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Clinical Study

Symptom resolution in infiltrating WHO grade II-IV glioma patients undergoing surgical resection

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ABSTRACT

Past studies of morbidity in patients with infiltrating gliomas have focused on the impact of surgery on quality of life. Surprisingly, little attention has been given to the rate at which the presenting symptoms improve after surgery, even though this is often the patient's first concern. This study is an initial effort to provide useful information about symptom resolution and factors predicting persistence of symptoms in glioma patients who undergo surgery. We conducted a retrospective analysis on patients who underwent surgery for World Health Organization (WHO) grade II-IV astrocytoma/oligodendroglioma/oligoastrocytoma at our institution. All patients were seen 2–4 months postoperatively, and asked about the persistence of symptoms they experienced preoperatively. Symptoms reported in clinic were assessed against symptoms reported prior to surgery. Our study includes 56 consecutive patients undergoing surgery for gliomas. Of patients who experienced symptoms initially, headache resolved in 18/27 postoperatively, weakness resolved in 8/14 postoperatively, altered mental status resolved in 8/12 postoperatively, vision problems resolved in 7/11 postoperatively, nausea resolved in 5/7 postoperatively, and ataxia resolved in 4/5 postoperatively. Headache was more likely to resolve in patients with frontal or temporal tumors ($p = 0.02$). Preoperative Karnofsky Performance Scale (KPS) of 70 or less was associated with longer post-surgical hospital stay ($p < 0.01$). Younger patients were more likely to experience a resolution of altered mental status ($p = 0.04$). Our analysis provides data regarding the rate at which surgery alleviates patient symptoms and considers variables predicting likelihood of symptom resolution. Some patients will experience symptom resolution following resection of WHO grade II-IV gliomas in the months following surgery.

1. Introduction

A diverse collection of initial symptoms may herald the diagnosis of a high- or low-grade glioma. Common symptoms encountered by infiltrating glioma patients include headache, weakness, ataxia, vision deficits, and cognitive changes. These tumors often have devastating outcomes for patients and can eventually be fatal. However, survival in glioma patients continues to improve with better medical and surgical therapeutic options.

A number of studies have examined the effect of surgical resection on overall survival and quality of life, but few have explored the rate at which the presenting symptoms improve after surgery. Symptom resolution in glioma patients following tumor resection has not been well described, though this often is the patient's greatest initial concern. Further, as survival in this population continues to improve, these patients are living longer with their symptoms.

As tumor resection has an important role in treating World Health Organization (WHO) grade II-IV gliomas [1–5], we aim to better understand the frequency of symptom resolution in patients who undergo surgery. To our knowledge, no study has yet examined the frequency of resolution of symptoms most common in glioma patients. This study presents an initial investigation of factors predicting persistence of symptoms despite surgery.

2. Materials and methods

2.1. Patient population

We performed a review of patients who recently underwent surgery at our institution for tumors involving the cerebral

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hemispheres. Only patients with histopathologic diagnosis of WHO grade II-IV astrocytoma, oligodendroglioma, and mixed oligoastrocytoma were included. We performed a retrospective assessment of hospital charts, medical records, and pathology reports. Only patients with complete medical records were included. This study was performed with approval of our Institutional Review Board (IRB #3199).

2.2. Treatment

Decisions regarding surgical approach to operative goals were by attending physician preference. All patients after 2005 received postoperative temozolomide and radiotherapy fitting with standard practices [6]. Steroids were weaned to the lowest dose possible within 3 weeks of surgery. MRI with gadolinium contrast was performed pre- and postoperatively.

2.3. Outcome assessment

History and physical examinations were performed preoperatively by an attending neurosurgeon. Preoperative Karnofsky Performance Scale (KPS) scores were assessed during this examination. Patients were asked whether symptoms reported preoperatively had changed at follow-up appointments 2–4 months postoperatively. We chose this duration as it is a typical follow-up time for re-imaging in tumor patients. Symptoms reported in clinic at that time were assessed against symptoms reported by patients prior to surgery. New complaints at follow up were also noted.

For initial complaints, including vision changes, nausea, and ataxia, the symptom was considered resolved if the patient reported absence (or near absence) of the symptom at postoperative follow-up. If the symptom, as reported by the patient, worsened or failed to improve completely with surgery, it was considered unresolved. Headache as an initial complaint was assessed by frequency and severity, and was considered resolved if the patient reported headaches occurring less than once per week and not restricting activity. Weakness was recorded as resolved if deficits noted on neurological exam preoperatively were absent postoperatively at clinic. Weakness that failed to improve with surgery or that worsened postoperatively was recorded as unresolved. Mental status was assessed pre- and postoperatively by the attending neurosurgeon as part of the standard neurological exam, and any abnormal exam was documented. Mental status was recorded as resolved if the patient had returned to his or her pre-tumor baseline mental status by the time of the follow-up appointment.

2.4. Statistical analysis

Potential differences in each subgroup of presenting symptom were assessed to identify factors associated with symptom resolution. Categorical variables were compared using Pearson chi-squared test. Fisher exact test was used if more than 80% of values were less than 5. Continuous variables were compared using independent samples Student's *t*-test. Confidence limits for proportions were calculated using the Clopper–Pearson Exact method. A p value $\leqslant 0.05$ was considered statistically significant.

3. Results

3.1. Patient characteristics

Patient demographics and tumor characteristics are summarized in Table 1. We identified 56 patients, 24 (43%) women and 32 (57%) men. Patient ages ranged from 20 to 82 years; median age was 50 years. Nine of 56 patients (16%) had WHO grade II astrocytoma/oligodendroglioma/oligoastrocytoma tumors, and 47/56 (84%) had WHO grade III-IV astrocytoma/oligodendroglioma/oligoastrocytoma/glioblastoma tumors. Twenty-three (41%) had left-sided tumors, 26 (46%) had right-sided tumors, and seven (13%) had tumor involvement bilaterally. Twenty-eight (49%) were in the frontal lobe, 10 (18%) were primarily in the temporal lobe, 15 (26%) were in the parietal lobe, and four (7%) were in the occipital lobe.

Table 1
Patient demographics and tumour characteristics of study group undergoing resection of WHO grade II-IV glioma

Gender	*N*	Median Age (Range)
Total	56	50 (20–82)
Women	24 (43%)	50 (20–82)
Men	32 (57%)	50 (21–79)
WHO Grade	***N***	
II	9 (16%)	
III-IV	47 (84%)	
EOR	***N***	
100%	19 (34%)	
90%–99%	14 (25%)	
70%–89%	23 (41%)	
Tumor Location	***N***	
Frontal	28 (49%)	
Temporal	10 (18%)	
Parietal	15 (26%)	
Occipital	4 (7%)	
Tumor Side	***N***	
Left	23 (41%)	
Right	26 (46%)	
Bilateral	7 (13%)	
KPS Score	***N***	
Preoperative Median	70	

EOR = extent of resection, KPS = Karnofsky Performance Scale, WHO = World Health Organization

3.2. Symptom resolution

Frequencies of presenting symptoms and symptomatic resolution are given in Table 2. Headache was the most commonly reported presenting symptom in 27/56 (48%) patients and improved in 18/27 (67%) patients (95% CI: 46%–84%). Weakness was a presenting symptom in 14/56 (25%) patients, and resolved postoperatively in 8/14 (57%) patients (95% CI: 29% 82%). Altered mental status (AMS) occurred in 12/56 (21%) patients and resolved in 8/12 (67%) patients (95% CI: 35%–90%). Difficulty with vision was a presenting symptom in 11/56 (19%) patients, and resolved

Table 2
Frequency of presenting symptoms and symptom resolution of WHO grade II-IV glioma

Presenting Symptom	Resolution
Headache	18/27 (67%) (95% CI: 46%–84%)
Weakness	8/14 (57%) (95% CI: 29%–82%)
Altered mental status	8/12 (67%) (95% CI: 35%–90%)
Vision Problems	7/11 (64%) (95% CI: 31%–89%)
Nausea	5/7 (71%) (95% CI: 29%–96%)
Ataxia	4/5 (80%) (95% CI: 28%–99%)