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Optimizing the extent of resection and minimizing the morbidity in insular high-grade glioma surgery by high-field intraoperative MRI guidance

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Aim: The result of surgical resection for insular high-grade glioma (HGG) is disappointing due to the complex anatomy of insula and aggressive growth of HGG. The use of intraoperative magnetic resonance imaging (iMRI) was reported to improve the results of glioma surgery. The authors aimed to evaluate the impact of high-field iMRI and functional neuronavigation on the surgical resection of insular HGG.

Materials & Methodology: Between July 2010 and July 2014, 51 insular HGG patients underwent operations guided by combined high-field iMRI and functional neuronavigation. Twenty-two insular HGG patients underwent conventional neuronavigation operations were assessed as the control group. Preoperative and postoperative tumor volumetric scan analysis, Karnofsky performance score (KPS) and follow-up results were reviewed retrospectively.

Results: Residual tumor was detected by the iMRI in 42 patients, and residual tumor of 37 patients was further resected in the iMRI-assisted group. The median extent of resection (EOR) increased significantly from 79% (58%–100%) to [96% (86%–100%), $p < 0.001$]. The median EOR of iMRI-assisted group [96% (86%–100%)] was significantly higher than that of conventional neuronavigation group [84% (69%–100%); $p = 0.031$]. Mean residual tumor volume of iMRI-assisted group [0.6 (0.0-5.2) cm³] was significantly smaller than that of conventional neuronavigation group [3.8 (0.0-12.1) cm³; $p = 0.003$]. KPS within 3 days after surgery reduced and KPS at 3 months after surgery improved for both groups. KPS of iMRI-assisted group [90(70-100)] was significantly higher than that of control group [80(60-100); $p = 0.021$] at 3 months after surgery. The median progression-free survival (PFS) of iMRI-assisted group [18(9-42) months] was better than that of control group [15(3-32) months; $p = 0.010$]. The median overall survival (OS) of iMRI-assisted group [28(14-49) months] was better than that of control group [18 (7-38) months; $p = 0.035$].

Conclusions: Combined high-field iMRI and functional neuronavigation optimize the extent of resection and minimize the morbidity in insular HGG surgery. Aggressive resection of insular HGG is predictive of improved OS and PFS.

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