

Correlation of High-Risk Histopathology Features in Magnetic Resonance Imaging in Retinoblastoma

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Introduction: Enucleation is the treatment of choice for advanced intraocular retinoblastoma, especially when the risks of attempted eye and vision salvage are greater than the benefits. MRI plays a crucial role in the pre-operative evaluation of this risk by providing a non-invasive evaluation of the tumor's relationship with crucial ocular structures. However, the signs of tumor invasion into the choroid, optic nerve or in the extraocular space are not always captured on imaging, leading to a false negative result. To address this, our study aims to study the morphological characteristics of high-risk histopathological features (HRPF), such as massive choroidal invasion and retro-laminar optic nerve invasion and compare it with pre-operative MRI images of the eye with retinoblastoma.

Methods: We retrospectively reviewed the medical records and staging MRI images of all patients undergoing primary enucleation for retinoblastoma at our institute from January 2000 to October 2023. We collected data regarding staging, treatment, and histopathological features. A neuroradiologist reviewed all radiological images that correlated with eyes that demonstrated features of high-risk pathology. All situations determined to be false negatives were further scrutinized by a second neuroradiologist. Further review of all radiological images associated with eyes without HRPF is pending.

Results: Twenty eyes of 20 patients were eligible for the study. The mean age at diagnosis was 28.4 + 2.3 months. AJCC pTNM were pT3a with massive choroidal invasion in 9 (45%), followed by pT3b with retrolaminar invasion of the optic nerve head in 8 (40%) and pT3d in 1 (5%) and pT4 in 2 (10%) patients. We found the sensitivity of MRI in detecting post-laminar optic nerve invasion to be 50%, massive choroidal invasion to be 82%, and scleral and extra-scleral extension to be 67% and 50%, respectively. Positive predictive value, specificity and accuracy will be determined after evaluating all MRI scans associated with eyes that underwent primary enucleation.

Conclusions: Our study underscores the importance of diagnostic imaging in evaluating retinoblastoma patients and detecting high-risk histopathological features. Identification of high-risk features of retinoblastoma on MRI imaging allows for better selection of eyes considered to be safe for eye salvage. False negative MRIs were mostly associated with concerns related to issues arising from image acquisition. Some eyes showed pathological features that were smaller than the spatial resolution achievable in the machine. This information allows us to improve the quality and protocol of MRI to achieve a higher sensitivity to detect HRPF.