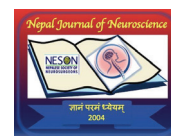


Outcomes of surgical excision of mass in the eloquent areas of brain : A prospective study at National Academy of Medical Sciences, Bir Hospital



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Abstract

Introduction: The treatment of choice for high and low-grade gliomas is primarily surgical resection, many gliomas of highly eloquent cortical regions still are not operated because of the impending risk of surgery-related deficits. Tumors of eloquent areas like sensorial, motor and language cortex need to be operated carefully so that the symptoms don't worsen after surgery. However, Intra operative computerized tomography (IOCT), neuronavigation including optical as well as EM (electromagnetic), Neuromonitoring, stereotaxy and awake surgery increase safety, which allows resection of most of these tumors with a considerably low rate of new deficits postoperatively.

Materials and Methods: Between 2021 and 2022, a consecutive series of 30 patients who had undergone surgery for tumors on eloquent area of brain, at National Neurosurgical Referral Center (NNRC), National Academy of Medical Sciences (NAMS), Bir hospital were included in this study. Ethical approval was taken from Institutional review board (IRB) of NAMS for the study. Preoperative functional MRI, DTI scan that revealed mass in eloquent brain areas were evaluated. The preformed proforma was used to collect the data including preoperative karnofsky performance score, age, gender, clinical. Manifestations, size and location of tumor, degree of resection, pathological grade. Patient are followed postoperatively for 3 months and postoperative KPS, morbidity and mortality was recorded. SPSS version 22 was used for statistical analysis..

Results: Out of these 30 lesion were 13 (43.3%) were WHO grade IV, 5 (16.6%) were WHO grade III astrocytoma, 3 (10%) were WHO grade III oligodendroglioma, 2 (6.6%) were WHO grade II astrocytoma, 4 (13.3%) were WHO grade I astrocytoma, 2 were tuberculoma and 1 was cavernoma. Majority of the patients (70%) (n=21 out of 30) presented with seizures. The mean age of the patient was 41.7 years (ranging from 21-71 years). Male predilection was observed accounting 60% of the cases.

Conclusion: The surgery of eloquent areas of brain though carries the risk of increased post operative neurological deficit, with assistance of advanced technology and experienced surgeons it still feasible option especially for young patients with good karnofsky score and low grade tumors which has improved overall survival.

Key words: Eloquent, Neurosurgery, Outcome

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Introduction

Surgery is an important part of multimodal therapy in the treatment of high- and low-grade gliomas however resection of infiltrative tumor in eloquent brain areas remains a neurosurgical challenge.^[1-4] The extent of resection of tumor has been shown to impact the quality of life and median overall as well as progression free survival rate.^[1, 3-5] The tumors of eloquent areas like sensorial, language and motor cortex need to be operated carefully in order to prevent the post-surgical worsening of symptoms. An awake craniotomy may be performed for

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the lesions involving language cortex, to assess language functions intraoperatively. [6-9] The resection of tumors in functional areas carries high risk of postoperative functional deficit which limits the extend of resection. In order obtain gross total resection with functional preservation, multiple modalities are utilized to examine, visualize and monitor anatomy and function pre-surgically and during resection. [10-15] Careful selection of multimodal setup, Preoperative functional MRI, intraoperative CT scan and awake surgery may help in increasing the safety and possibility of resection with postoperative new deficits in acceptable range. [16] In our center we use intraoperative neuromonitoring ,awake craniotomy and intraoperative CT scan while performing surgery of eloquent area. This is a prospective analysis of patient who presented with tumors in eloquent areas of brain and their outcomes following craniotomy and tumor excision.

Materials and Methods

Between 2021 and 2022, a consecutive series of 30 patients who had undergone surgery for tumors on eloquent area of brain, at National Neurosurgical Referral Center (NNRC), National Academy of Medical Sciences (NAMS), Bir hospital were included in this study. Ethical approval was taken from Institutional review board (IRB) of NAMS for the study. The preformed proforma was used to collect the data including preoperative karnofsky performance score, age, gender, clinical. Manifestations, size and location of tumor, degree of resection, pathological grade. Patient are followed postoperatively for 3 months and postoperative KPS, morbidity and mortality was recorded. SPSS version 22 was used for statistical analysis. The nominal data are represented as bar or charts.

Results

Majority of the patients in this study (70%) (n=21 out of 30) presented with seizures and a normal neurological examination, 8 patients (26.6%) presented with hemiparesis and speech difficulty in five cases (16.6%) (fig: 1.2). The mean age of the patient was 41.7 years (ranging from 21-71 years). Male predilection accounting 60% (n=18) of the total cases was found among the presenting cases (fig: 1.1).

Neuropsychological evaluation using showed that all the patients were right handed. Pre-operative MRI showed a tumour involving the supplementary motor area (SMA) in 3 and primary motor area in 6 case (non-dominant) and 3 patient with lesion in left Primary motor area, the primary somatosensory area in 6 cases (4 right 2 left), left dominant temporal lobe in 2 cases and non dominant in one case whereas left frontal lobe was involved in 3 three

patients, left thalamic mass in 2 cases, right thalamic mass in 1 case.

A preoperative motor deficit was present in 8 patients (26.6%). Median Karnofsky Performance Scale (KPS) was 90 (ranging from 40 – 100%). 18 patients (60%) were male and 12 (40%) were female. 12 tumors (40 %) were in the dominant hemisphere. Depending upon the neurophysiological status and location of lesion based on dominance 10 patient were subjected for awake craniotomy.

4 patients (13.3 %) underwent stereotactic biopsy, 10 (33.33%) patients treated with awake craniotomy and 6 (20 %) were treated by neuronavigation guided biopsy. Intraoperative ct scan was done for 16 patients (fig: 1.4). One patient suffered from increased dysphasia after surgery and improved completely within 1 month where as one patient had permanent broca's aphasia with pre-op speech difficulty and lesion in right inferior frontal lobe. 8 patients experienced postoperative deterioration of motor power, two of them had normal motor power preoperatively and developed weakness following operation that improved on the seventh day postoperatively and the remaining six patients were known to have preoperative weakness which neither improved nor deteriorated Post Operatively. No obvious deficit was noted in other patient except in a patient with right parietal mass, cortical sensory loss was noted in first 15 days. One patient had seizure during dural coagulation under LA based navigation biopsy and Two patients had seizure in 2nd POD pertaining to increase in vasogenic edema following surgery. One patient with right frontal mass, developed contralateral monoparesis which resolved on its own. Dysphasia was improved in patient with awake craniotomy. There was one mortality following thalamic mass biopsy with sudden deteriorating GCS and herniation.

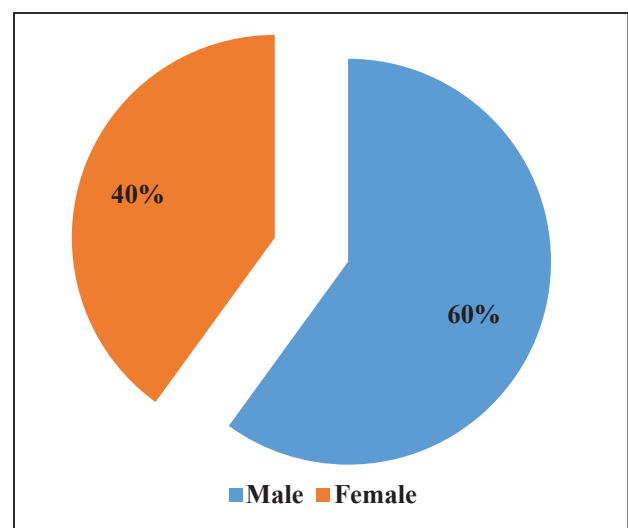


Figure 1.1: Gender distribution

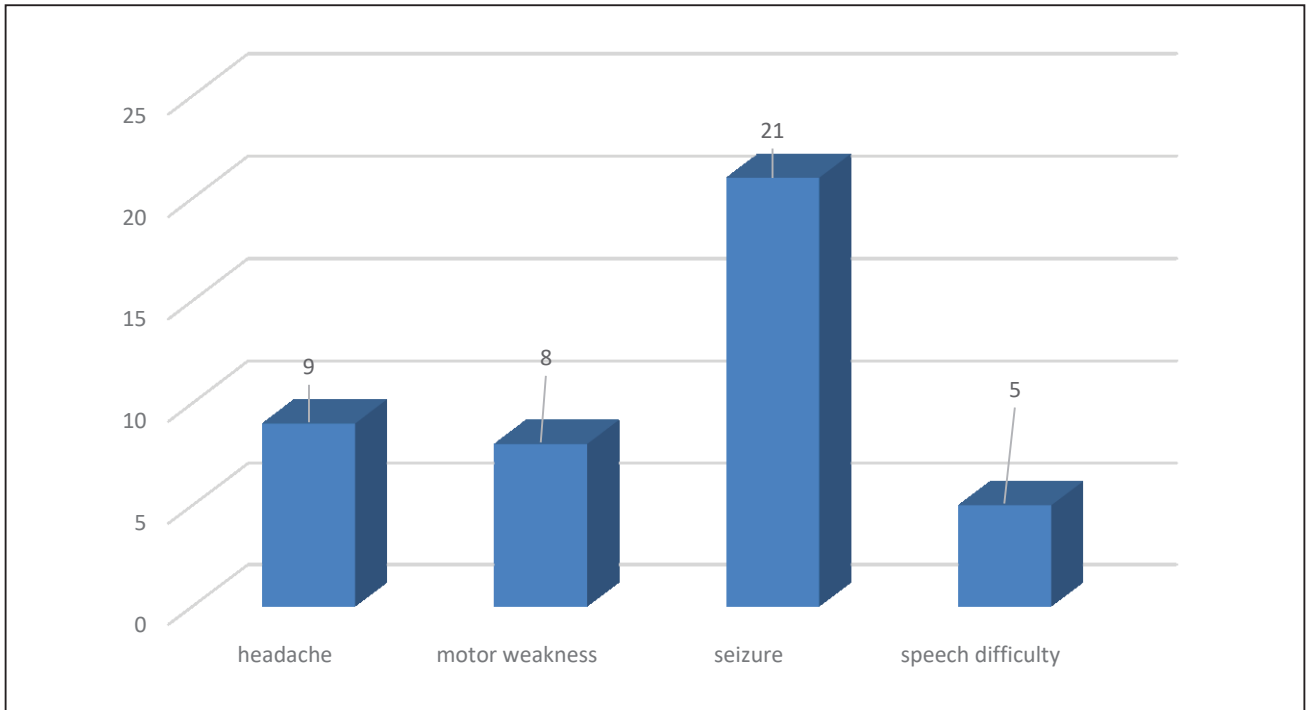


Figure 1.2: Clinical presentation

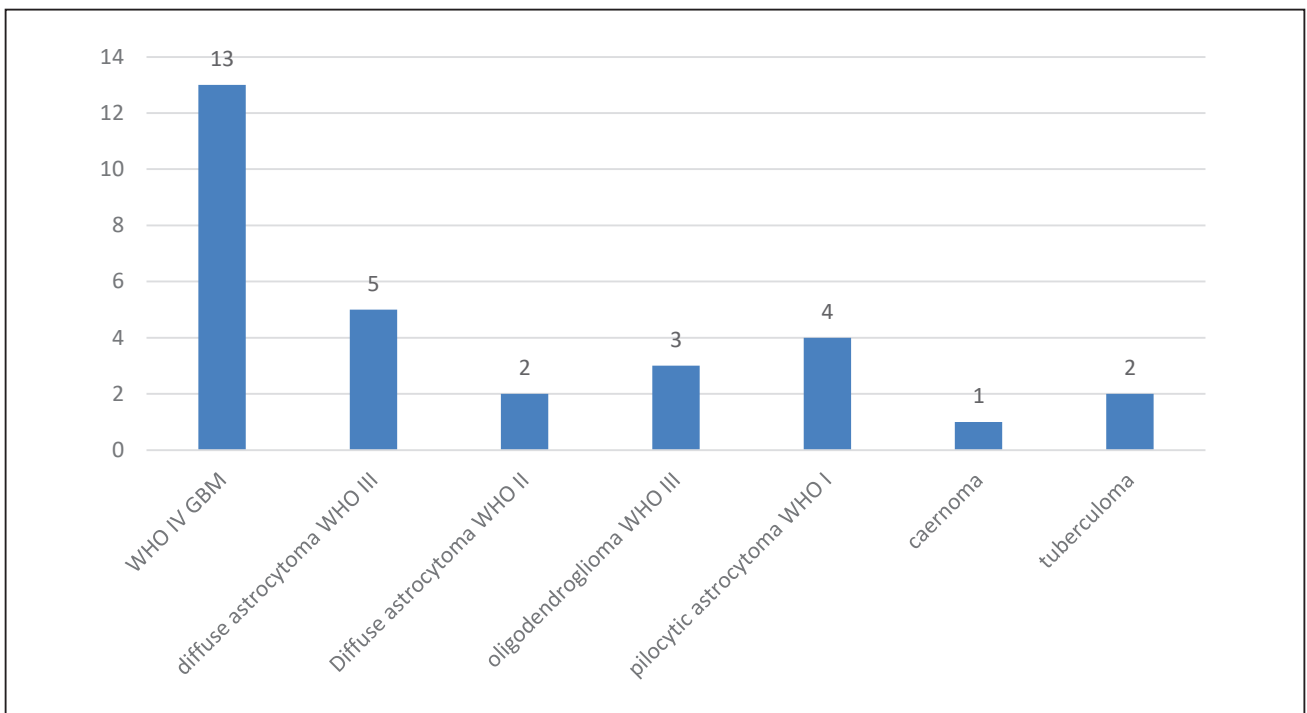


Figure 1.3: Histological diagnosis

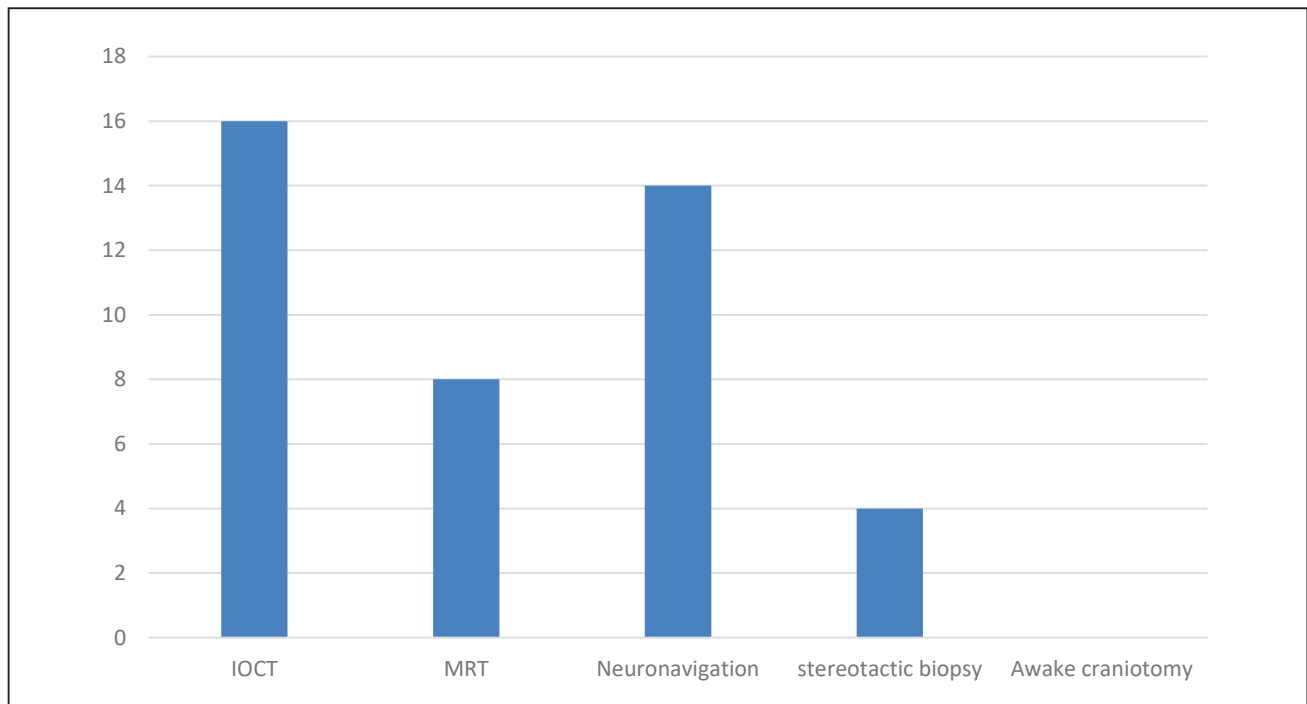


Figure 1.4: Modalities used

Discussion

The basic advantages of awake craniotomy, neuronavigation, intraoperative neuromonitoring and intraoperative CT as reported in the literature was realized in our cases as well as with minimal morbidity and no mortality in patient undergoing craniotomy and excision of mass in eloquent areas.^[18,19]

Our findings is consistent with the study by Satoer et al. in which forty five patients after resection and long-term follow up also suggested possibility of surgical resection of gliomas without major longterm cognitive dysfunction.⁶

The use of intraoperative neurophysiological monitoring (IONM), enables the identification and preservation of functionally defined, but anatomically ambiguous, cortico-subcortical structures through mapping and monitoring techniques.²¹

We performed 30 surgeries in eloquent areas with the use of intraoperative neuromonitoring and intraoperative CT scan and the postoperative functional deficit was observed in only 2 cases. Our study shows that even while performing surgery in eloquent brain areas, disability can be minimized with the use of recent neuromonitoring tools and subtotal excision to preserve function which is similar to the findings by Laws et al.⁵

Most of the cases in our study is glioblastoma which is a very aggressive tumors and on itself carries a poor prognosis however one could increase the overall disability free survival with safe surgery with use of monitoring tools like MEP, SEP.

The advances in stereotactic biopsy has made it possible to make histopathological diagnosis even in patient with poor karnofsky score and in avoiding unnecessary craniotomies. In this study 4 patient had undergone stereotactic biopsy from deep seated mass in eloquent brain region and without postoperative neurological deficits,

Conclusion

Our results showed that tumour judged as non-resectable are potentially eligible for surgical resection. A multimodal approach utilizing neuromonitoring, neuronavigation, intra operative CT guidance and awake craniotomy helps in achieving a high extent of resection with good post operative functional outcomes.

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