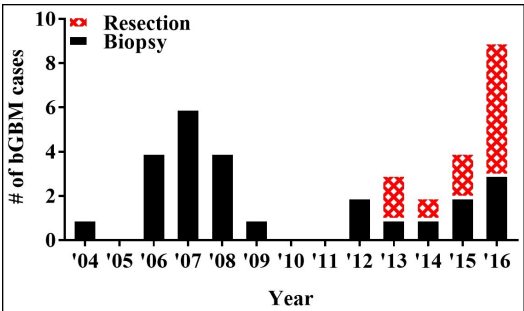


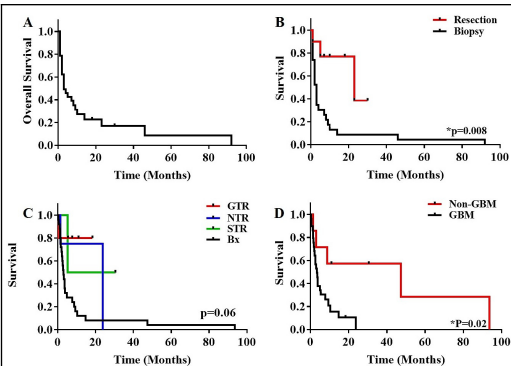
Although increasing evidence suggests survival benefit with maximal safe resection of glioma, those that invade the corpus callosum, also known as butterfly glioma (bG), are traditionally deemed inoperable. We evaluate how bG has been managed at our institution over the last decade and assess if surgical resection is safe and more effective than biopsy.

We retrospectively reviewed our institutional brain tumor registry for all adult patients who treated for high grade glioma (WHO grade III or IV) as diagnosed by a neuropathologist from October 2004 to October 2016. Butterfly glioma is defined in this study as a contrast enhancing lesion that invades the corpus callosum and crosses midline to the contralateral cerebral hemisphere. Survival between biopsy or resection assessed using the Kaplan-Meier model.



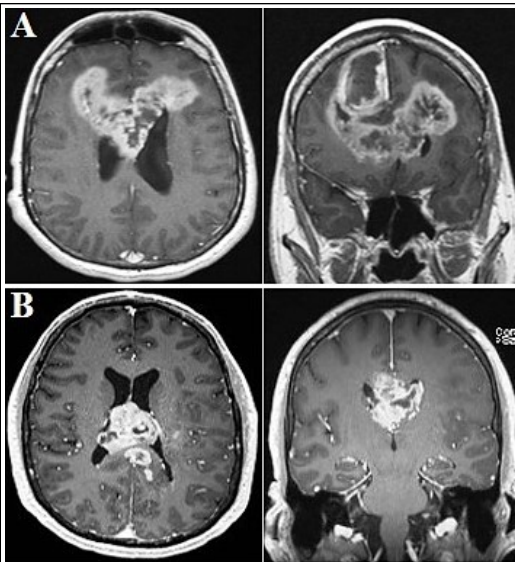
Histogram showing the number of butterfly glioma (bG) cases diagnosed and treated by biopsy or surgical resection from 2004 to 2016 at our institution.

Thirty-six (3.43%) of 1050 newly diagnosed high grade glioma (WHO grade III or IV) were identified as butterfly glioma (bG). Of these, 11(30.6%) underwent surgical resection and 25(69.4%) had biopsy. The extent of resection achieved among the resection cohort was; 5(45.5%) GTR, 4(36.4%) NTR and 2(18.2%) STR. Nineteen (52.8%) of patients had adjuvant therapy, while 10(27.8%) were palliated. Median survival of our entire cohort of bG patients was 3 and 23 months for biopsy and resection respectively. Median survival amongst patients diagnosed with glioblastoma(GBM) was significantly shorter than those with a "non-GBM" diagnosis (3.3 vs 47.4 months,  $p=0.02$ ). In a multivariate analysis, adjuvant therapy was independently associated with improved survival. Post-operative medical complications although significantly higher in the resection cohort when compared to the biopsy groups (5% vs 0%,  $p=0.002$ ) was no higher than risk and complications related to craniotomy for brain tumors as reported in the literature.



Kaplan-Meier estimates of overall survival (A) and survival stratified by treatment (B), extent of resection (C) and (D) tumor subtype (i.e GBM or “non-GBM”) for all bG patient cohort.

Surgical resection of butterfly glioma prolongs survival without an increased risk of a permanent neurological deficit. Adjuvant therapy as expected positively impacts survival.

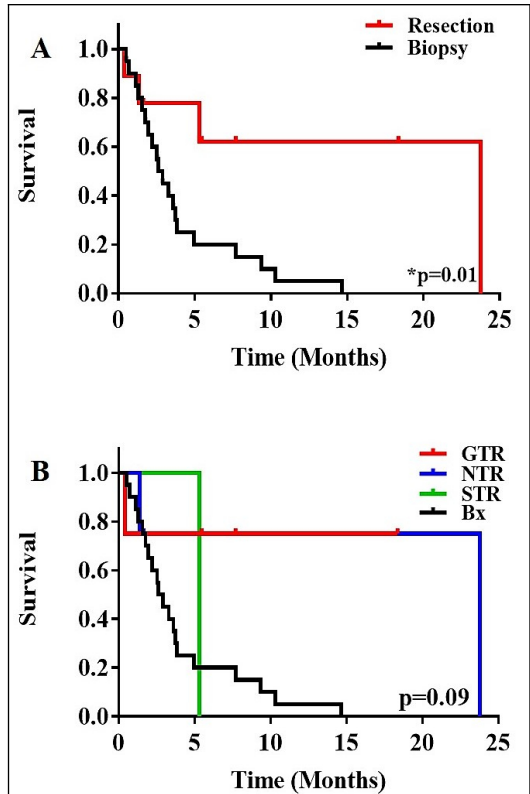


Example of butterfly glioma showed on axial (left panel) and coronal (right panel) T1+gadolinium magnetic resonance imaging (MRI) in 2 patients from the study. In this example, the corpus callosum is invaded by the enhancing lesion along the genu (A), and body(B).

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Dziurzynski K, Blas-Boria D, Suki D, Cahill DP, Prabhu SS, Puduvalli V, et al: Butterfly glioblastomas: a retrospective review and qualitative assessment of outcomes. *J Neurooncol* 109:555-563, 2012



Kaplan-Meier estimates of survival stratified by treatment (A) and extent of resection (B) for GBM alone among the study cohort.