Which Combination of MR Imaging Modalities Is Best for Predicting Recurrent Glioblastoma? Study of Diagnostic Accuracy and Reproducibility.

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Abstract

Purpose To compare the added value of dynamic contrast material-enhanced (CE) (DCE) magnetic resonance (MR) imaging with that of dynamic susceptibility CE (DSC) MR imaging with the combination of CE T1-weighted imaging and diffusion-weighted (DW) imaging for predicting recurrent glioblastoma. Materials and Methods This retrospective study was approved by the institutional review board, with the requirement for informed patient consent waived. CE T1-weighted images, DW images, DSC MR images, and DCE MR images in 169 patients with pathologically or clinicoradiologically diagnosed recurrent glioblastoma (n = 87) or radiation necrosis (n = 82) were retrospectively reviewed. Histogram cutoffs of quantitative parametric values were calculated from DW images, DSC MR images, and DCE MR images. Area under the receiver operating characteristic curve (A$_2$) and interreader agreement were assessed. Results For predicting recurrent glioblastoma, adding DCE MR imaging to the combination of CE T1-weighted imaging and DW imaging significantly improved A$_2$ from 0.84 to 0.96 for reader 1 and from 0.81 to 0.97 for reader 2, respectively. Adding DSC MR imaging also significantly improved A$_2$ (0.95 for reader 1 and 0.93 for reader 2). However, there was no significant difference in A$_2$ between the combination of CE T1-weighted imaging, DW imaging, and DSC MR imaging and the combination of CE T1-weighted imaging, DW imaging, and DCE MR imaging for both readers. The interreader agreement was highest for the combination of CE T1-weighted imaging, DW imaging, and DCE MR imaging (κ = 0.78) and lowest for CE T1-weighted imaging and DW imaging (κ = 0.65). Conclusion Adding perfusion MR imaging to the combination of CE T1-weighted imaging and DW imaging significantly improves the prediction of recurrent glioblastoma; however, selection of perfusion MR method does not affect the diagnostic performance. © RSNA, 2014.

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