Isolation of glioma cancer stem cells in relation to histological grades in glioma specimens.


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Abstract

PURPOSE: The existence of cancer stem cells (CSCs) in glioblastoma has been proposed. However, the unknown knowledge that is yet to be revealed is the presence of glioma CSCs (gCSCs) in correlation to each WHO grades of glioma. We approached this study with a hypothesis that specimens from high-grade gliomas would have higher isolation rate of gCSCs in comparison to those of lower-grade gliomas.

METHODS: The glioma specimens were obtained from patients and underwent gliomasphere assay. The gliomaspheres were chosen to be analyzed with immunocytochemistry for surface markers. Then the selected gliomaspheres were exposed to neural differentiation conditions. Lastly, we made mouse orthotopic glioma models to examine the capacity of gliomagenesis.

RESULTS: The gliomaspheres were formed in WHO grade IV (13 of 21) and III (two of nine) gliomas. Among them, WHO grade IV (11 of 13) and III (two of two) gliomaspheres showed similar surface markers to gCSCs and were capable of neural differentiation. Lastly, among the chosen cells, 10 of 11 WHO grade IV and two of two WHO grade III gliomaspheres were capable of gliomagenesis. Thus, overall, the rates of existence of gCSCs were more prominent in high-grade gliomas: 47.6 % (10 of 21) in WHO grade IV gliomas and 22.2 % (two of nine) in WHO grade III gliomas, whereas WHO grade II and I gliomas showed virtually no gCSCs.

CONCLUSIONS: This trend of stage-by-stage increase of gCSCs in gliomas showed statistical significance by chi-square test linear-by-linear association. We prove that the rates of existence of gCSCs increase proportionally as the WHO grades of gliomas rise.

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