A Short Atlas of Intraocular Tumors

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The most important diagnostic study in the evaluation of a suspected intraocular malignancy is visual inspection of the tumor.

Introduction

The evaluation of intraocular tumors differs from almost all other oncologic evaluations because there is little reliance on tissue diagnosis. Definitive therapies such as enucleation and radiation are usually based on the results of ophthalmoscopy and a limited number of ancillary studies without the aid of biopsy. Although biopsies can be performed on most intraocular tumors, the ocular morbidity associated with these procedures is usually not worth the added benefit of a tissue diagnosis. The limited role of intraocular biopsy reflects the high degree of confidence that exists with interpretation of clinical findings.

The single most important diagnostic study is visual inspection of the tumor with the slit lamp and/or ophthalmoscope. For this reason, representative illustrations of the most common intraocular tumors are presented.

Melanoma and Simulating Lesions

The accuracy of the clinical diagnosis of posterior uveal melanoma is exceedingly high. For example, the diagnostic error rate in the Collaborative Ocular Melanoma Study (COMS) was only 0.48%. Misdiagnoses occur in less than 4% of enucleated eyes at tertiary referral centers. The diagnostic error rate in the COMS, however, was measured under ideal conditions; all tumors were well visualized and photographed. Patient were excluded from the COMS if the ocular media was opaque. In real-world situations, the misdiagnosis rate for posterior melanoma may be greater than that reported by the COMS.

Choroidal melanomas exhibit various shapes, configurations, and degrees of pigmentation. Most have a brown to grey-green color and a dome or mushroom shape. Not all elevated pigmented lesions of the posterior pole of the eye are melanomas. A localized accumulation of blood beneath the retinal pigment epithelium can have a green-grey color similar to some melanomas. Suprachoroidal hemorrhage following ocular surgery has been mistaken for choroidal melanoma. Fluorescein angiography and ultrasonography are important ancillary studies that help to make the distinction between loculated blood and melanoma. A typical melanoma demonstrates mottled progressive fluorescence compared to the hypofluorescence of loculated blood. A retinal macroaneurysm that hemorrhages beneath the retinal pigment epithelium can also simulate choroidal melanoma. In this situation, the putative source of retinal bleeding can often be seen near the apex of the domeshaped lesion. Fluorescein angiography will help confirm the diagnosis of retinal macroaneurysm. Most hemorrhages from macroaneurysms will resorb within several months, thus leaving little question about the correct diagnosis.
Some choroidal melanomas are nonpigmented (Fig 5). The major diagnostic consideration in the case of a nonpigmented placoid or dome-shaped choroidal mass is metastatic carcinoma. Metastases to the choroid usually do not assume a mushroom configuration, which is highly suggestive of primary choroidal melanoma. Most metastatic tumors of the choroidal are cream-colored and often have clumps of brown pigment on their surfaces. There are several differences in the ultrasonographic pattern of choroidal melanoma and a metastatic tumor. A-scan ultrasound of a typical choroidal metastasis shows moderate internal reflectivity, whereas melanoma usually shows relatively low internal reflectivity. A thorough systemic evaluation is particularly important in the workup of a nonpigmented intraocular tumor. Multiple tumors and rapid growth (ie, over months) are findings very suggestive of metastatic carcinoma (Figs 6 and 7).

Circumscribed choroidal hemangiomas are dome-shaped and usually do not become very elevated. Their subtle red-orange color and white surface deposits help to distinguish them from amelanotic melanoma and metastatic carcinoma (Fig 8). Hemangiomas have high internal reflectivity on A-scan ultrasound.
Anterior Segment Tumors

The biologic behavior of melanocytic tumors of the iris range from benign nevi to malignant melanoma. In general, however, melanomas of the iris differ from those of the posterior segment of the eye because the majority have a good prognosis. Iris melanomas rarely result in death. The reason for this difference in behavior is unclear but may be due to the fact that most iris melanomas are small when first detected. They also tend to have an innocuous histologic appearance that consists predominately of spindle cells with rather bland nuclei. Some observers have speculated that most iris melanomas are actually nevi.4

Iris melanomas appear as well-circumscribed, pigmented masses ranging in color from beige to light tan to dark brown. Most appear as localized thickening of the iris (Fig 9). Bulky tumors can encroach or touch the cornea. There are no absolute clinical criteria for distinguishing iris nevi from melanoma. Perhaps the two most important clinical features are documented growth and absolute size. A primary ciliary body melanoma needs to be considered any time a pigmented iris tumor involves the angle of the anterior chamber (Fig 10).

Metastatic carcinoma needs to be considered in the differential diagnosis of an acquired fleshy or nonpigmented iris or angle tumor in an adult (Figs 11 and 12). These lesions are often vascular and may bleed spontaneously into the anterior chamber.
Retinoblastoma and Its Differential Diagnosis

Retinoblastomas usually come to clinical attention because they produce a white pupillary reflex (leukocoria) or cause strabismus, signs of inflammation, or decreased vision. The accuracy of clinical diagnosis of retinoblastoma is high. Most retinoblastomas have a characteristic clinical appearance. The presence of calcium within a soft-tissue mass in a child’s eye, demonstrated by either computed tomography or ultrasound, is a highly specific sign of retinoblastoma. Retinoblastomas grow beneath the retina, leading to secondary retinal detachment, or grow into the vitreous where they appear as a white tumor mass. The major differential diagnosis of leukocoria is Toxocara endophthalmitis, Coat’s disease, retinal dysplasia, persistent hyperplastic primary vitreous, and retinal detachment of unknown cause. Small tumors appear as white nodules on the retina and often contain white flecks of calcium (Figs 13A–B). The presence of intraocular calcium is an important clinical finding because few simulating lesions in the differential diagnosis become mineralized.

Retinocytoma, the benign variant of retinoblastoma, has the appearance of a treated retinoblastoma. The tumor is semitransparent and contains flecks of white material (calcium) (Fig 14).

Gliomas of the retina are rare and usually are associated with tuberous sclerosis or neurofibromatosis. These whitish tumors often contain calcium and may resemble a small retinoblastoma. Retinal gliomas are probably hamartomatous malformations and have limited growth potential. When no signs of a systemic phakomatosis exist, a retinal or optic nerve head glioma can present a diagnostic challenge (Fig 15).

Retinal hemangiomas are found in von Hippel-Lindau syndrome and appear as a pink retinal mass. These vascular tumors typically have a large retinal feeder vessel and vein. The vessels in retinal hemangioma have poorly developed tight junctions and leak lipid rich exudate into and beneath the retina (Fig 16).
Intraocular Lymphoma

Primary intraocular lymphoma may mimic inflammatory conditions of the eye, but some cases also have a highly characteristic clinical appearance. Some primary intraocular lymphomas appear to originate in the space between retinal pigment epithelium and Bruch’s membrane. Tumor cells lift off the retinal pigment epithelium and create elevated cream-colored detachments of the retinal pigment epithelium (Fig 17). Limited vitreous reaction may be present during the early stages of the disease so lesions are usually visible. In time, tumor cells invade the retina, turning it white. Cells eventually seed the vitreous, thereby obscuring the view of the retina.

References