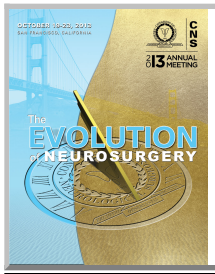

Glioblastoma Involving the Subventricular Zone is Associated with Aggressive Radiographic Features and Poor Outcomes

Achal Singh Achrol; Lex A Mitchell; Joshua J Loya; Erick M Westbroek; Abdullah Feroze; Scott Rodriguez; Olivier Gevaert; Kristen Yeom; Debashis Sahoo; Abdulrazag Mohammad Ajlan; Sharareh Gholamin; Siddhartha S. Mitra; Robert M. Lober; Steven D. Chang; Griffith R. Harsh; Gordon Li; Gary K. Steinberg; Samuel Henry Cheshier

Introduction

Distinct glioblastoma (GBM)-derived cancer stem cells (CSCs) have recently been described. Adult neural stem cells normally exist in the subventricular zone (SVZ) and may give rise to CSCs that produce a unique subset of GBM. In this study, we sought to better characterize clinical characteristics of GBM involving the SVZ, which we hypothesized would differ from GBM not involving the SVZ.

Methods

Patients with newly diagnosed GBM confirmed by pathological review at our institution between 1/1/2003-1/1/2013 were identified. All patients with preoperative MRI available for review were included for analysis. Clinical features included age at diagnosis, Karnofsky performance score (KPS), treatments, and overall survival. All MRIs were reviewed by an expert neuroradiologist blinded to patient status. Preoperative MRI was reviewed to determine involvement of SVZ (SVZ+ versus SVZ-), as well as location, volume of contrast-enhancing lesion (CEL), presence of multiple lesions (multicentric versus solitary), invasion across midline, cortex infiltration, and midline shift (MLS).

Results

A total of N=364 patients (age 62.2±14.1; 57% male) met inclusion criteria, including N=214 SVZ+ GBM (59%). SVZ+ GBMs were associated with more aggressive radiographic features, including large volume at presentation (OR:2.9, P=0.04), multiple lesions (OR:1.7, P=0.05), and invasion across midline (OR:6.9, P<0.0001). Median time to death was 13.6 months in SVZ- GBM, versus 6.7 months in SVZ+ GBM. SVZ+ GBMs were associated with poor survival in univariate (HR:1.7, P<0.0001) and multivariate Cox survival analysis adjusting for age and KPS (HR:1.6, P=0.0002).

Conclusions

These data represent the largest single-institution experience reporting features of GBM involving the SVZ. SVZ+ GBMs exhibit more aggressive radiographic features, including larger tumor bulk at presentation, invasion across midline, and development of multiple lesions. Consistent with this, SVZ+ GBMs were associated with poor overall survival independent of known prognostic factors. Further research is warranted to clarify the relationship between SVZ+ GBM, CSCs, and overall survival.

Learning Objectives

Understand recent literature on cancer stem cells in glioblastoma, and implications of cell-of-origin to understanding individual variation in tumor biology and development of targeted cancer therapy against the brain tumor-initiating cells of GBM.

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