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Consensus Radiation Treatment Planning Guidelines Utilizing (68)Ga-DOTATATE PET/CT for Resected Meningiomas

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Abstract

Background: Meningiomas are the most common primary intracranial tumor. Somatostatin receptor 2 (SSTR 2) is almost universally expressed in meningioma tissue. For patients who require adjuvant radiation, SSTR based (68)Ga-DOTATATE positron emission tomography (PET) imaging can detect additional or residual disease not discernible on magnetic resonance imaging (MRI). PET-guided radiation treatments may improve local control, minimize toxicity by allowing for more precise radiotherapy plans, and allow for more precise dose escalation to maximize local control. The aim of this study was to develop consensus PET-guided treatment planning guidelines for common meningioma presentations.

Methods: Five post-operative clinically relevant meningioma cases were selected from a prospective single-institutional registry of patients. Each patient had a preoperative and post-operative contrast enhanced T1-weighted volumetric MRI, and a post-operative (68)Ga-DOTATATE PET/CT, to assist with target delineation. The full treatment scenario including clinical history, histology, surgical history, and imaging were provided for each patient. Nineteen international experts who have published on the treatment and management of meningiomas, and who utilize (68)Ga-DOTATATE PET/CT in their practice, evaluated each case. Individual prescription recommendations were created, pooled, and discussed to create consensus recommendations.

Results: Consensus recommendations were created for each case. In most cases, PET-based contouring allowed for more precise-dose escalation to 66-70Gy targeting residual disease. When compared to RTOG 0539 and modern clinical trial contouring guidelines, a smaller CTV expansion from the surgical cavity was recommended using PET-guided radiation plans in the absence of radiographic or pathologic evidence of brain or bone invasion.

Conclusion: This report provides consensus target volume delineation guidelines for meningiomas receiving postoperative radiation in common clinical situations. Integration of these guidelines into clinical practice may allow for more precise biomarker-guided radiation treatments and standardize radiotherapy on future meningioma clinical trials.

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