

The Surgical Management of Supratentorial Astrocytomas Study of Preoperative Functional Status and Grade of Tumour For The Final Outcome

MUHAMMAD ANWAR, BABAR BUTT, NAVEED ASHRAF

Ghulam Younis, Asif Rashid, Azhar Javed

Department of Neurosurgery Unit II, PGMI / Lahore General Hospital, Lahore

ABSTRACT

Objective: Thirty cases of supratentorial extraganglionic astrocytoma were studied pre-and post operatively to evaluate the surgical Mortality and morbidity in relation to preoperative Karnofskys performance scale and histopathology of astrocytoma study. Comparative observational study conducted Neurosurgery Unit II, PGMI / Lahore General Hospital, Lahore.

Results: Mortality was 26.6% (8 patients), 87.5% patients having KPS <70 and 12.5% patients having KPS >70, as the level of significance is 0.1, p. value is 0.14. Mortality was high in high grade astrocytoma; G IV 50%, G III 37.5% and low in low grade astrocytoma; G II- 12.5% and G I-0%. With 0.1 level of significance, p. value is 0.07. Surgical morbidity was 50% (15 patients), of which 60% was early morbidity. Delayed morbidity occurred in 13% and was mixed (early and delayed) in 27%. Morbidity was high in high grade astrocytomas; G IV 27% G III - 47% and low in low grade astrocytoma G II 26% and G I-0%.

Conclusion: Mortality depended upon pre operative functional status and histopathological grade of astrocytoma in this study. Quality of life after surgical excision also depended upon the pre operative neurological status.

Key Words: Supratentorial astrocytoma, surgical morbidity, mortality.

Abbreviations: KPS = Karnofsky's Performance Scale, G = Grade, GBM = Glioblastoma Multiformae.

INTRODUCTION

The worldwide incidence of astrocytomas increased over the last few years, most noticeably in the elderly.¹ This could be due to an absolute increase in these tumors particularly when the life expectancy has increased. It could also be due to newer imaging methods which are available nowadays, both of these factors are responsible for increased no. of patients diagnosed every year.²

Supratentorial astrocytomas constitute major burnt of neurosurgery. The successful removal of astrocytomas without increase in the pre-existing neurological deficit of the patient is the main objective the surgery.

The majority of Astrocytomas are infiltrating tumors, therefore during resection, the borderline between normal tissue and tumor is usually not clear. On the other hand, for achievement of optimal results maximal tumor resection is necessary with minimal disturbance of normal tissue. For astrocytomas present in the cerebral hemisphere, frontal, temporal and parietal osteoplastic craniotomies are performed according to the site of the tumor. For deep seated astrocytomas in the region of thalamus and basal ganglia usually the Stereotactic biopsy is performed. The choice of operation depends upon the surgeon, whether he wants to go for resection of the tumor or for the biopsy.

MATERIALS AND METHODS

Aim and Objective

1. To study the mortality and morbidity in relation to preoperative Karnofskys performance scale and histopathology of astrocytoma.
2. To assess the functional status at the end of one year according to Karnofskys performance scale.

Methodology:

1. The study was carried out in the Department of Neurosurgery, Unit II, Lahore General Hospital Lahore, affiliated with Postgraduate Medical Institute and Fatima Jinnah Medical College Lahore. This department deals with cases referred from most of the areas of Punjab and other provinces of Pakistan. Most of the cases in this study were presented through out-patient department and others were admitted through emergency. Patients were included/ excluded from study according to inclusion/exclusion criteria.
2. All patients included in this study were admitted from May, 2001 to January 2002. All patients had C.T. Scan (Plain / Contrast) with provisional diagnosis of astrocytoma. Confirmed cases on histopathology basis were included in the study.
3. Following information was obtained from every patient according to proforma.
4. Gross total/subtotal excision of the tumor was carried out whenever it was indicated.
5. Thirty cases of histologically proven astrocytoma with subtotal or total excision, were followed up for one year.
6. In follow-up, patients were assessed according to Karnofskys performance scale after one, three, six months and one year.
7. Results were analyzed statistically by using statistical package of social sciences-10 to determine mortality, morbidity and quality of life in relation to Karnofskys performance scale in different grades of astrocytoma.

Study Design

It was a comparative observational study (before and after), study comprising thirty cases of Supratentorial astrocytomas presenting to Department of Neurosurgery Unit II, Lahore General Hospital Lahore.

Data Analysis

Data was prosecuted as proportions (%), and was analyzed by applying chi. square test using statistical package for social sciences-10. Data were collected from every patient according to a proforma.

Inclusion Criteria

Adults of both sexes between 15-70 years of age.

All patients with a provisional diagnosis of having Supratentorial astrocytomas as diagnosed on C.T. Scan and confirmed on histopathology.

Exclusion Criteria

1. Those harboring deep seated lesions.
2. Butterfly gliomas
3. Recurrent astrocytomas.
4. G.C.S less than 10.
5. Medically unfit patients.
6. Biopsy proven other than astocytomas.

Data Collection and Observation

Thirty eight patients of suspected astrocytomas on C.T. Scan were included in this study. Out of thirty eight patients, eight patients histopathology proved to be glial tumors other than astrocytomas such as oligodendrogliomas, ependymoma etc. These were excluded from the study.

Follow-up of these patients was done for one year with interval of one, three, six months and one year - During follow-up quality of life was evaluated according to Karnofskys performance scale. Mortality and morbidity of these patients was also determined.

RESULTS

Sex Incidence

In the present study male dominancy was noted with males outnumbering females in a ratio of 2.75:1.

Seventeen patients had tumors in the left hemisphere and thirteen patients in the right hemisphere. Astrocytomas were commonly present in temporo-parietal region (23.3%), followed by Frontoparietal region (20%). Various sites of the tumors are given in Table 1. Twenty eight patients had solid and semisolid tumors and two patients had cystic tumors. Majority of the lesions were contrast enhancing either homogeneously or non-homogeneously. Few lesions were non-enhancing (Table 2). Lesions in five patients showed calcification in various areas of the tumors. None of the lesions showed evidence of the hemorrhage.

Table 1: Topographical Site.

Site	No. of Patients	%
Temporo-parietal	7	(23.3%)
Fronto-parietal	6	(20%)
Parietal lobe	6	(20%)
Frontal lobe	6	(20%)
Temporal lobe	4	(13.3%)
Posterior parietal	1	(03.3%)

Histopathology

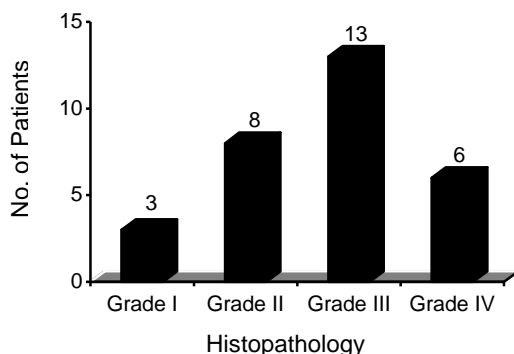
The histopathology (Table 3, Graph 1) showed that 3 (30%) patients were in Grade I (10%), 8 (27%) Patients in G II, 13 (43%) patients in G III and 6 (20%) patients were in G IV. Gross total/near total surgical excision was feasible in 90% of cases and 10% were excised partially.

Outcome

Twenty two (73%) patients survived for 1 year after total / subtotal surgical excisions. Out of these 5 (17%) patients were in KPS-100, 7 (23%) patients were in KPS-90, Four (13%) patients were in KPS-80 which is a high Karnofsky score and shows good recovery. 2 (7%) patients were in KPS-70, 3 (10%) patients were in KPS-60, in these scores patient cannot take of themselves care himself and cannot do the normal activity without distance shows moderate recovery. One (3%)

Table 2: Enhancement Pattern of Astrocytoma.

Enhancement	19	(63%)
Non-Enhancement	6	(20%)
Poorly Enhancing	5	(17%)



Graph 1: Histopathology.

patient was in KPS-40, who was disable and requires special assistance and care, it shows poor recovery.

Table 3: Histopathology.

Histopathology	No. of Patients	%
Grade I	3	(10%)
Grade II	8	(27%)
Grade III	13	(43%)
Grade IV	6	(20%)

Mortality

Mortality (Table 4) at the end of one year was 8 (27%) patients. Postoperative mortality, death in one month of surgery, came out to be 2 (7%) patients. One (12.5%) patient died with preoperative KPS-90 which had good quality of life preoperatively while 7 (87%) patients died having KPS-70 or below in which patient cannot do his normal life activities he needs assistant and care.

Table 4: Mortality in relation to Histopathology.

Histopathology	No. of Patients Expired	%
Grade I	6	0
Grade II	1	3.3%
Grade III	3	10%
Grade IV	4	13.3%
Mortality	8	27%

With reference to the **grading** of astrocytoma as the malignancy increases **mortality** increases, it is one patient (12.5%) in astrocytoma grade II, three patients (37.5%) in astrocytoma grade III and four patients (50%) in astrocytoma grade IV after one year of surgical excision.

Morbidity

Surgical morbidity (Table 5) occurred in 15 (50%) patients out of which 12 (80%) patients had early morbidity: wound infection, CSF leakage, hematoma formation and weakness. Three (13%) patients recurrence had delayed morbidity: fits, delayed wound infection and weakness. Six (40%) patients having surgical morbidity had expired and nine (60%) patients had recovered.

Table 5: Surgical Morbidity.

Surgical Morbidity	Early Morbidity		Delayed Morbidity	
	No. of Patients	%	No. of Patients	%
Wound infection	2	13%	0	0
Fits	3	20%	1	6.6%
Motor weakness	2	13%	1	6.6%
Intracerebral hematoma	2	13%	0	0
Extradural hematoma	1	6.6%	0	0
Recurrence	0	0	1	6.6%
Cerebrospinal fluid leakage	2	13%	0	0
Total	12	80%	3	20%

Table 6: Histopathology and Kernofskys Performance Scale Preoperatively and at One Year Follow-up.

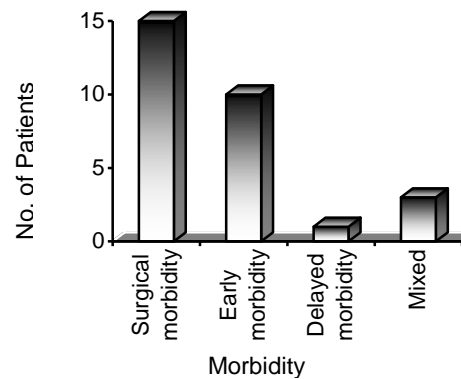
Histopathology	Preoperative KPS	No. of Patients / %	KPS at One Year	No. of Patients / %
Grade I	> 70	2 (6%)	< 70	3 (13.6%)
	< 70	1 (3%)	< 70	No
Grade II	> 70	4 (13%)	> 70	6 (27%)
	< 70	3 (10%)	< 70	2 (9%)
Grade III	> 70	4 (13%)	> 70	5 (23%)
	< 70	10 (33%)	< 70	4 (18%)
Grade IV	> 70	1 (3%)	> 70	2 (9%)
	< 70	5 (7%)	< 70	No

Table 7: Karnofskys Performance Scale of Follow-up.

KPS	One Month	Three Months	Six Months	One Year
100	0	2	5	5
90	6	6	6	7
80	6	4	4	4
70	6	5	3	2
60	2	2	3	3
50	5	5	1	0
40	2	2	3	1
Total Aline	27	26	25	22

Follow-Up

Thirty patients under went total/partial resection and were followed-up at one month, three months, six months and one year after surgery. In the follow-up visits quality of life was assessed according to Karnofskys s performance scale. The following data was obtained (Table 7).



Graph 2: Histopathology.

One Month

Twenty seven patients were alive at the end of first month. Three patients died within one month due to surgical morbidity, giving a peri-operative mortality rate of 10%.these included post. Operative fits, wound infection, cerebrospinal fluid leakage. kernofskys performance scale of twenty seven patients after one month of surgery is given in the Table 7.

Three Months

Twenty six patients were alive at the end of three months. One patient died in the 2nd month and 45 days after surgery. He was post operatively in KPS.80 and was of astrocytoma of G III. He had post-operative wound infection and fits.

Six Months

Twenty five patients were alive at the end of six months. One patient died in 5th month in postoperative period. He had postoperative KPS.40 and had fits post-operatively and was of astrocytomas G IV (Table 7).

One Year

Twenty two patients were alive at the end of one year. Three patients died in the postoperative duration of 6 month to one year. All the three patients had post-operative KPS. 40-50. two patients had astrocytoma of

G IV and one had of G III (Table 7).

DISCUSSION

In our study 3 patients were in Grade I (10%), 8 (27%) patients in G II, 13 (43%) patients in G III and 6 (20%) patients were in G IV. Majority of the patients were having high grade tumors. Gross total/near total surgical excision was feasible in 90% of cases and 10% were excised partially. Although the question of optimal treatment for malignant gliomas has been addressed in many retrospective papers, no clear answer has been found to what extent surgical removal of tumor tissue should be performed. Kiwit and Floeth conducted a retrospective analysis in 274 unselected patients, of malignant supratentorial glioma. Median survival time after surgery was analyzed with respect to the following defining variables: Age, pre- and postoperative Karnofsky Performance Scale (KPS), tumor location, histology, sex, pre- and postoperative tumor volume and volumetrically measured extent of resection, they found that all these defining variables with exception of sex and preoperative tumor volume were of significant influence on the median survival time of glioma patients. In addition median postoperative KPS at the point of discharge in patients with tumor resection was slightly better (KPS 58%) in comparison with the biopsy group (KPS 53%) but not on a significant level. They concluded from these data that patients harbouring malignant gliomas clearly benefit from cytoreductive surgery compared with stereotactic biopsy regarding life expectancy and mildly regarding life quality¹. The extent of tumor removal and the amount of residual tumor volume, documented on postoperative imaging studies, seem to be highly significant factors affecting the median time to tumor progression and median survival for patients with high grade astrocytomas of the cerebral hemisphere⁴.

In our study Patients with good preoperative condition improved after surgical excision, and patients with poor neurological status, Karnofskys performance scale < 70 had poor results. Thirteen patients improved neurologically, 6 patients had the same status, two have poor status than preoperative condition, one had recurrence. Karnofskys performance scale for all cases was most commonly is 80-90 and there tended to be higher percentage of patients with malignant tumors to have a Karnofskys performance scale less than 70. Karnofskys performance scale was higher in the patients up to 4th decade, and declining with increasing age.

Karnofskys rating were analyzed preoperatively as well as in each follow up and at the end of one year. For a large group of patients with GBM, less than 20% had KPS greater than 70. According to Stephen Mehlay for major histological groups of astrocytoma, 5-year survival rates were significantly better for patients with initial score more than 70.⁵

In our study, (Table 6) seventeen (56.6%) patients had Karnofskys performance scale more than 70 and 13 (43.3%) patients which are mostly of astrocytoma G.III, G.IV. Postoperatively Karnofskys scale more than 70 was in 16 (73%) patients and patients with Karnofskys scale less than 70 are in 6 (27%) patients. Therefore mortality depended upon the preoperative quality of life, 87% mortality was in those patients who could not do the normal life activities preoperatively and 12.5% in those patients who had good quality of life preoperatively.

The clinical functional ability of the brain-tumor patient at the time of treatment is known to be strong predictors of out come. Karnofskys performance scale is available for many cases, and most patients presented with near normal functional abilities and minor symptoms. The more Anaplastic the histopathology of the patients tumor, the lower the presenting Karnofskys performance scale was likely to be. Higher the Karnofskys performance scale, lower the Anaplastic the histopathology.

Shinoda et al⁶ in his study to evaluated the extent of resection in GBM observed that Karnofsky performance scale (KPS) score (70-100%) and extent of surgery (gross total resection) were significant good prognostic factors.

In multiple studies it is concluded that mortality in relation to histopathology is more in astrocytomas of high grade; G-III, G-IV and less in low grade astrocytoma; G-I, G-II.⁷⁻¹⁰ In our study the results are similar to these results, as mortality in G.I, 3.3%, in G-II, 3.3%, in G-III, 10% and in G-IV, 13.3% of the total patients. Our clinical experience showed that tumor-mass reduction by surgery is efficacious in many patients with glioblastoma because it improved their symptoms and provide the opportunity to administer adjuvant therapy with less adverse effects.

In a review of international literature, Neuwelt and Nazzaro found that despite extensive studies over 50 years the role of cytoreductive reductive surgery as related to survival remained unclear.¹¹ There is agreement that **extensive resection is preferable for frontal, temporal and occipital polar lesion**, but there is disagreement regarding the extent of excision in other

areas⁸. Ciric and Ammirati and Salcman et al have demonstrated that **gross total resection** of malignant astrocytoma is associated with a low morbidity and mortality and with **prolongation of life** and a **better quality of survival**.^{12,13} This view is not shared, however, by a number of neurosurgeons who prefer a minimal decompression fearing that an extensive resection increases the danger of post operative neurological deficit and hemorrhage.¹⁴

The role of surgery in the management of supratentorial astrocytomas remains undisputed.¹⁵ It yields tissue for diagnosis, thus providing the basis for subsequent management decision: it also achieves decompression, relieving signs and symptoms of increased intracranial pressure. Studies on the effectiveness of radical tumor resection have produced divergent results.¹⁶ The **issue** that remains unresolved, therefore, is not the advisability of surgery, but rather the **extent of the resection**.

CONCLUSION

The results of this study suggest to us that:

1. **Mortality** depended upon pre operative **functional status** and histopathological **grade** of astrocytoma. **Quality** of life after surgical excision also depended upon the pre operative neurological status.
2. We think that, in all patients submitted to surgery for the treatment of supratentorial astrocytomas an **attempt should be made to resect the lesion maximally**. The risks appear no greater and the benefits are substantial.

Address for correspondence:

Dr. Mohammad Anwar Ch.

Department of Neurosurgery

PGMI / Lahore General Hospital, Lahore

Cell: 0321 - 4333007

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