

## ABSTRACT

J Neuroimaging. 2023 Jan 11. doi: 10.1111/jon.13080. Online ahead of print.

Brain magnetic resonance spectroscopy to differentiate recurrent neoplasm from radiation necrosis: A systematic review and meta-analysis.

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**BACKGROUND AND PURPOSE:** Postradiation treatment necrosis is one of the most serious late sequelae and appears within 6 months. The magnetic resonance spectroscopy imaging (MRSI) has been used for the detection of brain tumors. The study aimed to determine the radiological accuracy and efficacy in distinguishing recurrent brain tumor from radiation-induced necrosis by identifying pseudoprogression.

**METHODS:** The research was performed in accordance with the preferred reporting items for systematic review and meta-analysis guidelines. International electronic databases including 15 English sources were investigated. A total of 4281 papers with 2159 citations from 15 databases from 2011 to 2021 met the search strategies of magnetic resonance (MR) spectroscopy in recurrent brain tumors and postradiation necrosis.

**RESULTS:** Nine studies were enrolled in the meta-analysis with a total of 354 patients (203 male and 151 female) whose average age ranged from 4 to 74 years. Anbarlouei et al., Elias et al., Nemattalla et al., Smith et al., Zeng et al., and Weybright et al. showed strong evidence of heterogeneity regarding choline/N-acetylaspartate (Cho/NAA) ratio in the evaluation of the nine studies. Elias et al., Nemattalla et al., Bobek-Billewicz et al., and Smith et al. showed a high heterogeneity in Cho/creatine (Cr) ratio. Elias et al., Nemattalla et al., Smith et al., and Weybright et al. revealed high heterogeneity in NAA/Cr ratio estimates.

**CONCLUSION:** MR spectroscopy is effective in distinguishing recurrent brain tumors from necrosis. Our meta-analysis revealed that Cho/NAA, Cho/Cr, and NAA/Cr ratios were significantly better predictor of detected recurrent tumor. Therefore, the MRSI is an informative tool in the distinction of tumor recurrence versus necrosis.

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DOI: 10.1111/jon.13080

PMID: 36631883