Ventriculoperitoneal Shunting for Communicating Hydrocephalus in Glioblastoma.

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Introduction

- 3-25% of glioblastoma (GBM) patients develop communicating hydrocephalus after resection
- The specific pathogenesis of this disruption in flow of cerebrospinal fluid (CSF) is unclear
- Few studies have evaluated the risk factors for the development of hydrocephalus and the clinical benefit of ventriculoperitoneal shunt (VPS) in these patients
- We sought to study potential associated factors for the development of hydrocephalus, identify who may benefit most from shunting, and assess functional and survival benefits after shunting

Methods

Case-control study comparing hydrocephalus and non-hydrocephalus patients

- GBM patients who underwent VPS for communicating hydrocephalus at our institution between 1997-2012
- 1:1 matched controls for age, Karnofsky Performance Score (KPS) at presentation and diagnosis date within a month

Cohort study evaluating clinical outcomes in hydrocephalus population after VPS

- Improvement in KPS after shunting
- Overall survival (OS) after shunting

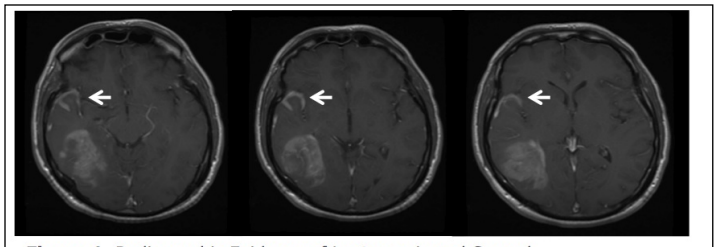

Figure 1. Radiographic Evidence of Leptomeningeal Spread

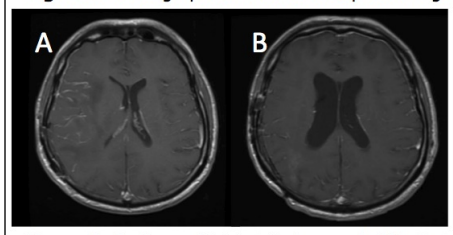

Figure 2. Radiographic Ventriculomegaly (A) Post-gadolinium T1-weighted image at diagnosis. (B) 7.4 months after resection showing evidence of hydrocephalus

Results

We identified 33 patients who underwent VPS due to communicating hydrocephalus (excluding obstructive hydrocephalus). Table 1 shows a comparison between the clinical characteristics between the patients who developed hydrocephalus vs ones who did not.

Table 1. Patient Clinical Characteristics

Characteristics	No Hydrocephalus (n=33)	Hydrocephalus (n=33)
Sex		
Male	15 (45%)	24 (73%)
Female	18 (55%)	9 (27%)
Tumor Location		
Frontal	16 (48%)	16 (48%)
Parietal	3 (9%)	4 (12%)
Temporal	10 (30%)	8 (24%)
Occipital	2 (6%)	2 (6%)
Other	2 (6%)	3 (9%)
Ventricular Entry		
Present	2 (6%)	5 (15%)
Absent	31 (94%)	28 (85%)
Leptomeningeal Spread		
Present	4 (12%)	4 (12%)
Absent	29 (88%)	29 (88%)
Tumor Removal?		
Resection	25 (76%)	30 (91%)
Biopsy	8 (24%)	3 (8%)
Radiation		
Treated	22 (88%)	30 (91%)
Untreated	3 (12%)	3 (8%)
Chemotherapy		
Treated	20 (80%)	29 (88%)
Untreated	5 (205)	4 (12%)
Extent of Resection		
Total		15 (45%)
Subtotal		12 (36%)
Radiographic Appearance		
Ventriculomegaly		18 (55%)
No Ventriculomegaly		15 (45%)

Associated Factors for Development of Hydrocephalus

- Ventricular entry at initial resection- patients who developed hydrocephalus were more than twice as likely to have had their ventricles opened during initial resection.
- Predominance of hydrocephalus in males
- Amount of tumor burden removal (resection vs. biopsy), completion of chemoradiation, tumor size, and leptomeningeal spread were not associated with development of hydrocephalus

Functional Performance after VPS

- Median KPS at time of VPS was 70 (30-90)
- Median KPS after VPS was 75 (10-90)
- There is significant improvemnt in KPS after VPS ($p<0.02$)
- 9 out of 33 patients experienced shunt related complications after placement

Factors Predicting KPS Improvement

- Radiographic ventriculomegaly ($p=0.04$)
- Absence of ventricular opening at time of resection ($p=0.0014$)
- Age, initial tumor volume and number of prior resections were not correlated to improvement in KPS

Survival After VPS

- Median overall survival (OS) was 5.5 months after shunting
- Total resection at diagnosis, completion of adjuvant chemotherapy or radiation were correlated to greater OS after shunt placement ($p=0.011$, $p=0.001$, $p=0.013$)
- Age, initial tumor volume and number of prior resections were not correlated with OS after shunt

Conclusions

VPS improves performance status in GBM patients with non-obstructive hydrocephalus. There is a predominance of the male sex and presence of ventricular entrance at initial resection in patients who develop hydrocephalus in this GBM population. While shunts are sometimes placed because of symptoms alone, patients with radiographic enlarging ventricles had increased likelihood of improvement compared to clinical symptoms alone. Our results suggest that there is benefit to VPS in GBM patients with communicating hydrocephalus regardless of age, time after recurrence, and number of prior resections.

References

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