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Hypofractionation Regimens for Stereotactic Radiotherapy for Large Brain Tumors

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Corrected Proof

Purpose

To investigate equivalent regimens for hypofractionated stereotactic radiotherapy (HSRT) for brain tumor treatment and to provide dose-escalation guidance to maximize the tumor control within the normal brain tolerance.

Methods and Materials

The linear-quadratic model, including the effect of nonuniform dose distributions, was used to evaluate the HSRT regimens. The α/β ratio was estimated using the Gammaknife stereotactic radiosurgery (GKSRS) and whole-brain radiotherapy experience for large brain tumors. The HSRT regimens were derived using two methods: (1) *an equivalent tumor control approach*, which matches the whole-brain radiotherapy experience for many fractions and merges it with the GKSRS data for few fractions; and (2) *a normal-tissue tolerance approach*, which takes advantages of the dose conformity and fractionation of HSRT to approach the maximal dose tolerance of the normal brain.

Results

A plausible α/β ratio of 12 Gy for brain tumor and a volume parameter n of 0.23 for normal brain were derived from the GKSRS and whole-brain radiotherapy data. The HSRT prescription regimens for the isoeffect of tumor irradiation were calculated. The normal-brain equivalent uniform dose decreased as the number of fractions increased, because of the advantage of fractionation. The regimens for potential dose escalation of HSRT within the limits of normal-brain tolerance were derived.

Conclusions

The designed hypofractionated regimens could be used as a preliminary guide for HSRT dose prescription for large brain tumors to mimic the GKSRS experience and for dose escalation trials. Clinical studies are necessary to further tune the model parameters and validate these regimens.

[Hypofractionation](#), [Dose prescription](#), [Radiosurgery](#), [Linear-quadratic model](#), [Brain tumor](#)

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Conflict of interest: none.

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