Article

Epidemiological study of insular glioma – an institutional experience

Kumar Praveen, Aggrawal Manish, Sinha Virendra Deo, Bhandari Anu
INDIA

DE GRUYTER OPEN

DOI: 10.1515/romneu-2017-0014

DOI: 10.1515/romneu-2017-0014

Epidemiological study of insular glioma – an institutional experience

Kumar Praveen[1], Aggrawal Manish[2], Sinha Virendra Deo[3], Bhandari Anu[4]

[1]Resident in Neurosurgery, SMS medical college and hospitals Jaipur, INDIA
[2]Professor in Neurosurgery, SMS medical college and hospitals Jaipur, INDIA
[3]Professor and head of department, department of Neurosurgery, SMS medical college and hospitals Jaipur, INDIA
[4]Professor department of radiology J. K. Lone hospital Jaipur, INDIA

Abstract: *Object*: Insular gliomas are difficult and challenging tumors to operate and manage due to the inherent complexity and the adjacent vital structures around them. Our aim is to define the morbidity profile and the mortality associated with the maximum possible safe resection of these less common tumors. *Methods*: The study was conducted on patients who were diagnosed as insular gliomas on MRI. All grades of patients treated by microsurgical techniques at our center from 2010 to 2016 were included in the study. *Results*: Median age at diagnosis was 39.52 years, Mean KPS score was 92.Male patients constituted 23 of all patients.68% patients had right sided tumors.WHO grade 2 was most common grade and constituted 64% of all cases.One patient developed expressive aphasia and five patients developed hemiparesis .There was one mortality due to unrelated causes. *Conclusion*: With the use of meticulous microneurosurgical technique, safe yet aggressive resection of the insular gliomas can be accomplished with comparable morbidity and mortality rates even when the modern neurosurgical tool such as intraoperative neuromonitoring and neuronavigation systems are unavailable.

Key words: Insular glioma, Microneurosurgery, Intraoperative neuronavigation

Introduction

Insular gliomas are difficult and challenging tumors to operate and manage due to the inherent complexity of the insular region and the adjacent vital structures around them. Although it constitutes a small region of cerebral cortex i.e. less than 2% but it is very important functionally and anatomically. It is involved in various important functions like speech production, pain perception, processing of social emotions like anger, fear, disgust, joy and

sadness. Its most anterior part considered as part of the limbic system. The clinical presentation of insular gliomas is somewhat associated with the grade. Epilepsy was the presenting symptom in 58% of cases without neurological deficit in low grade insular gliomas [Duffau et al., 2005] (3). On the other hand, high grade gliomas (HGGs) frequently cause surrounding vasogenic edema with adjacent tissue infiltration, resulting in local and hemispheric mass effect and sensorimotor and/or language deficits.Insular region gliomas have long been considered as difficult and challenging cases to be operated upon.This was due to the reason that these tumor arises in the region which has eloquent areas and microvasculature which supplies the important language and motor areas. With all these concerning issues it is difficult to decide the most appropriate treatment for LGG and HGG arising in the insular region. Insular gliomas are not rare and importantly most of these are low grade gliomas as reported in the previous epidemiological study by Duffau and Capelle, (3) these lesions accounted for 25% of all LGG and 10% of all HGG. As insular gliomas have an inherent tendency to be low grade because of which most of the patients having these tumors have a prolonged and slowly progressive clinical course. Based upon these observations we will study the various epidemiological factors associated with these tumors and to define the morbidity profile associated with the aggressive resection of these neoplasms. In this study we will assess the morbidity and mortality associated with the insular gliomas surgery without using the modern neuronavigation and intraoperative neuromonitoring system which is not available at all neurosurgical centres in the devolping countries.

Methods

The study was conducted in the Department of Neurosurgery S.M.S. Medical College&Hospital, Jaipur, India. All the insular glioma cases (age >18 years) operated and managed from January 2010 to February 2016 were included in the study. Histopathological tumor grading was done according to the WHO guidelines.Patient with multifocal lesions were excluded from study. The clinical data was collected from the patient records. Ethical committee of S.M.S. Medical College, Jaipur approved the study.

Technique

Patient was positioned with a rest pad under the ipsilateral shoulder with the head turned 60 degree contralaterally, which allows the frontal and temporal lobes to separate so that the sylvian fissure can be exposed easily without applying the retraction. This position provides a better orientation and exposure of the posterior insular lobule, which is hidden by both the pre- and postcentral gyri [Hentschel & Lang, 2005] (16). All cases were operated by standard microsurgical technique under general anaesthesia. Awake craniotomy (for speech centre localization) was not done in any of the patients. Intraoperative neuromonitoring or the neuronavigation system was not used. Frontotemporal craniotomy was planned in standard fashion to include the whole perisylvian area from the pars orbitalis of the inferior frontal gyrus to the postcentral sulcus which is the widest sulcus opening in to the sylvian fissure and

which limits the posterosuperior corner of the insula followed by the meticulous microsurgical dissection taking care of the vascular anatomy as avulsion of the short branches of the MCA may injure the parent vessel with serious consequences. The long perforators, supplying the corona radiata, must be saved during surgery to avoid ischemic injury of the white matter (Lang et al., 2001) (4). In the area of the limen insulae, the lenticulostriate arteries originates commonly from the medial or superior aspect of the MCA, five mm or less around its bifurcation, their injury could lead to ischemic damage of the internal capsule and hence needs to be protected during the tumor dissection. Gross total removal of the tumor was done and tumor tissue was sent for histopathological examination.

Patient outcome measurement

Patient was assessed and neurological examination was done in peri-operative period. Later, the patient was assessed at 1 week and at 4 week interval for any residual neurological deficit or improvement in any postoperative neurological deficit.

Results

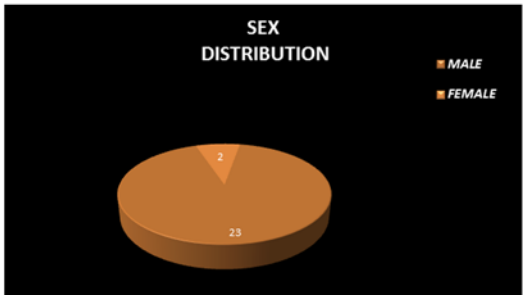
Patients' demographics

The study population included a total of 25 patients, in which 23 were men and 2 were women, with mean age of 39.5 years (range 21- 64 years) as illustrated in (table 1). Out of 25 patients 23 patients (92%) were male and 2 patients (8%) were females. Most common presentation was headache in 18 (68%) patients followed by seizure of recent onset in 64% patients. None of our patient has any sensory and language deficit. Right sided insular gliomas were seen in 17 (68%) patients whereas 8 (32%) patients had left sided tumors. The most common histologic grade of the tumor was WHO grade 2 in 16 patients (64%) followed by WHO grade 3 in 8cases (32 %) while WHO grade 4 was found only in 4 cases (4%). There was no WHO grade 1 tumor patients in our series. KPS score of the patients ranged from 30 to 100 with a mean score of 92.

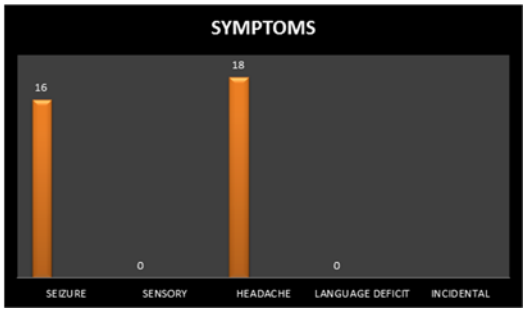
Table 1

Summary of patient, disease and treatment characteristics

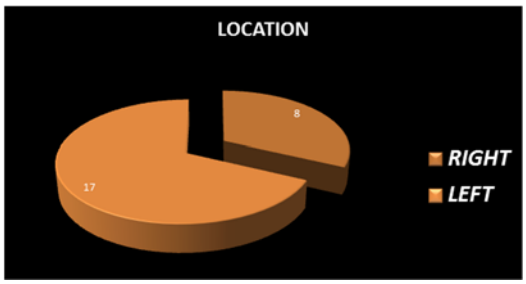
PARAMETERS	NUMBER(%)
AGE AT DIAGNOSIS (Yrs)	
Median	39.52
Range	21-64
SEX	
Male	23(92%)
Female	2(8%)
KPS SCORE (at diagnosis)	
Median	92
Range	30-100
SYMPTOMS AT PRESENTATION	
Seizure	16(64%)
Sensory	0
Headache	18(68%)
Language deficit	0
Incidental	0
SIDE OF TUMOR	
RT	17(68%)
LT	8(32%)
WHO TUMOR GRADE	
Grade II	16(64%)
Grade III	8(32%)
Grade IV	1(4%)



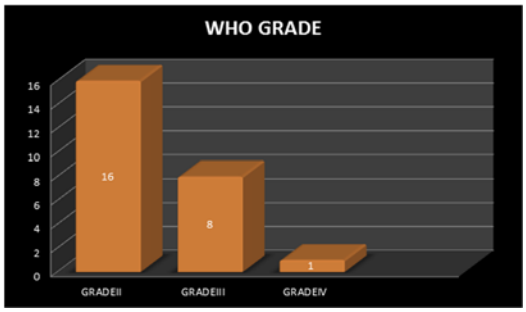
Piechart: sex distribution of insular glioma



Bar diagram: showing symptoms of insular glioma



Pie chart: showing location of gliomas



Histogram: showing grades of insular glioma

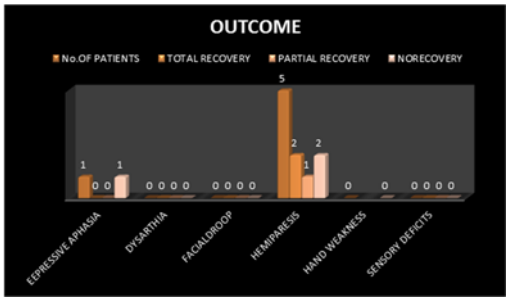


Chart: showing outcome of patients with insular glioma

Morbidity profile

We assessed the patients at four weeks and found that one patient (4%) developed expressive aphasia (Table 2) which did not improve after four weeks. None of the patients developed motor aphasia. Five of our patients (20%) developed hemiparesis. Out of these two patients had total functional recovery, one patient had partial recovery while two patients had no recovery in a four week follow up. There was no incidence of facial hemiparesis, hand weakness or new sensory deficits in the postoperative follow up in any patients. Mean KPS score at presentation was 92 and the postoperative mean KPS score was also 92. There was one mortality and patient died on 18 postop day due to unrelated causes. There is no intraoperative death in our series.

Discussion

Insular gliomas are the brain tumors which arise from the glial cells in the insular region. The Island of reel (insula) is composed of anterior and posterior lobule divided by a central sulcus. It is a hidden lobe situated in the depth of sylvian fissure. It is

pyramid shaped and its perimeter is defined by anterior, inferior and superior peri insular sulci. The limen insulae represents the medial limit of insula .It is a white matter structure which lies between the anterior perforated substance and the insular pole along the sylvian stem, and lies parallel to the lateral olfactory striae (true et al. ,1999) (12). Deep to the central portion of the insula, in a lateral-to-medial direction, lies the external capsule, claustrum, external capsule and putamen with its subjacent globus pallidus.

Insular gliomas are heterogenous in nature because of the variations in the histological grading, involved genetic factors and tumor locations (Sanai et al) (1). Surgical treatment of glial tumours arising in the insula is specially challenging due to its proximity to the internal capsule. (V. Vanaclocha et al) (17, 18). Surgical management of these tumors is recommended to improve the patient survival and increase the recurrence-free period [Duffau et al., 2009; Sanai et al., 2010] (1, 2). Since the first report by (Yasargil et al., 1992) (12), few authors have dealt with the surgical treatment of tumours infiltrating the insula [Duffau et al., 2005; Hentschel & Lang, 2005; Lang et al., 2001; Sanai et al., 2010; Zentner et al., 1996] (1, 3, 13, 16, 17). The blood supply of the insula is derived from the second (M2) segment of the middle cerebral artery (MCA) through its short and medium sized perforating branches. Long perforators overlying the posterior lobule are larger in diameter and may supply the corona radiata, particularly, the corticospinal tract fibres and thalamocortical fibers [Hentschel&Lang, 2005] (16). In the present study the incidences of insular gliomas in males were 92% and in females it was 8% whereas in previous study by Sanai et al (1) male and female incidence was 42% and 62% respectively. Most common symptoms of presentation in the previous study by Sanai et al1 was seizure in 72.1%, sensory deficit in12.5%, headache in 6.7%, language deficit in 4.8% and incidental in3.8%. Duffau et al (2) had seizure as most common presentation in 98% patients but in our series most common symptom was headache in (68%) followed by seizure (64%), none of our patient had language deficit, sensory disturbance or incidental presentation. Left Side of tumor was more common (55.7%) as compared to Rt. Side tumors (44.3%) in the study by Sanai et al (1), whereas in our study right Side tumor was more common and involved 17 patients (68%) and left side tumor was seen in 8 patients (32%). In our study 23 patients (92%) were male and 2 patients (8%) were females whereas in the previous study by Sanai et al (1) female patients constituted 59.6% and male patients constituted 40.4%. In our study WHO grade 2 was most common and constituted 64% grade 3 32% and grade 4 4% patients whereas in series published by Sanai et al (1) also, WHO grade 2 tumor was most common and constituted 60.1%, grade 3 30.4% and grade 4 8.7% patients. Karnofsky performance scale score of the patients ranged from 30 to 100 and mean KPS score was 92 whereas in Sanai et al (1) study the mean KPS score was 84. In the postop period one patient (4%) developed motor aphasia and five patients (20%) developed

hemiparesis. None of the patient developed new sensory deficit, hand weakness or facial droop. Mean KPS score at presentation was 92 and in the postoperative follow up also it was 92 at four weeks. There was one postoperative death in our series which was unrelated to the primary disease. Important predictors of outcome in insular glioma surgery were WHO grade of the tumor, age of the patient and Karnofsky performance scale score at the time of surgery. Inspite of the fact that we have operated all our cases under GA and we have not used awake craniotomy (for speech centre localization), intraoperative neuromonotoring, neuronavigation system our morbidity profiles are comparable to the previous published series. Although it is true that we can significantly increase the safe extent of resection with the use of above mentioned diagnostic tools and these should be used whenever these are available. But our small volume yet significant study has provided us encouraging results that similar results in terms of morbidity and mortality are achievable with the use of meticulous microneurosurgical technique.

Conclusion

Insular glioma surgery is challenging surgery due to its peculiar anatomical characteristics and carries substantial morbidity and complications. Better knowledge and understanding of locoregional anatomy and insular pathophysiology has helped us a lot in decreasing the morbidity and mortality associated with these tumors. Although our series is a small series of 25 cases but inspite of not using the neuromonitoring and neuronavigation system the postoperative morbidity profiles are comparable to the previous publications. However this does not negate the fact that better results and outcome is achievable with modern neuro-navigation and neuro-monitoring support and their use should be encouraged to promote better patient care.

Correspondence
Dr. Praveen Kumar
SMS medical college and hospitals Jaipur, India
+91- 7727834376
praveenthkr30 @gmail.com

References

1.Insular glioma resection: assessment of patient morbidity, survival, and tumor progression Nader Sanai, M.D., Mei-Yin Polley, Ph.D Mitchel S. Berger, M.D J Neurosurg 112:1–9, 2010.

2. Duffau H: A personal consecutive series of surgically treated 51 casesof insular WHO GRADE II glioma: advances and limitations J Neurosurg 110:696-708,2009

3. Duffau, H.; Taillandier, L.; Gatignol, P. & Capelle, L. (2005). The insular lobe and brain plasticity: Lessons from tumor surgery. Clinical Neurology and Neurosurgery,Vol.108, No.6, (September 2005), pp.543-548

4.Lang FF, Olansen NE, DeMonte F, Gokaslan ZL, Holland EC,Kalhorn C, et al: Surgical resection of intrinsic insular tumors: complication avoidance. J Neurosurg 95:638–650, 2001

5.Mehrkens JH, Kreth FW, Muacevic A, Ostertag CB: Long term course of WHO grade II astrocytomas of the Insula of Reil after I-125 interstitial irradiation. J Neurol 251:1455– 1464, 2004

7.Moshel YA, Marcus JDS, Parker EC, Kelly PJ: Resection of insular gliomas: the importance of lenticulostriate artery position.J Neurosurg 109:825–834, 2008

8.Sanai N, Berger MS: Glioma extent of resection and its impact on patient outcome. Neurosurgery 62:753–756, 2008

9.Schramm J, Aliashkevich AF: Surgery for temporal mediobasal tumors: experience based on a series of 235 patients. Neurosurgery 60:285–295, 2007

10. Simon M, Neuloh G, von Lehe M, Meyer B, Schramm J: Insular gliomas: the case for surgical management. J Neurosurg 110:685–695, 2009

11.Tanriover N, Rhoton AL Jr, Kawashima M, Ulm AJ, Yasuda A: Microsurgical anatomy of the insula and the sylvian fissure. J Neurosurg 100:891–922, 2004

12.Türe U, Yaşargil DC, Al-Mefty O, Yaşargil MG: Topographic anatomy of the insular region. J Neurosurg 90:720–733, 1999

13. Zentner, J.; Meyer, B.; Stangl, A. & Schramm, J. (1996). Intrinsic tumors of the insula: a prospective surgical study of 30 patients. Journal of Neurosurgery, Vol.85, No.2,(August 1996), pp.263-271

14.Yasargil, MG.; von Ammon, K.; Cavazos, E.; Doczi, T.; Reeves, JD. & Roth, P. (1992). Tumors of the limbic and paralimbic systems. Acta Neurochirurgica, Vol.116, No.2-4, (March1992), pp.147-149

15.Signorelli, F.; Guyotat, J; Elisevich, K. & Barbagallo, GM. (2009). Review of current microsurgical management of insular gliomas. Acta Neurochirurgica, Vol.152, No.1,(January 2010), pp.19-26,

16.Hentschel, SJ. & Lang, FF. (2005). Surgical resection of intrinsic insular tumors. Neurosurgery, Vol.57, No.1, (July 2005), pp.176-183

17. Surgical treatment of insular gliomas.Vanaclocha V1, Sáiz-Sapena N, García-Casasola C. Acta Neurochir (Wien). 1997;139(12):1126-34

18. Technical nuances for surgery of insular gliomas: lessons learned.
Rey-Dios R1, Cohen-Gadol AA. Neurosurg Focus. 2013 Feb;34(2):E6