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# Outcomes Following CSF Shunting in Malignant Glioma Patients

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## Introduction

The clinical course of malignant central nervous system gliomas is occasionally complicated by the development of hydrocephalus. The risks of shunt placement and clinical outcome following CSF diversion in this population are not well-defined.

## Methods

We retrospectively reviewed the outcomes of patients with pathologically-confirmed WHO grade III or IV malignant gliomas with shunted hydrocephalus treated at our institution. Additionally, we reviewed outcomes of patients with malignant primary brain tumors who underwent a ventricular shunt procedure in a national database of hospital-reported outcomes.

## Results

Forty-one patients who underwent CSF shunting between 2001 and 2016 at our institution were identified. Non-communicating and communicating hydrocephalus occurred at similar rates in our cohort (51.2% vs 48.8%). While symptomatic improvement after shunting was observed in 75.0% of patients, a major complication occurred in 17.1% of cases, with two patients suffering an intracerebral hemorrhage. Among patients that received chemo- or radiotherapy prior to shunt placement, previous administration of bevacizumab was significantly associated with the incidence of hemorrhage ($p = 0.002$). Three patients (7.3%) died during their admission and six (18.1%) required readmission to the hospital within 30 days of discharge. Overall 30-day mortality was 19.5% (8/41). Revision surgery was necessary in seven (17.1%) patients. Among outcomes contained within a national database, compared to patients without malignant primary brain tumors, length of stay (6.9 vs 5.1 days; $p = <0.001$), direct cost of admission ($15,755.8 vs $11,606.7; $p = <0.001$), and the rate of 30-day readmission (20.6% vs 7.0%; $p = <0.001$) were significantly greater among patients with brain tumors.

## Conclusions

Shunting can be an effective treatment for the symptoms of hydrocephalus in patients with malignant gliomas. Our results suggest, however, that this procedure carries a significant risk of complications in this patient population particularly after prior bevacizumab.

## Learning Objectives

1) We aim to provide an overview of the risks of complication and revision surgery after shunting in the setting of malignant gliomas.

2) We hope to emphasize the risks of shunting particularly in the setting of prior bevacizumab use.