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Assessment of Effect of Ventricular Entry on Patient Outcome During Glioblastoma Resection

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ABSTRACT

Background: Aim: Assessment of effect of ventricular entry on patient outcome during glioblastoma resection. **Methods:** Sixty- two cases of recurrent supratentorial glioblastoma (GBM) of either gender were included. Based on VE, patients were divided into 2 groups. Group I were those with VE and group II were without VE. Tumor location with respect to the subventricular zone (SVZ), size, and extent of resection were assessed using pre- and postoperative imaging. **Results:** Postoperative hydrocephalus was seen in 1.4% and 2.6%, ventriculoperitoneal shunting in 1% and 3.8%, subdural hematomas in 11.4% and 4.2% and pseudomeningoceles in 8% and 4.2% in group I and II respectively (P< 0.05). Survival rate in type I and II in group I was 1.23 years and 1.73 years in group II and in type III and IV was 1.18 years in group I and 1.68 years in group II. A significant difference was observed (P< 0.05). **Conclusion:** It was observed that ventricular entry during glioblastoma multiforme resection is not associated with adverse patient outcomes and should be used by surgeons to enhance extent of resection.

Keywords: Glioblastoma multiforme, Tumor location, Ventricular entry.

INTRODUCTION

Glioblastoma multiforme (GBM) is the most common malignant primary brain tumor in adults and is known for its invasive and aggressive behavior.[1,2] The optimal combination of medical, surgical, and radiation therapy for patients with GBM has yet to be defined, and the surgical component of therapy can range from a minimally invasive biopsy to a craniotomy with a goal of gross total resection (GTR).[3,4] Although the advent of 5-aminolevulinic acid–guided intra-operative techniques has increased the extent of resection (EOR) that is surgically possible, not every patient receives an aggressive resection.[5] Moreover, variations in treatment protocols have done very little to extend survival, and fierce debate about this topic continues. Although cytoreductive surgery is the cornerstone of therapy in GBM, no consensus exists regarding the optimal EOR necessary to improve survival.[6,7]

While manifestation of malignant gliomas outside the central nervous system is extremely rare, leptomeningeal metastasis (LM) is a well-known but widely underestimated complication in the course of disease of these patients.[8] To date, we are unaware of the causes of LM and methods and techniques of prevention are not available.[9] Although frequently detected in the absence of clinical symptoms LM can be the source of massive morbidity and poor survival of patients after diagnosis of LM has unequivocally been reported.[10,11] Considering this, the present study was conducted with the aim to assess effect of ventricular entry on patient outcome during glioblastoma resection.

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MATERIALS AND METHODS

A total of sixty- two cases of recurrent supratentorial glioblastoma (GBM) of either gender. The approval for the study was obtained from institutional review board and all enrolled patients were verbally informed and their written consent was obtained.

All patients underwent resection. Their demographic data such as name, age, gender etc. was recorded. Tumor location with respect to the subventricular zone (SVZ), size, and extent of resection were assessed using pre- and postoperative imaging. VE was determined by postoperative imaging and/or the operative report. Based on VE, patients were divided into 2 groups. Group I were those with VE and group II were without VE.

RESULTS

Table 1: Distribution of patients

Groups	Group I	Group II
Status	VE	Without VE
Male	17	20
Female	14	11

There were 17 males and 14 females in group I and 20 males and 11 females in group II [Table 1].

Table 2: Comparison of parameters

Parameters	Group I	Group II	P value
Postoperative hydrocephalus	1.4%	2.6%	<0.05
Ventriculoperitoneal shunting	1%	3.8%	>0.05
Subdural hematomas	11.4%	4.2%	<0.05
Pseudomeningoceles	8%	4.2%	<0.05

Postoperative hydrocephalus was seen in 1.4% and 2.6%, ventriculoperitoneal shunting in 1% and 3.8%, subdural hematomas in 11.4% and 4.2% and pseudomeningoceles in 8% and 4.2% in group I and II respectively (P< 0.05) [Table 2, Figure 1].

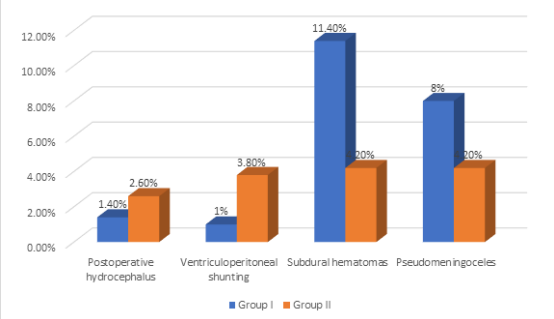

Figure 1: ?

Table 3: Survival rate (years)

Type	Group I	Group II	P value
I & II	1.23	1.73	<0.05
III & IV	1.18	1.68	<0.05

[Table 3] shows that survival rate in type I and II in group I was 1.23 years and 1.73 years in group II and in type III and IV was 1.18 years in group I and 1.68 years in group II. A significant difference was observed (P< 0.05).

DISCUSSION

The causal association between aggressive tumor resection with tumor-negative margins and improved survival is a venerated belief in the field of surgical oncology despite several spectacular refutations, most notably in the world of breast oncology, where nearly a century of commitment to radical mastectomy ultimately yielded to the long-term results of randomized clinical trials.[12,13] The single and highly significant risk factor for LM was surgical opening of the ventricle.[14] The risk for a patient with ventricular entry to experience LM in the course of disease is 8 times that of a patient without ventricular entry. Elliot et al,[15] did not find a correlation between ventricular entry and LM in their series of 51 HGG patients (of whom 35% developed LM). Bae et al,[16] reported ventricular entry in 35 of 96 patients with HGG and all 11 patients with LM had previous ventricular entry. In line with these and our findings, several other authors found LM to be related to ventricular entry. In light of the large variance of time between surgical ventricular entry and the diagnosis of LM observed in the present study (67–1070 days), non-surgical mechanisms like tumor recurrence with breach of the ventricles or local recurrence in the setting of a previously opened ventricle have to be taken into consideration as potential cause of LM. The present study was conducted to assess effect of ventricular entry on patient outcome during glioblastoma resection.

We observed that there were 17 males and 14 females in group I and 20 males and 11 females in group II. Young et al,[17] in 200-patient cohort of newly diagnosed and recurrent GBM, 26.5% of patients had VE during resection. Patients with VE were more likely to have pre-existing subependymal disease (41.5% vs 15.0%). Comparing patients with VE to those without VE, there was no difference in the rates of postoperative hydrocephalus (1.9% vs 4.8%), ventriculoperitoneal shunting (0% vs 3.4%), pseudomeningoceles (7.5% vs 5.4%), or subdural hematomas (11.3% vs 3.4%). Importantly, rates of subsequent leptomeningeal disease (7.5% vs 10.2%) and distant parenchymal recurrence (17.0% vs 23.1%) were not different between the groups. Newly diagnosed patients with tumors contacting the SVZ (type I or II) had worse survival than patients with tumors that did not contact the SVZ (type III or IV) (1.27 vs 1.84 years), but VE was not associated with worse survival in these patients with high-risk SVZ type I and II tumors (1.15 vs 1.68 years).

We observed that postoperative hydrocephalus was seen in 1.4% and 2.6%, ventriculoperitoneal shunting in 1% and 3.8%, subdural hematomas in 11.4% and 4.2% and pseudomeningoceles in 8% and 4.2% in group I and II respectively (P< 0.05). Roelz et al,[18] assessed the influence of potential risk factors for LM and the impact of LM on survival multivariate statistics were performed. 239 patients with a diagnosis of HGG and at least 6 months of MRI and clinical follow-up were included. LM occurred in 27 (11%) patients and was symptomatic in 17 (65%). A strong correlation of surgical entry to the ventricle and LM was found (HR: 8.1). Ventricular entry was documented in 137 patients (57%) and LM ensued in 25 (18%) of these. Only two (2%) of 102 patients without ventricular entry developed LM. Median overall survival of patients after diagnosis of LM (239 days) was significantly shorter compared to patients without LM (626 days). LM is a frequent complication in the course of disease of HGG and is associated with poor survival. Surgical entry to the ventricle is a key risk factor for LM.

In present study, survival rate in type I and II in group I was 1.23 years and 1.73 years in group II and in type III and IV was 1.18 years in group I and 1.68 years in group II. Brown et al,[19] revealed decreased mortality for GTR compared with STR at 1 year (RR, 0.62; 95% CI, 0.56-0.69; P < .001; number needed to treat [NNT], 9) and 2 years (RR, 0.84; 95% CI, 0.79-0.89; P < .001; NNT, 17). The 1-year risk for mortality for STR compared with biopsy was reduced significantly (RR, 0.85; 95% CI, 0.80-0.91; P < .001). The risk for mortality was similarly decreased for any resection compared with biopsy at 1 year (RR, 0.77; 95% CI, 0.71-0.84; P < .001; NNT, 21) and 2 years (RR, 0.94; 95% CI, 0.89-1.00; P = .04; NNT, 593). The likelihood of disease progression was decreased with GTR compared with STR at 6 months (RR, 0.72; 95% CI, 0.48-1.09; P = .12; NNT, 14) and 1 year (RR, 0.66; 95% CI, 0.43-0.99; P < .001; NNT, 26). The quality

of the body of evidence by the GRADE criteria was moderate to low.

CONCLUSION

It was observed that ventricular entry during glioblastoma multiforme resection is not associated with adverse patient outcomes and should be used by surgeons to enhance extent of resection.

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