructive sleep apnea and cough relative contraindications [5]. Standard preoperative preparation also involves screening for neurological deficits as well as existing psychological disorders. The surgical and anesthetic procedures should be completely explained to the patient, and he should be mentally prepared for the whole experience by a qualified psychiatric team [3]. The patient is made familiarized with the theater environment, and the activities involved in brain mapping are rehearsed several times before the surgical date. In our patient, we believe the success in the surgery relied primarily upon these pre-operative preparations, which were given much attention.

The most suitable anesthetic technique for the particular surgery needs to be decided, as it plays a key role during the procedure. The two established techniques are the Awake through-out technique and the Asleep/Awake/Asleep technique[4,5]. In our case, the latter was utilized.

In reviewing the literature, several studies were identified which compared the awake craniotomy to the conventional craniotomy under general anesthesia (GA). Awake craniotomy allows

continuous functional assessment of neurophysiological parameters, which is not possible under general anesthesia. Hence, this allows surgeons to functionally differentiate between eloquent and non-eloquent brain tissue, preventing injury to the eloquent areas of the brain. The ultimate result is achieving higher extents of safe resection while preserving neurological functions. In addition, awake craniotomy has been proven to minimize hospital stay preserving resources, minimize intraoperative cardiorespiratory complications and decrease postoperative morbidity[4,6].

As with any surgical procedure, awake craniotomy exhibits its own set of complications. Intraoperative seizures have a higher incidence of occurrence with awake craniotomy, approximately 3%-16% [5]. This leads to procedure failure as well as temporary postoperative neurological disabilities [6]. In order to overcome this, a perioperative antiepileptic regime was initiated in our patient.

In Teaching Hospital Anuradhapura, this was the first complete simulation of an awake craniotomy procedure for brain tumor resection. Our experience is shared in literature for future references, as we agree that awake craniotomy is safe and vastly beneficial for the health sector as well as for the patient.

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None

Author Contributions

Dr. W.N.Y. Perera, Dr. K.M.A.G. Karunatilaka- Acquisition of data, Literature review, Drafting of the manuscript, Taking responsibility in the construction of the whole manuscript

Dr. A.D.M. Gomez, Dr. M.M.R.S. Paris- Supervision and Critical revision of the manuscript.

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Availability of data and materials

Data is available as supplemental files on request from corresponding author

Ethics approval and consent to participate

Informed written consent was obtained from the patient.

Competing interests

None

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