CLINICAL RESEARCH

Case Report of a Focal Scleral Nodule in a Patient with Prostate Cancer

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Abstract

Distinguishing benign retinal lesions from metastatic lesions is critical for proper patient management. With the advancement of ocular coherence tomography, imaging can now be used to determine precise anatomical locations, allowing for new terminologies. This case report will discuss retinal findings in a patient being treated for prostate cancer and emphasize the importance of using technology for differentiating focal scleral nodules from choroidal lesions such as choroidal metastasis.

KEY WORDS:
Focal scleral nodule, solitary idiopathic choroiditis, choroidal metastasis

INTRODUCTION

Focal scleral nodule (FSN) is a term that has recently been proposed to accurately categorize the anatomical location of lesions formerly labeled solitary idiopathic choroiditis.[1] Focal scleral nodules are post-equatorial, unilateral, elevated lesions that display distinctive features on multimodal imaging.[1,2] With the advent of enhanced depth imaging (EDI) on ocular coherence tomography (OCT), these lesions, which were previously believed to be of choroidal origin, can now be classified as scleral.[2,3] They are most often solitary, but may present multifocally.[3]

Newly noted choroidal lesions warrant further investigation. Choroidal tumors range from benign findings such as choroidal osteomas to more ominous conditions including choroidal metastasis and melanoma.

In patients with a known history of cancer, choroidal metastasis may be a leading differential for a previously unnoticed choroidal lesion. Of the uveal tissues, the choroid is affected more frequently by metastasis than the iris or ciliary body.[4] A 2020 study found that the primary organ site for uveal metastasis was most commonly breast followed by lung, with the prostate as the sixth most frequent site.[5] Ascertaining a lesion's choroidal versus scleral origin should guide proper patient management.

CASE REPORT

A 73-year-old Caucasian male presented to the eye clinic due to complaints of new-onset blurred vision of the right eye. His ocular history was remarkable for asymptomatic Hollenhorst plaque of the left eye, visually significant cataract OD, OS, and diabetes and hypertension without retinopathy OD, OS.

His medical history consisted of type 2 diabetes with hemoglobin A1C of 7.8%, hypertension, hyperlipidemia, depression and prostate cancer. These conditions were treated with glimepiride, empagliflozin, insulin, lisinopril, metoprolol tartrate, rosuvastatin and sertraline. He had received two injections of leuprolide and radiation for the prostate cancer, with his final radiation treatment one week prior to this visit. His social history was positive for smoking between the ages of 14 and 40; he had quit 33 years ago.

He had a history of right carotid stenosis (30-49%), left carotid endarterectomy 17 years prior and quadruple coronary artery bypass graft for which he was taking clopidogrel and 81mg aspirin.

On examination, his best corrected visual acuity was 20/40 OD and 20/30 OS, a change from 20/30 and 20/25 at his prior visit. Amsler grid was unremarkable without metamorphopsia or scotoma in each eye. Confrontation visual fields were full to finger-counting in each eye. Pupils were equal without afferent pupillary defect and extraocular motilities were full and smooth.

Applanation tonometry read 12mmHg OD and 13mmHg OS. Dilated examination revealed grade 2 nuclear sclerotic cataracts bilaterally with trace central posterior subcapsular cataract OD. Cup-to-disc ratios were 0.35 OD and 0.30 OS. Fundoscopic exam revealed a parafoveal elevated amelanotic lesion nasally in the right eye (Figure 1a) which appeared hyperautofluorescent with fundus autofluorescence (FAF) (Figure 1b). The left fundus appeared unremarkable (Figure 2). There was no Hollenhorst plaque present.

Figure 1 a,b: *Right eye. Note the yellow-white lesion located between the optic nerve head and macula. The lesion appears hyperautofluorescent with autofluorescence.*

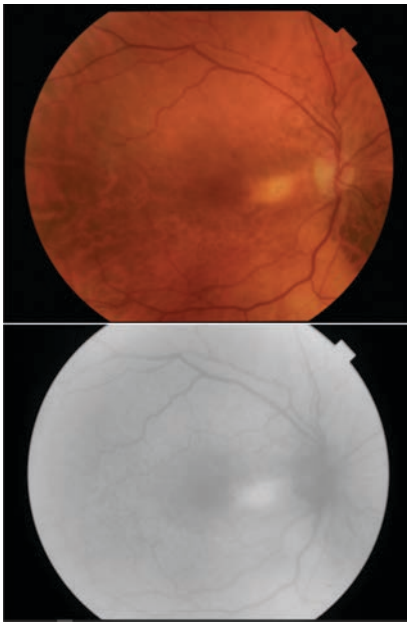
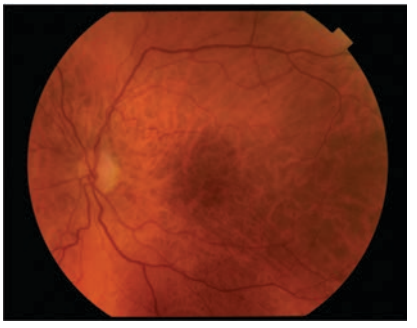


Figure 2: *Left eye. Unremarkable fundus.*



EDI-OCT of the lesion in the right eye (Figure 3) was obtained, revealing a subchoroidal dome-like elevation nasal to the right fovea. There was no associated subretinal or intraretinal fluid and the overlying retinal layers appeared intact. There was appreciable thinning of the choroid above the scleral lesion. This choroidal compression was most marked at the dome's apex. Infrared (IR) reflectance imaging revealed a hyperreflective mass with a surrounding hyporeflective halo. The lesion appeared solid on ultrasonography (Figure 4) and measured 1.2mm in thickness.

Figure 3: *EDI OCT of the right eye. Note the dome-shaped scleral elevation wider horizontally than vertically. The overlying retina remains intact but there is marked choroidal thinning at the dome's apex. The lesion appears hyperreflective with a surrounding hyporeflective halo on infrared imaging.*

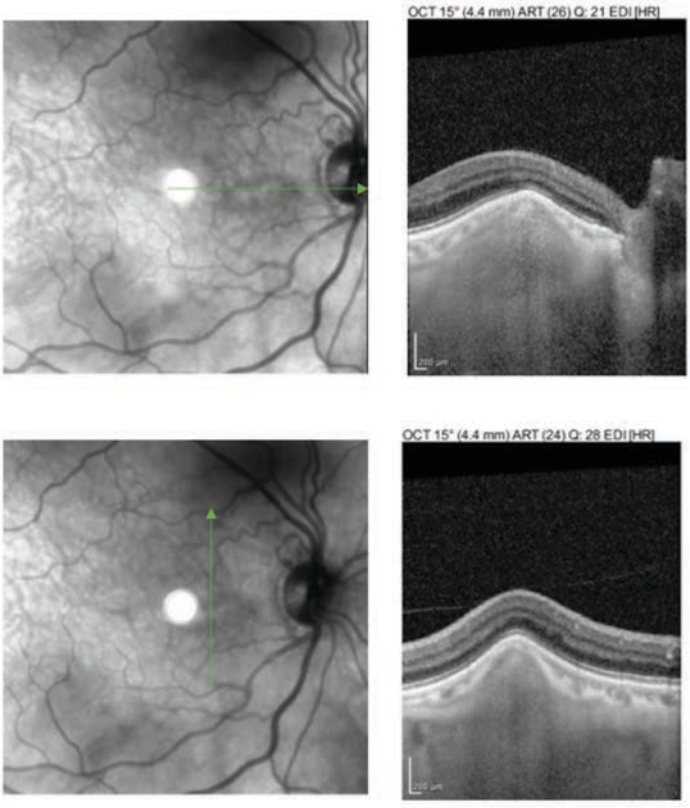
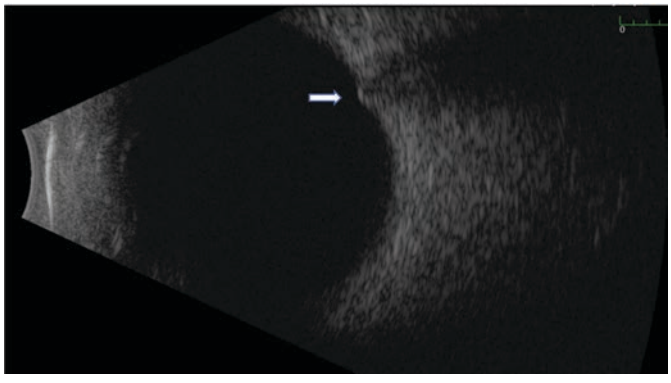


Figure 4: *The focal scleral nodule appears elevated and solid on B-scan of the right eye. The posterior hypoechoic signal is attributable to the lesion's proximity to the optic nerve.*



The patient was subsequently evaluated at the clinic for a same-day retina consultation. The retina specialist recommended a prompt referral to ocular oncology to rule out a choroidal metastasis given the patient's history of prostate cancer. Ocular oncology consultation rendered the opinion that the lesion was a focal scleral nodule with unlikely relation to the prostate cancer. However, the option of obtaining a whole-body positon emission tomography (PET) – computerized tomography (CT) scan was discussed with the patient to definitively rule out metastasis. He decided to proceed with the PET-CT scan, which returned negative for metastasis.

DISCUSSION

The term focal scleral nodule originated as a result of details obtained through advanced imaging techniques. The previous terminology of unifocal helioid choroiditis and solitary idiopathic choroiditis (SIC) was used to describe non-visually significant amelanotic lesions. Unifocal helioid choroiditis was the first proposed term for a unique clinical entity describing a solitary, amelanotic lesion of about one disc diameter in size that was thought to represent localized choroidal inflammation.[6] In a study by Hong et al., all subjects were symptomatic for visual changes. These lesions were noted to have subretinal fluid and were not associated with any systemic condition.[6] Later, SIC was used to describe similar post-equatorial, choroidal, yellow-white lesions sometimes having an orange halo that likely represented the same entity. Research by Shields et al. revealed that patients with SIC lesions had an active or inactive phase and were also unrelated to systemic causes including posterior uveitis and metastasis.[7] Given that this study was conducted over 20 years ago, prior to the advent of OCT, imaging was limited to fundus photography, fluorescein angiography (FA), indocyanine green angiography (ICG) and ultrasonography.

The first case series to examine solitary idiopathic choroiditis lesions using OCT was conducted in 2013 and revealed that these lesions originated from the sclera or outer choroid.[2] On EDI-OCT, all lesions had a dome-shaped appearance and choroidal thinning overlying the lesion. There were variable outer retina changes, however, no inner retinal changes or subretinal fluid were found. Nine lesions displayed hyperautofluorescence and eight lesions were hyperreflective on IR.

EDI-OCT allows for better visualization of choroidal and scleral structures. With traditional OCT, imaging of deeper layers is restricted due to light scattering by the retinal pigment epithelium and choroidal vasculature. EDI-OCT increases the resolution of the choroid compared to traditional OCT scans by enhancing the sensitivity of imaging the choroid and sclera, resulting in sharply focused and detailed structures.[8]

Fung et al. coined the term focal scleral nodule in 2020 after observing that all patients with lesions previously labelled as solitary idiopathic choroiditis and unifocal helioid choroiditis in fact had scleral, not choroidal origins.[1] Most FSNs are dome-shaped but can have a nodular or volcanic appearance.[1] Typically, FSNs have intact overlying neurosensory retinal layers, however, changes may be seen in the ellipsoid layer and retinal pigment epithelium.[1] On B-scan ultrasonography, these lesions have a mean thickness of 1.6mm. Most FSNs were hyperautofluorescent with FAF and bright with IR. A choroidal flow void was present over each of 13 lesions that were examined by OCT angiography. In this case series, Fung classified multimodal images that had been obtained from 63 patients with SIC in one eye. Patients in this series were predominantly white (89%) and female (59%), and ranged from 12-83 years old.[1] Visual acuity was only affected in one patient with a subfoveal FSN and associated subretinal fluid. Lesions were usually yellow, and some had an associated orange halo.[1] Most lesions were located inferiorly to the optic nerve. The FSN was 0-6.8 mm from the optic nerve and 0.1-12.0 mm from the fovea. The maximal linear basal diameter was 1.0-6.3 mm. It is thought that FSNs do not represent an active inflammatory process, given the lack of associated inflammatory findings usually observed with a choroiditis.[1] The lesions are typically stable over time.[1,3] A congenital origin was proposed after FSNs were documented in patients as young as 3 and 12 years.[1,2]

In the case presented here, the FSN was located 1.74mm inferior to the optic nerve and 2.38mm from the fovea. The maximal linear basal diameter was 2.12mm. B-scan ultrasonography gave a thickness of 1.2mm, fitting the profile of FSN noted above.

Choroidal lesions are the most clinically significant differential diagnosis, ranging from benign conditions such as amelanotic nevus, sclerochoroidal calcifications, choroidal hemangiomas and osteomas to inflammatory etiologies such as granulomas. More ominous sight- and/or life-threatening conditions such as melanoma and metastasis emphasize the importance of obtaining a thorough medical history and proper use of ancillary testing. Determining that the origin is scleral using multimodal imaging could avoid the unnecessary testing and rigorous follow-up required with malignant choroidal tumors. Choroidal granuloma and osteoma, although similar in appearance clinically, will show changes in both the shape and visual appearance of the lesion on EDI-OCT reflective of the systemic

etiology.[9] Osteomas have been shown to change slowly over time; 50% show growth and decalcification that can be tracked through the use of imaging.[10] Granulomas can be distinguished from FSN on EDI-OCT due to the lesion taking on a homogenous mass distinctly within the choroid.[9] A very similar entity is a sclerochoroidal calcification. In a case series by Fung et al., these orange to yellow lesions all originated from the sclera, with a thin to absent choroid having a typical location of superior temporal.[11] Most of these lesions were elevated and the anterior sclera was described as rocky or rolling.[11] Choroidal melanomas also show distinctive imaging features that distinguish them from FSN. Location is key in OCT, as the melanoma originates from the choroid, however other features to keep in mind are thickness greater than 2 mm, acoustic hollowness, orange pigment and subretinal fluid.[12]

Although the patient in this case had a history of prostate cancer, choroidal metastasis is not likely. A large review found that 2% of patients with choroidal metastasis had prostate cancer as the origin.[13] Konstantides et al. found that the mean time between the diagnosis of primary cancer and detection of uveal metastasis was 24 months, with a range of 1-288 months.[14] Choroidal metastasis has specific features found on EDI-OCT that are distinctive. A specific sign seen on imaging is thinning of the choriocapillaris, which was found in 100% of subjects in a study by Cennamo et al.[15] Shaggy photoreceptors and subretinal fluid were also closely associated with metastasis whereas FSN typically does not affect the retina in this way.[15] Table 1 summarizes the multimodal imaging features of FSNs and its differentials.

When examining patients with retinal lesions with or without a history of cancer, the clinician must seek to rule out any potentially sight- or life-threatening conditions. This case report underscores the importance of EDI-OCT to determine the location of the lesion which will dictate follow-up testing and management while differentiating benign from malignant conditions. ●

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REFERENCES

1. Fung AT, Waldstein SM, Gal-Or O, et al. Focal Scleral Nodule: A New Name for Solitary Idiopathic Choroiditis and Unifocal Helioid Choroiditis. Ophthalmology 2020 Nov;127(11): 1567-77.
2. Fung AT, Kaliki S, Shields CL, Mashayekhi A, Shields JA. Solitary idiopathic choroiditis: findings on enhanced depth imaging optical coherence tomography in 10 cases. Ophthalmology 2013 Apr;120(4):852-8.
3. Park HS, Kim YJ, Choi EY, et al. Expanded spectrum of focal scleral nodule: focal scleral nodules can be bifocal. Eye 2022 Apr.
4. Shields CL, Shields JA, Gross NE, Schwartz GP, Lally SE. Survey of 520 eyes with uveal metastases. Ophthalmology 1997 Aug;104(8):1265-76.
5. Shields CL, Acaba-Berrocal LA, Selzer EB, et al. Uveal metastasis based on patient age in 1,111 patients. Retina 2020 Feb; 40(2): 204-13.
6. Hong PH, Jampol LM, Dodwell DG, Hrisomalos NF, Lyon AT. Unifocal helioid choroiditis. Arch Ophthalmol 1997 Aug;115(8):1007-13.
7. Shields JA, Shields CL, Demirci H, Hanovar S. Solitary idiopathic choroiditis: the Richard B. Weaver lecture. Arch Ophthalmol 2002 Mar;120(3):311-9.
8. Spaide RF, Koizumi H, Pozonni M. Enhanced Depth Imaging Spectral-Domain Optical Coherence Tomography. Am J Ophthalmol 2008 Oct;146(4):496-500.
9. Invernizzi A, Mapelli C, Viola F, et al. Choroidal granulomas visualized by enhanced depth imaging optical coherence tomography. Retina 2015 Mar;35(3):525-31.
10. Olguin-Manríquez F, Enríquez AB, Crim N, et al. Multimodal imaging in choroidal osteoma. Int J Retina Vitreous 2018 Aug 15;4:30.
11. Fung AT, Arias JD, Shields CL, Shields JA. Sclerochoroidal Calcification Is Primarily a Scleral Condition Based on Enhanced Depth Imaging Optical Coherence Tomography. JAMA Ophthalmol 2013;131(7):960-3.
12. Shields CL, Dalvin LA, Ancona-Lezama D, et al. Choroidal Nevus Imaging Features in 3,806 Cases and Risk Factors for Transformation into Melanoma in 2,355 Cases: The 2020 Taylor R. Smith and Victor T. Curtin Lecture. Retina 2019 Oct; 39 (10):1840-51.
13. Arepalli S, Kaliki S, Shields CL. Choroidal metastases: origin, features, and therapy. Indian J Ophthalmol 2015 Feb;63(2):122-7.
14. Konstantinidis L, Rospond-Kubiak I, Zeolite I, et al. Management of patients with uveal metastases at the Liverpool Ocular Oncology Centre. Br J Ophthalmol 2014 Jan; 98:92-8.
15. Cennamo G, Montorio D, Carosielli M, Romano MR, Cennamo G. Multimodal Imaging in Choroidal Metastasis. Ophthalmic Res. 2021;64(3):411-6.
16. Shields JA, Shields CL. CME review: sclerochoroidal calcification: the 2001 Harold Gifford Lecture. Retina 2002 Jun;22(3):251-61.
17. Sallet G, Amoaku WM, Lafaut BA, Brabant P, De Laey JJ. Indocyanine green angiography of choroidal tumors. Graefes Arch Clin Exp Ophthalmol 1995 Nov;233(11):677-89.
18. Shields CL, Bianciotto C, Pirondini C, Materin MA, Harmon SA, Shields JA. Autofluorescence of choroidal melanoma in 51 cases. Br J Ophthalmol 2008;92:617-22.
19. Bowen RC, Raval V, Soto H, Singh AD. Intraocular Tumors: Angiographic Patterns. Asia Pac J Ophthalmol (Phila) 2020 Sep-Oct;9(5):449-60.
20. Shields CL, Mashayekhi A, Materin MA, et al. Optical coherence tomography of choroidal nevus in 120 Patients. Retina 2005 Apr; 25(3): 243-52.
21. Shields CL, Pirondini C, Bianciotto C, Materin MA, Harmon SA, Shields JA. Autofluorescence of choroidal nevus in 64 cases. Retina 2008 Oct;28(8):1035-43
22. Sen M, Honavar SG. Circumscribed choroidal hemangioma: An overview of clinical manifestation, diagnosis and management. Indian J Ophthalmol 2019 Dec;67(12):1965-73
23. Ramasubramanian A, Shields CL, Harmon SA, Shields JA. Autofluorescence of choroidal hemangioma in 34 consecutive eyes. Retina 2010 Jan;30(1):16-22
24. Shields CL, Perez B, Materin MA, Mehta S, Shields JA. Optical coherence tomography of choroidal osteoma in 22 cases: evidence for photoreceptor atrophy over the decalcified portion of the tumor. Ophthalmology 2007 Dec;114(12):e53-8.
25. Bloom PA, Ferris JD, Laidlaw A, Goddard PR. Appearances of choroidal osteomas with diagnostic imaging. Br J Radiol 1992 Oct;65(778):845-8.
26. Lafaut BA, Mestdagh C, Kohno T, Gaudric A, De Laey JJ. Indocyanine green angiography in choroidal osteoma. Graefes Arch Clin Exp Ophthalmol 1997 May;235(5):330-7.
27. Shields CL, Shields JA, Augsburger JJ. Choroidal osteoma. Surv Ophthalmol 1988 Jul-Aug;33(1):17-27.
28. Venkatesh R, Bavaharan B, Yadav NK, et al. Multicolor imaging in choroidal osteomas. Int J Retina Vitreous 2018 Dec; 13;4:46.