Original Article

Role of echography in diagnostic dilemma in choroidal masses

Kopal N Mithal, Hansa H Thakkar[1], Mudit A Tyagi, Rekha M Bharwada[1], Puja O Billore[1]

Purpose: To evaluate the role of echography in diagnosis and management of a diverse array of choroidal masses. **Materials and Methods:** Sixty-two cases of clinically suspected choroidal masses were prospectively analyzed with B-scan (10 Hz), A-scan, and ultrasound biomicroscopy (UBM) (50 Hz) after a meticulous history and ocular examination. Ancillary investigations and systemic evaluation were also done. **Results:** Based on clinical suspicion, acoustic features, response to treatment, and other ancillary tests combined together, the various masses were differentiated. The cases included in the study were as follows: *n* = 10 malignant melanomas, *n* = 16 metastasis and infiltrations, *n* = 9 hemangioma, *n* = 7 tuberculoma, *n* = 8 nonspecific inflammatory masses, *n* = 2 disciform plaques, *n* = 4 macular cysts or retinoschisis, *n* = 2 Coat's disease, *n* = 1 melanocytoma, and *n* = 2 osteomas. Ultrasonography (USG) alone could identify *n* = 51 lesions, while UBM in combination with USG was needed in remaining 11 masses. **Conclusion:** Standardized echography is an important adjunct in the diagnosis and management of eyes with intraocular masses. A better understanding of the clinicopathological and echographic picture of the diverse lesions can help in detection, differentiation, diagnosis, proposing a therapeutic approach, and also monitoring response to treatment. Echography is essential to evaluate tumors for extrascleral and anterior segment extension.

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Choroidal masses present with a diverse array of clinical features ranging from life-threatening malignant melanomas and metastatic deposits to an innocuous nevus. They more often than not become a diagnostic dilemma for the clinician. The fight against pseudomelanomas, i.e. masses simulating the deadly malignant melanoma, was started by the pioneers in the field like Jerry A. Shields and Zimmerman. In the last three decades, the rate of misdiagnosis and enucleation for choroidal melanomas has been brought down from 20% to less than 1%, but this fight still continues. Many early treatable lesions go undiscovered or wrongly diagnosed, many salvageable eyes are lost, and many lives are lost because of mostly lack of experience in the field and unavailability of affordable imaging modalities. In recent years, ophthalmic ultrasound comprising B-scan (10 MHz), A-scan, and ultrasound biomicroscopy (UBM) (50 MHz) has become a useful, rather indispensable tool for management of such intraocular masses and tumors. Apart from cases with opaque media, echography is also used as an adjunct to clinical examination in the detection, differentiation, measurement of accurate dimensions, monitoring growth, looking for extra orbital extension, and monitoring regression in response to treatment.[1] It is cost-effective, noninvasive, and reproducible, which are important considerations, especially in rural settings.[2] It has been shown to have greater than 95% accuracy[3] in differentiating choroidal melanomas from other eye lesions.

Materials and Methods

A prospective analysis of 62 cases of choroidal masses was done between September 2007 and August 2009. Most cases were referred to us from peripheral centers as suspected posterior segment masses, while a few had already been treated as common conditions such as retinal detachment, and glaucoma and came to us in advanced stages.

On presentation, a thorough history taking and clinical examination were carried out. Indirect ophthalmoscopy was done followed by echographic evaluation with B-scan (10 MHz) and A-scan by a single examiner. UBM evaluation (50 MHz) was done when ciliary body and iris involvement were suspected. The various acoustic features studied were as follows: anatomical location, extent, approximate dimensions, shape, internal reflectivity, echogenicity, acoustic hollowing, choroidal excavation, hemorrhage, calcification, retinal detachment, scleral or extrascleral extension, and involvement of iris and/or ciliary body.[4] Ancillary investigations were ordered when needed. Expert opinions were taken from oncology, chest and tuberculosis, neurosurgery, and pediatric departments. These in collaboration with clinical features and proposed clinical judgment helped us frame a diagnosis. Inflammatory, tuberculous, and other benign lesions were managed conservatively with specific or nonspecific therapy, and response to treatment was monitored with echography which confirmed the diagnosis at times. Malignant conditions were referred to the oncology department for further management and response to treatment was monitored with echography. The cases treated surgically were confirmed by histopathology.

Results

In our study, we enrolled 62 cases of choroidal masses comprising *n* = 10 malignant melanomas (16.1%), *n* = 16 metastasis and infiltrations (25.8%), *n* = 9 hemangiomas (14.5%), *n* = 7 tuberculoma (11.2%), *n* = 8 inflammatory masses (12.9%), *n* = 2 disciform plaques (3%), *n* = 4 macular cysts or retinoschisis (6%), *n* = 2 Coat's disease (3%), *n* = 1 melanocytoma (1.5%), *n* = 1 nevus (1.5%), and *n* = 2 osteomas (3%) [Fig. 1].

LVPEI, Hyderabad, [1]Ultrasound and Retina Department, M&J Institute, Ophthalmology, Ahmedabad, Gujarat, India

Correspondence to: Prof. Hansa H. Thakkar, Ultrasound and Retina Department, M&J Institute of Ophthalmology, Ahmedabad, Gujarat, India. E-mail: dr.hansathakkar@gmail.com

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Ultrasonography (USG) alone could identify 51 lesions, while UBM in combination with USG was needed in remaining 11 masses. Bilateral involvement was seen in six cases which comprised two leukemic infiltrates, one metastasis, two hemangiomas, and one disciform scar. The more severely affected eye was included in the study.

Forty-one eyes had mass limited to choroidal tissue behind the equator (66.1%), 6 eyes had diffuse involvement of the choroidal tissue (9.6%), 4 masses filled the whole posterior segment (6.4%), and rest 11 had involvement of iris or ciliary body in addition to choroidal tissue (17.74%). Fig. 2 shows few classical configurations seen in lesions under study. The main echographic features found in the 62 choroidal masses in our study on echography are briefly described in Table 1.

A total of 41% cases had hazy media, while 72% cases had associated retinal or choroidal detachments. The various features of the lesion or conditions of affected eye which made echography useful and often essential in our evaluation have been described in Table 2. Few interesting and classical cases included in our study have been showed in Figs. 3-6.

Discussion

The echographic profile of the various choroidal masses we studied closely matched the features described by various sources, not withstanding a few variations.[1,5-7]

A 14-year retrospective evaluation of choroidal masses

Table 1: Types of choroidal lesions

Diagnosis	Shape (%)	Echogenicity (%)
Malignant melanoma	Collar stud (70) Lobulated 30	Hyper echoic (100) with acoustic hollowing (18.5)
Metastasis	Lobulated (68.7) Diffuse (33.3)	Hyper echoic heterogenous (56.2), low-to-moderate echoic heterogenous (43.7)
Hemangioma	Dome shape (66.6) Concave diffuse (33.4)	Moderate-to-hyper echoic heterogenous (100)
Tuberculoma	Dome shape (71.4) Concave diffuse (28.6)	Moderate echoic heterogenous (100)
Inflammatory	Dome shape (75) Concave diffuse (25)	Low-to-moderate echoic heterogenous (100)
Retinoschisis	Bullous (100)	Hypo echoic (100)
Disciform	Local thickening (100)	Hyper echoic heterogenous (100)
Coat's disease	Concave diffuse (100)	Low-to-moderate echoic heterogenous (100)
Nevus	Local thickening (100)	Hyper echoic homogenous (100)
Osteoma	Concave diffuse (100)	Hyper echoic calcified (100)

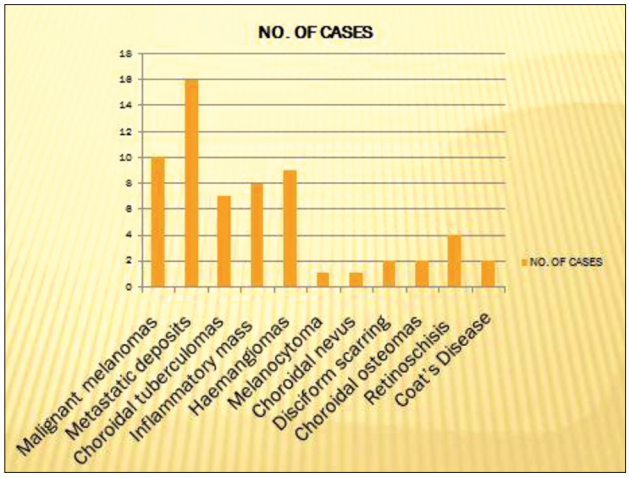

Figure 1: Types of the choroidal lesions

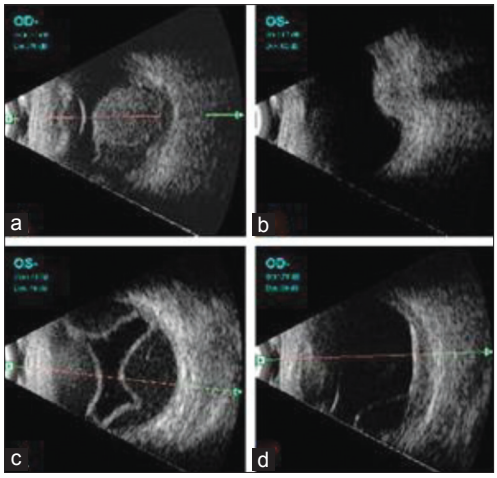

Figure 2: Classical configurations of choroidal lesions (a) Mushroom shaped melanoma (b) Dome shaped haemangioma (c) Bullous choroidal detachment (d) Diffuse tuberculoma

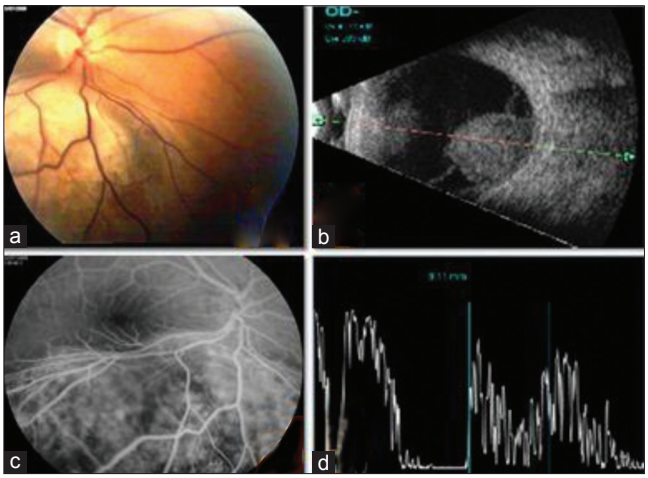

Figure 3: Malignant melanoma of choroid (a) Fundus photo of large posterior pole melanoma (b) Multiple pin point leaks on FFA (c) Mushroom sharped mass on B-scan (d) Low to moderate internal echoes on A-san

done at Chang Gung Memorial Hospital, Taiwan, showed a closely resembling profile of 46 patients (51 eyes) including 12 cases (26%) of metastatic deposits, 10 cases (22%) of hemangiomas, 2 cases (4%) of osteomas, 5 cases (11%) of melanocytoma, 8 cases (17%) of malignant melanomas, and 9 cases (20%) of other melanocytic lesions.

Jerry A Shields has summarized 25 years experience of differentiating melanomas from lesions simulating them and showed that 14% of suspected posterior uveal melanomas were pseudomelanomas consisting of naevi, hemangiomas, choroidal effusions, age-related macular degeneration (ARMD), etc.[8]

While most studies on choroidal tumors have been done in the west, data from our subcontinent are very little. Unlike the usual belief, melanomas are commonly seen in the Indian subcontinent. Nonspecific and specific inflammatory masses like tuberculoma which are rather rare in the literature are seen more commonly and exclusively in our country.

While the western literature claims that one hemangioma is seen per 15-40 cases of melanomas,[9] we have come across a nearly equal number of hemangiomas as melanomas in our 2 years of study. The principles laid down by Dr. K.C. Ossoinig[1,10] for diagnosing various posterior segment masses still hold true. We have used them as a guide in our diagnosis. The classical features seen in choroidal masses have been shown in Table 3.

Conclusion

A better understanding of clinicopathological correlation combined with an early echography can diagnose the choroidal masses and hence can propose a timely therapeutic approach even in peripheral centers. Follow-up echography ascertains diagnosis and monitors the response to treatment modalities. The diagnostic dilemma in cases of suspicious choroidal masses can be majorly resolved with a judicious echography reducing

Table 2: Indications for echography in choroidal lesions

Indication for imaging	No. of cases (%)	Associated lesions
Retinal/choroidal detachment	45 (72.5)	Melanoma, inflammatory masses, metastasis, hemangioma, retinoschisis, Coat's disease
Corneal opacity	23 (37)	Melanoma, inflammatory masses, hemangioma
Dense cataract	12 (19)	Various
Non dilating pupil	09 (14)	Malignant melanoma, metastasis, inflammatory masses
Iris/CB involvement	10 (16)	Malignant melanoma, metastasis
Vitreous hemorrhage	07 (11)	Leukemic infiltrates
Vitreous haze	10 (16)	Inflammatory masses, retinoschisis, Coat's disease
Mass filling eye	14 (22)	Hemangioma, melanoma, metastasis, Coat's disease, inflammatory masses
Scleral involvement	05 (08)	Melanoma, metastasis
Calcification	03 (4.8)	Osteoma, disciform scar

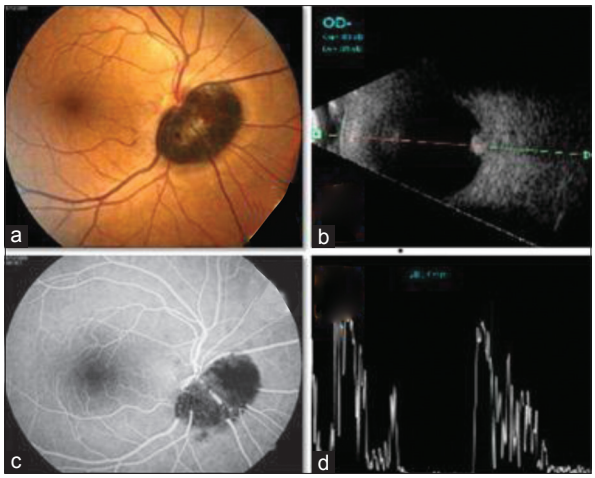

Figure 4: Melanocytoma over optic nerve head. (a) Fundus photo posterior pole melanocytoma (b) Blocked fluorescence with fimbriated margins (c) Nodular mass on B-scan (d) High internal echoes on A-scan

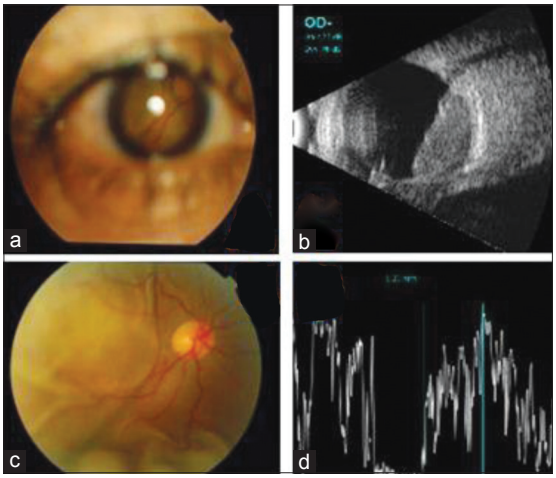

Figure 5: Metastatic choroidal deposit from carcinoma breast (a) Metastatic deposit from breast carcinoma (b) Retinal datachment (c) Flat topped posterior pole metastatic deposits (d) Moderate to high internal reflectivity on A-scan

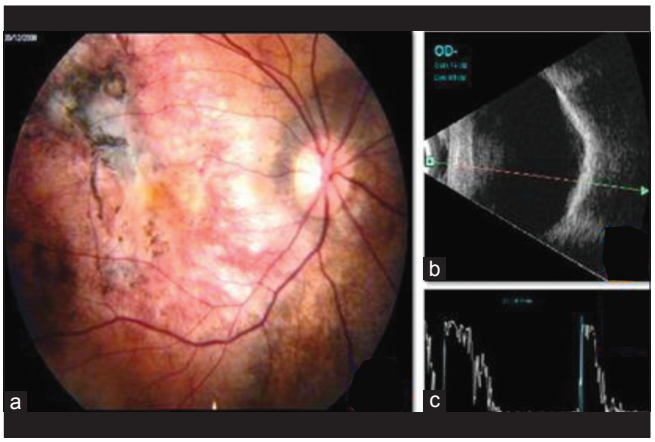

Figure 6: Choroidal osteoma (a) Yellowish orange macular Choroidal Osteoma (b) Posterior pole calcified plaque (c) High echoes on lowest gain on A-scan

Table 3: Chief acoustic features of choroidal masses

Diagnosis	Chief acoustic features
Malignant melanoma	Mushroom/dome shape, solid homogenous, low-to-moderate internal reflectivity, growth on follow-up, ±acoustic hollowing, choroidal excavation, internal vascularity, serous retinal detachment
Metastasis	Flat, elevated or lobulated, at posterior pole/ multifocal, heterogenous, medium-to-high internal reflectivity, ±central excavation, nonvascular, RD
Tuberculoma	Diffuse, mild elevation, posterior pole, heterogenous, moderate internal reflectivity, dramatic regression on treatment
Inflammatory masses	Smooth, thickened, dome shape/multiloculated, posterior to equator, regression on treatment
Hemangioma	Moderately elevated, solid, dome-shaped, diffuse in Sturge-Weber syndrome, homogenous, high spike with two peaks, static, nonvascular
Melanocytoma	Circumscribed nodular elevation, homogenous, high internal reflectivity, on or near optic nerve head, no growth, nonvascular
Choroidal nevus	Small, minimally elevated(<3 mm), high reflective, nonvascular, no or minimal growth
Disciform scar	Localized at macula, plaque like, highly reflective, calcified, flatten on follow-up, hemorrhage
Retinoschisis	Smooth, bullous, localized, high spike, inferotemporal, bilateral
Osteoma	Plaque like, high reflective even at low gain, calcified, acoustic shadowing, over posterior pole
Coat's disease	Multifocal low reflective retinal elevations, exudative retinal detachment, low-to-moderate internal echoes with after movement

RD: Retinal Detachment

the incidence of erroneous diagnosis. Echography helps in reduction of morbidity and mortality due to late or wrong diagnosis of malignant melanomas and other lesions.

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