CNS 2018 ANNUAL MEETING
HOUSTON, TEXAS
OCTOBER 6-10, 2018

Astrocytic Gliomas Differentially Disrupt Functional Connectivity with Implications for Language Plastiticy

Jacob Young; John David Rolston MD, PhD; Sofia Kakaizada; EunSeon Ahn; Ramin A. Morshed MD; Mitchel S. Berger MD; Shawn L. Hervey-Jumper MD
University of California, San Francisco

UCSF

Introduction

Astrocytes are the most abundant cell type in the brain. Distinct astrocyte populations across the brain show molecular diversity, differentially supporting synaptogenesis and tumorigenesis. While WHO II oligodendrocytomas and diffuse astrocytomas both infiltrate brain parenchyma, it is possible that astrocytic gliomas differentially impact functional connectivity between the tumor and surrounding cortex. Here, we test the hypothesis that WHO II astrocytic gliomas differentially influence functional connectivity and infiltration into cortical areas.

Methods

Ten patients undergoing left sided awake craniotomy for glioma resection with intraoperative electrocorticography (ECoG) were recruited to participate. ECoG imaging coherence was used to determine functional connectivity within both glioma and non-glioma channels. Additionally, direct cortical stimulation (DCS) brain maps between 2014-2017 were analyzed for cortical language sites. Intraoperative brain maps, WHO grade, tumor genetics, structural and molecular imaging were analyzed. Nonparametric statistical analysis was performed to assess for associations between glioma histology, grade, and cortical function.

Results

The average node strength of glioma sites was significantly less that non-glioma cortex (p= 0.002, Wilcoxon sign-rank text) in 10/10 patients. 218 patients (mean age 44.6 years) with DCS mapping for newly diagnosed gliomas were identified. Intratumoral language was identified in 30% of tumors. As WHO grade increased, the percentage of tumors with intratumoral function decreased (Grade II: 34.2%, Grade III: 31.3%, Grade IV: 21.7%). IDH-mutant WHO II astrocytomas were more likely to have intratumoral function than IDH-wild type tumors and 1p19q co-del oligodendrogliomas (36.4% vs. 19.6%, chi-square 6.41, p = 0.04).

Learning Objectives

1) Establish that astrocytic tumors can have retained function on DCS within the tumor

2) Establish a relationship between tumor grade and pathological characteristics with intratumoral function identified with DCS

3) Utilize ECoG imaging to investigate functional connectivity within glioma and nonglioma channels

Conclusions

Taken together these data suggests that regardless of cell of origin, gliomas disrupts functional connectivity. Astrocytic IDH-mut gliomas have a greater propensity to infiltrate functional language areas.