Characteristic Ultrasonographic Findings of Choroidal Tumors

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Purpose: To report the characteristic ultrasonographic findings of choroidal tumors diagnosed at a university hospital between 1999 and 2002.

Materials and Methods: The charts of patients with choroidal tumors diagnosed between January 1999 and December 2002 were reviewed retrospectively. Age, gender and symptoms were recorded. The characteristic ultrasonographic findings of choroidal tumors, including shape, internal reflectivity, location and associated retinal detachment, were analyzed.

Results: A total of 27 cases of choroidal tumors were reviewed. Choroidal hemangioma was found in 15 cases (56%), choroidal melanoma in 10 (37%), and metastatic choroidal tumor in two (7%). Fourteen patients had a dome-shaped tumor mass (14 choroidal hemangiomas), 11 had a collar-button tumor (10 choroidal melanomas and 1 choroidal hemangioma), and two had an irregular/bumpy tumor (metastatic choroidal tumors). Retinal detachment was noted in 14 cases. Thirteen choroidal hemangiomas (86.7%) were located adjacent to the optic nerve, while eight choroidal melanomas (80%) were not located at the posterior pole. High internal reflectivity was noted in 13 choroidal hemangiomas (86.7%). Five cases of choroidal melanoma (50%) had medium to high internal reflectivity, and four cases (40%) showed low to medium internal reflectivity.

Conclusions: Ultrasonography is a non-invasive examination for choroidal tumors. However, not all choroidal tumors had the typical pictures described by previous studies. From our study, the shape, location, reflectivity, and associated retinal detachment might be helpful indicators for differential diagnosis of choroidal tumors.

(J Med Ultrasound 2003;11:55–9)

KEY WORDS: • ocular ultrasonography • choroidal hemangioma • choroidal melanoma • metastatic choroidal tumor

INTRODUCTION

Choroidal melanomas and hemangiomas, and metastatic choroidal tumors are common choroidal tumors encountered by ophthalmologists [1]. Diagnosis of choroidal tumors is mainly based on typical clinical pictures. However, it is difficult to evaluate the exact thickness and internal structures
using only an ophthalmoscope. High-frequency ocular ultrasonography is the ideal method for imaging the eye and intraocular structures [1]. Standardized A- and B-scan ultrasonography are useful in differentiating choroidal tumors [2]. Here, we report the characteristic ultrasonographic findings of choroidal tumors diagnosed at National Taiwan University Hospital over a period of 3 years and compare the results with those of previous reports.

**Patients and Methods**

We reviewed the charts of patients with choroidal tumors for whom ultrasonograms were available and who were seen at the National Taiwan University Hospital between January 1999 and December 2002. The patient’s age, gender and symptoms were recorded. Examinations were performed using A- and B-scan ultrasonography with a 10 MHz transducer (Sonomed B 3000, Sonomed Technology Inc, Lake Success, New York, USA). The shape (irregular/bumpy, dome, collar-button), reflectivity (low, medium, high), location (adjacent to optic nerve or not) and associated retinal detachment were noted. The thickness of the tumors was not measured on A-scan ultrasonography due to the considerable size of tumors in our series. Choroidal melanoma was proven by pathologic examination of the enucleated eyeball. Choroidal hemangioma was confirmed by further studies such as fluorescein angiography, computed tomography and magnetic resonance imaging or clinical observations. A diagnosis of choroidal metastatic tumors was made when there was a primary tumor and typical characteristics were noted ophthalmoscopically. Patients with uncertain diagnoses were excluded.

**Results**

The charts of 27 patients (17 males and 10 females; mean age, 55.6 ± 19.5 years) with choroidal tumors were collected. Choroidal hemangioma was found in 15 cases (56%; 7 males and 8 females; mean age, 56.8 ± 21.8 years), choroidal melanoma in 10 (37%; 8 males and 2 females; mean age, 49.2 ± 14.1 years) and metastatic choroidal tumor in two (7%; 2 males; mean age, 78.0 ± 5.7 years).

The ultrasonographic shape of these choroidal tumors are shown in Table 1. Retinal detachment was noted in 14 cases (5 with choroidal hemangioma, 7 with choroidal melanoma, and 2 with metastatic choroidal tumor). Thirteen choroidal hemangiomas (86.7%) were located adjacent to the optic nerve, while eight choroidal melanomas (80%) were not located at the posterior pole.

Internal reflectivity was evaluated by A-scan ultrasonography (Table 2). High internal reflectivity was noted in 15 cases, medium to high reflectivity in eight, and low to medium reflectivity in four.

There were two choroidal metastatic tumors. One metastasized from the lung and the other from the liver.

**Discussion**

Circumscribed choroidal hemangioma usually occurs in the fourth decade of life. Our 15 patients were slightly older (mean age, 56.8 ± 21.8 years). The typical A-scan ultrasonographic picture of circumscribed choroidal hemangioma is a relatively high internal reflectivity due to the numerous echogenic interfaces within the tumor [3–5]. This is consistent with our finding where 13 cases showed high internal reflectivity. With B-scan ultrasound, the tumor appears as a sessile or dome-shaped solid mass without choroidal excavation [3–5]. Of 15 cases, 14 showed the typical dome-shaped appearance (Fig. 1). However, one case with a huge hemangioma showed a collar-button appearance (Fig. 2), mimicking choroidal melanoma with a mushroom-shaped configuration. Spraul et al reported a similar case [6]. They described a choroidal tumor that was mushroom-shaped, with high internal reflectivity and choroidal excavation. The enucleation specimen contained a cavernous hemangioma that extended through Bruch’s membrane and grew into the subretinal space. In our series, the huge choroidal hemangioma occurred in a 7-year-old girl. The tumor showed high internal reflectivity without choroidal excavation. The diagnosis was confirmed by imaging studies and subsequent clinical observation.

Choroidal hemangiomas are located posterior to the equator in 95% of cases, within 3 mm of the foveola in 86% of cases [3, 4]. Thirteen cases in our series were located adjacent to the optic nerve, which may explain why most of these patients presented with the chief complaint of blurred vision. Retinal detachment was noted in five cases (33%). This is a lower incidence than in previous reports,
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which show that more than two-thirds of patients have serous retinal detachment at presentation [3, 7]. The subretinal fluid may be minimal adjacent to the tumor or it may produce a total shifting retinal detachment.

Choroidal melanomas are the most common primary ocular tumor in adults. The cardinal features of choroidal melanoma include collar-button shape, low to medium internal reflectivity, regular internal structure and internal blood flow [8, 9]. A-scan ultrasonography characteristically shows a high initial spike with medium to low internal reflectivity within the tumor. B-scan ultrasonography shows a collar-button or mushroom-shaped choroidal mass with acoustic hollowness and choroidal excavation [10].

In our 10 patients with choroidal melanoma, the mass showed a collar-button appearance (Fig. 3). Due to their cellular, homogeneous architecture, these tumors typically demonstrate low to medium reflectivity. However, in our cases, the reflectivity was high in one patient, medium to high in five, and low to medium in four. The high reflectivity may be due to hemorrhage or necrosis. Large ocular melanoma may produce significant internal sound

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Fig. 1. Dome-shaped choroidal hemangioma located at the posterior pole without retinal detachment.

Fig. 2. Huge choroidal hemangioma mimicking a choroidal melanoma with collar-button appearance.
attenuation, but this was not obvious in our 10 patients. In addition, there was no choroidal excavation. Seven patients had retinal detachment (70%), a greater percentage than with choroidal hemangioma (33%). These exudative detachments often extend from the margins of the tumor. Eight tumors were not located at the posterior pole (Fig. 4).

The incidence of choroidal metastasis in patients with systemic malignancies is estimated to be 5% [11]. Metastatic choroidal tumors present as yellowish, elevated, diffuse lesions with irregular borders. They are frequently associated with serous retinal detachment, which tend to be more elevated and extensive than those in melanomas of similar size [12]. This could be helpful in differential diagnosis from amelanotic tumors. Echographically, metastatic choroidal tumors can be confused with diffuse choroidal melanoma, uveal lymphoid hyperplasia, choroidal hemangioma and choroidal nevi. The internal reflectivity of metastatic tumors is generally medium to high, but the internal structure can be somewhat irregular. Additionally, internal vascularity is typically minimal or absent in these lesions. Approximately 40% of all choroidal metastases lie deep in the macular region. This predilection may be based on the nature of the choroidal circulation or on the greater likelihood that macular lesions will be discovered because of visual symptoms. Multifocal lesions are found in approximately 20% to 28% of cases [13–15]. Bilateral involvement has been reported in 33% of cases [14, 16]. Both our patients had irregular/bumpy tumors with medium to high reflectivity and serous retinal detachment (Fig. 5).

In conclusion, ultrasonography, a non-invasive examination for intraocular lesions, is a convenient method to detect choroidal tumors. However, not all choroidal tumors have the typical features described in the literature. In our patients, choroidal hemangiomas were dome shaped and most were located at the posterior pole. Huge hemangiomas may mimic choroidal melanomas, appearing as collar-buttons on ultrasonography. Choroidal melanomas have a collar-button appearance but may have high internal reflectivity. The percentage of retinal

![Fig. 3. Typical collar-button pattern of choroidal melanoma.](image3)

![Fig. 4. Choroidal melanoma with retinal detachment.](image4)

![Fig. 5. Choroidal metastatic tumor with irregular/bumpy appearance.](image5)
detachments associated with choroidal melanoma is higher than that with choroidal hemangioma. From our series, the shape, location, reflectivity and associated retinal detachment might be helpful indicators for differential diagnosis of choroidal tumors.

REFERENCES