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Comparison between Contrast Clearance Analysis and Gadolinium-MRI to Differentiate Tumor Progression and Pseudoprogression

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Abstract
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Victor Goulenko [1] , Amade Bregy [2] , Lindsay Lipinski [2] , Robert Plunkett [2] , Dheerendra Prasad [3]

1. Radiation Medicine, Roswell Park Comprehensive Cancer Center, Buffalo, USA 2. Neurosurgery, Roswell Park Comprehensive Cancer Center, Buffalo, USA 3. Neurosurgery and Radiology, Roswell Park Cancer Institute, Buffalo, USA

Corresponding author: Victor Goulenko, vgoulenko@gmail.com

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Abstract

Objectives:

Radionecrosis/pseudoprogression is a well-characterized toxicity associated with radiation for intracranial lesions which can be difficult to differentiate from tumor progression on follow-up imaging, making treatment decisions challenging in this patient population. This study has the goal to show the clinical application of the contrast clearance for proper diagnose and treatment.

Methods:

All patients who had undergone contrast clearance analysis (CCA) to distinguish treatment response from tumor progression as part of their follow-up for prior stereotactic radiosurgery were included. Demographical data as well as clinical, complementary treatment, radiographical, and CCA evaluation of patients and their tumor pathology were assessed. A comparison of a clinician's evaluation of follow-up MRI imaging versus CCA imaging was performed.

Results:

Seventy patients were evaluated in this study. The most common primary disease of included patients was metastasis, especially non-small cell lung cancer, followed by glioblastomas and atypical meningioma. The majority (96.47%) of treated patients had multiple brain metastases, accounting for a total of 425 lesions, being 104 suspicious of pseudoprogression or recurrence. Multiple imaging follow-up led to 146 tumor analyses. From the 38 lesions diagnosed as recurrence based on MRI, only 12 (32%) were considered positive on CCA, which would lead to 17.8% overtreatment. Other 21 lesions (14.38%) evaluated as tumor by CCA were classified as pseudoprogression or equivocal by MRI. Inter-rater reliability using Cohen's kappa coefficient showed poor strength of agreement at 0.09 between the two modalities.

Conclusion(s):

CCA imaging is a promising tool to distinguish tumor progression from radiation necrosis in the setting of radiosurgical treatment, lowering the chances of not treating recurrent lesions or overtreating pseudoprogression, therefor, increasing patient's safety. Further studies are needed to clearly show its sensitivity and positive predictive value and comparison with other diagnostic methods.