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Abbreviated Reports

MR of a Melanoma Simulating Ocular Neoplasm

The correct clinical diagnosis of an intraocular tumor can be difficult, especially the differentiation between a choroidal melanoma and a metastatic neoplasm. Although technological advances such as sonography and fluorescein angiography are helpful, false-positive diagnoses of choroidal melanoma continue to occur. Recent work with MR imaging suggests that choroidal melanomas can be differentiated from metastatic neoplasms on the basis of the characteristically short T1 times of the first and the characteristically long T1 times of the second. We report a case in which an intraocular tumor displayed MR signal characteristics (including a short T1) consistent with the presumptive clinical diagnosis of choroidal melanoma, but enucleation and pathologic evaluation showed the tumor was a mucin-secreting adenocarcinoma metastatic to the choroid.

Case Report

A 55-year-old man consulted his ophthalmologist because of a 2-week history of decreased vision in his right eye. Ophthalmic examination revealed decreased visual acuity and a superior visual field deficit in the right eye caused by a large choroidal mass. A-scan sonography showed a choroidal mass 4.9 mm in elevation with high internal reflectivity and 0 to 1+ vascularity. The mass measured approximately 8–9 mm in greatest surface diameter and had a pattern of surface pigmentation consistent with the diagnosis of choroidal melanoma.

After 3 months of further observation, the patient was referred for an MR examination (Fig. 1) that was performed at an outside hospital. A Diasonics 0.35-T imaging system equipped with a standard head coil was used. Axial images were obtained with a TR of 1000 msec, a TE of 28 and 56 msec, and a slice thickness of 5 mm. The radiologist performing the scan had been informed of the presumptive diagnosis. His report stated that the tumor at the posterior surface of the right globe was of high intensity "indicative of a short T1 relaxation time suggesting the presence of a paramagnetic substance. Melanin is such a paramagnetic substance; therefore, these findings are consistent with a choroidal melanoma."

One week later the patient had another sonogram. Relative to the previous sonogram, the mass had increased in height to 5.27 mm and had changed to medium irregular reflectivity with 1+ vascularity. These sonographic changes were consistent with the diagnosis of choroidal melanoma. After consultation with the referring ophthalmologist, the patient elected to undergo enucleation of the right eye.

Gross pathologic examination showed a relatively unpigmented choroidal mass that measured 13.1 mm in greatest diameter and 4.4 mm in elevation. The tumor extended to the temporal margin of the optic disk. An extensive serous retinal detachment was seen overlying the tumor, extending inferonasally to the ora serrata and anteriorly on the nasal and temporal sides of the tumor. Microscopic examination of the tumor (Fig. 2) showed a glandular pattern of cuboidal cells with pleomorphic nuclei and prominent nucleoli. The lumens were filled abundantly with mucinous material and occasionally with serous exudate. Invasion of the overlying sclera was minimal. No evidence of hemorrhage was noted. The optic nerve and vitreous were unremarkable. The pathologic diagnosis was mucin-secreting adenocarcinoma metastatic to the choroid.

Discussion

Early research with MR revealed that malignant melanoma, unlike other neoplasms, exhibited shorter T1 times than the corresponding untransformed tissue [1]. This unique characteristic of melanomas was attributed to stable free-radical forms of melanin that participate in dipole-dipole interactions with water protons and thereby cause a paramagnetic proton relaxation enhancement that shortens both the T1 and T2 times of the tumor. Later work on imaging the eye and orbit confirmed these findings [2–5] and showed that the T1 and T2 shortening observed in melanomas depends on melanin concentration [5]. These findings led many researchers to suggest that the unique signal characteristics of melanomas could be useful in making a clinical diagnosis: "The T1 properties of melanomas should lend some specificity in differentiating this tumor (melanoma) from other malignancies" [3], and "MR may be useful in differentiating primary melanoma from metastatic disease" [4].

The T1-weighted image (Fig. 1A) of the mucin-secreting adenocarcinoma shows a lenticular-shaped tumor at the posterior pole of the right eye with a serous retinal detachment extending anteriorly on both the nasal and temporal sides of the tumor. The tumor (short T1) appears as a semicircular region of medium intensity with a core of high intensity. The location and size of the tumor defined by MR

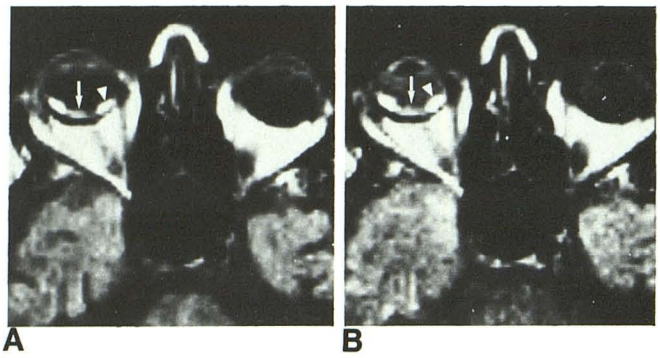

Fig. 1.—*A* and *B*, MR images, SE 1000/28 (*A*) and SE 1000/56 (*B*), show tumor mass (*arrows*) at posterior pole of right eye, with serous subretinal fluid (*arrowheads*) on either side of tumor.

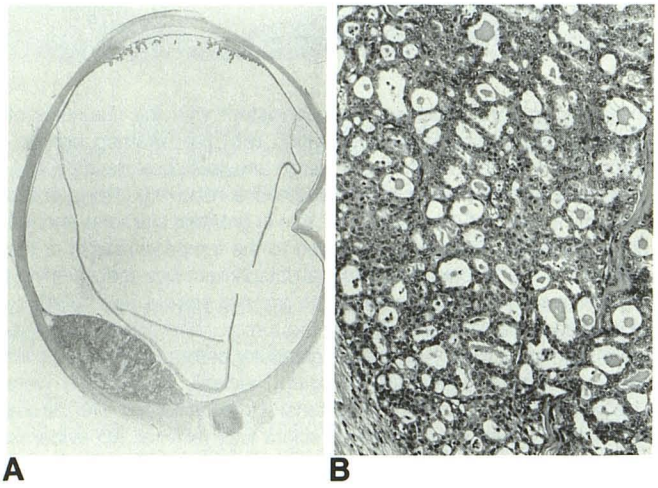

Fig. 2.—*A* and *B*, photomicrographs show lenticular-shaped choroidal mass in the posterior fundus (*A*, H and E, ×24) and glandular pattern and mucin-filled lumina (*B*, H and E, ×250).

correspond with the location and size defined by fundus examination, fluorescein angiography, and gross pathologic appearance. Subretinal fluid (short T1) appears as regions of high intensity on the nasal and temporal sides of the tumor. Similar imaging characteristics for subretinal fluid have been reported in cases of retinal detachment associated with choroidal melanoma [4, 5].

The unexpectedly short T1 time exhibited by this mucin-secreting adenocarcinoma probably was caused by the large quantities of mucinous fluid contained within the tumor. Mucinous fluid was expressed freely from the tumor during sectioning, and large quantities of mucin were noted during microscopic examination. Mucinous fluid can cause a shortening of T1 times in a manner similar to subretinal fluid [4] and proteinaceous cystic fluid. Macromolecules within these fluids contain hydrophilic binding sites that shorten T1 relaxation times by reducing the motional frequencies of bound protons and thereby increasing the efficiency of T1 relaxation.

Signal averaging between the tumor and adjacent subretinal fluid could have contributed to the unexpectedly short T1 time exhibited by this mucin-secreting adenocarcinoma. Subretinal fluid adjacent to the tumor appeared as regions of high signal intensity on both T1- and T2-weighted examinations. This potential source of error can be minimized on current scanners with thinner sections.

In addition to the present case, several other ocular disorders can display MR signal characteristics that are compatible with choroidal melanoma. One case of retinal gliosis [6] could not be distinguished from melanoma by MR, and two cases of retinoblastoma [4] exhibited the same signal characteristics as melanoma of T1-, T2-, and proton-density-weighted MR examinations. Also of note is the possibility that ocular neoplasms causing subacute hemorrhage can simulate the MR appearance of hemorrhagic choroidal melanomas; subacute blood contains free methemoglobin, which can cause a powerful T1 shortening effect [6] by a mechanism of paramagnetic proton relaxation enhancement similar to that seen with melanin. Therefore, choroidal melanomas do not exhibit truly unique MR signal characteristics; short T1 and T2 times are usually indicative of choroidal melanoma, but important exceptions must be considered when a clinical diagnosis is made.

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REFERENCES

1. Damadian R, Zaner K, Hor D, DiMaio T. Human tumors detected by nuclear magnetic resonance. *Proc Natl Acad Sci USA* **1974**;71:1471–1473
2. Bilaniuk LT, Schenk JF, Zimmerman RA, et al. Ocular and orbital lesions: surface coil MR imaging. *Radiology* **1985**;156:669–674
3. Sobel DF, Kelly W, Kjos BO, Char D, Brant-Zawadzki M, Norman D. MR imaging of orbital and ocular disease. *AJNR* **1985**;6:259–264
4. Sullivan JA, Harms SE. Surface-coil MR imaging of orbital neoplasms. *AJNR* **1986**;7:29–34
5. Gomori JM, Grossman RI, Shields JA, Augsburger JJ, Joseph PM, DeSimeone D. Choroidal melanomas: correlation of NMR spectroscopy and MR imaging. *Radiology* **1986**;158:443–445
6. Mafee MF, Peyman GA, Grisolano JE, et al. Malignant uveal melanoma and simulating lesions: MR imaging evaluation. *Radiology* **1986**;160:773–780

Thornwaldt Cyst: An Incidental MR Diagnosis

Four Thornwaldt cysts were identified as an incidental finding in conjunction with the evaluation of approximately 2000 MR studies over a 16-month interval.

The Thornwaldt cyst is a posterior nasopharyngeal notochordal remnant lined by respiratory epithelium that has a potential communication with the nasopharynx. Nasopharyngeal inflammatory disease may result in a midline fluid-filled mass [1]. Although usually asymptomatic, persistent nasopharyngeal drainage, foul breath and taste, and occipital headache can occur [2].

Previous radiologic characterization of these lesions before MR imaging included plain film radiographic and complex motion tomographic findings of a well-defined round or oval mass of soft-density tissue projecting into the radiolucent air shadow of the posterior superior angle of the nasopharynx [3]. CT shows a nonspecific, low-