Review Paper:
Optic Disc Melanocytoma: A Case Report and Review

Ali Ahmadzadeh Amiri[1], Majid Reza Sheikhrezaei[2], Ahmad Ahmadzadeh Amiri[2*]

1. Sports Medicine Research Center, Neuroscience Institute, Tehran University of Medical Sciences, Tehran, Iran.
2. Department of Ophthalmology, Faculty of Medicine, Clinical Research Development Unit of Bu-Ali Sina Hospital, Mazandaran University of Medical Sciences, Sari, Iran.

Use your device to scan and read the article online

Citation Ahmadzadeh-Amiri A, Sheikhrezaei M, Ahmadzadeh-Amiri A. Optic Disc Melanocytoma: A Case Report and Review. Journal of Pediatrics Review. 2021; 9(1):61-66. http://dx.doi.org/10.32598/jpr.9.1.855.1

http://dx.doi.org/10.32598/jpr.9.1.855.1

Article info:
Received: 05 Oct 2019
First Revision: 02 Dec 2019
Accepted: 10 Jan 2020
Published: 01 Jan 2021

Keywords:
Neoplasms, Eye, Fluorescein, Angiography, Tomography

ABSTRACT

Introduction: Melanocytoma is a rare benign stationary tumor that usually appears as a pigmented lesion on the optic disk. Optic Disc Melanocytoma (ODM) can compress the optic nerve or undergo necrosis, leading to ischemic axonal loss and visual field defect, similar to those caused by glaucoma. Also, ODM often displays a clinical diagnostic dilemma due to its similarities with melanoma. Some patients have undergone enucleation because of uncertainty between both pathologies. Progressive growth and malignant transformation can be documented by close monitoring of the patient's eyes. Fundus examination and ancillary imaging procedures such as fundus photo, autofluorescence, B-scan ultrasonography, fluorescein angiography, and spectral-domain optic coherence tomography are powerful tools for ODM diagnosis and management.

Case Presentation: A 19-year-old female presented with a decrease in vision in the left eye for about 3 months. Her visual acuity was 20/20 and 20/80 in her right and left eyes, respectively. Funduscopic examination of the left eye showed a well-defined deeply pigmented brownish-black, dome-shaped nodular mass covered the entire optic disc with the normal-appearing overlying vitreous, macula, and surrounding retina. Short-wave autofluorescence revealed hypo-autofluorescence on the pigmented mass lesion. The patient's condition did not change significantly over 2 years of follow-up. The diagnosis was made as ODM.

Conclusions: Melanocytomas grow very slowly over several years or remains stable, in contrast to malignant melanoma. Although ODM tends to have benign behavior, it may adversely affect visual function. Yearly fundus examination is necessary for monitoring growth and detecting malignant transformation. Visual loss can result from optic neuropathy or retinal vascular obstruction. In suspicious cases, close follow-up with serial fundus photographs is essential, even though the malignant transformation is exceptional.

* *Corresponding Author:*
Ahmad Ahmadzadeh-Amiri, MD.
Address: *Department of Ophthalmology, Faculty of Medicine, Clinical Research Development Unit of Bu-Ali Sina Hospital, Mazandaran University of Medical Sciences, Sari, Iran.*
Tel: *+98 (11) 33344506*
E-mail: *ahmadzdh@yahoo.com*

1. Introduction

Optic Disk Melanocytoma (ODM) is a rare, deeply pigmented benign variant of nevus that typically occurs on or adjacent to the optic disc. Clinically these patients are usually asymptomatic, and the nevus is characterized as a dark brown to the black lesion with feathery margins in the optic disk (1, 2). ODM may cause compression of the optic nerve or undergo necrosis, leading to ischemic axonal loss and visual field defects, similar to those caused by glaucoma (3-5).

Regarding the clinical presentation and vision, life-threatening melanoma represents a critical differential diagnostic challenge because of its subtle clinical similarities with ODM (6, 7). In most cases, ODM has a distinctive clinical appearance with no tendency to grow (8). However, a delicate extension may occur in 10-15% of cases during several years, and malignant transformation is considered in about 5% of cases (3, 9). Supplementary imaging procedures, such as fundus photography, short-wave autofluorescence, fluorescein angiography, and optical coherence tomography, are essential for the management and follow-up evaluations of melanocytoma (10, 11). Optical coherence tomography angiography, as a newly advanced procedure, can provide more information on optic disc perfusion than conventional angiography in ODM cases (5). As a case of ODM can imitate life-threatening melanoma and elicit a real diagnostic dilemma that bears serious clinical implications, in the current case report, we aimed to present the clinical and imaging finding in an eye with stable large unilateral ODM.

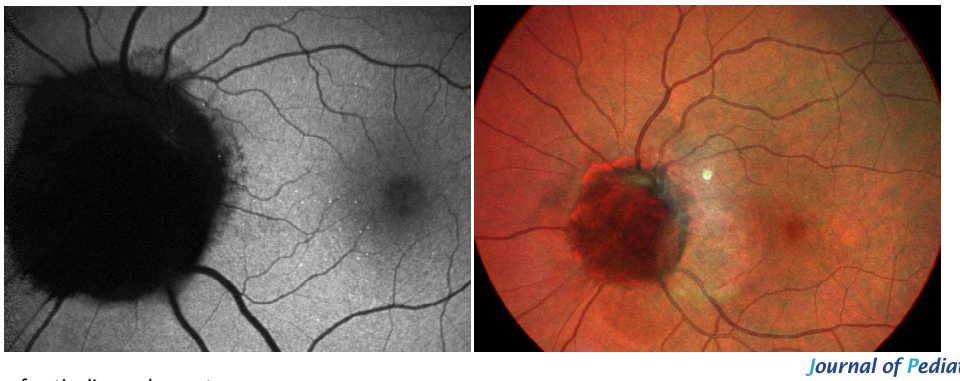
2. Case Presentation

A 19-year-old Iranian female initially presented with a known decrease in vision in the left eye for about 3 months. She underwent a detailed ophthalmic examination. The best-corrected visual acuity in her right and left eyes was 20/20 and 20/80, respectively. The pupillary examination was within the normal range in both eyes. The anterior segment findings and intraocular pressures were unremarkable in both eyes. Funduscopic examination of the left eye disclosed a well-defined densely pigmented brownish-black, dome-shaped nodular mass encompassing the entire optic disc with the normal-appearing overlying vitreous, macula, and surrounding retina (Figure 1). However, the right eye ophthalmoscopy was within normal limits. Short-Wave Autofluorescence (SW-AF) using the Heidelberg Retinal Angiography (HRA), available as the Heidelberg Spectralis, revealed hypo-autofluorescence corresponding to the pigmented masses on the optic disk. Fluorescein angiography displayed a hypofluorescent mass in both early and late phases with fine leaking from retinal telangiectasia on the tumor surface. The visual field examination exhibited blind spot enlargement. Clinically, the lesion was diagnosed as ODM. This case was followed up for over 2 years; there were no significant changes in her ocular condition.

3. Discussion and Review of Literature

Melanocytoma of the optic disc is a static tumor often found in an incidental routine ophthalmic evaluation. These lesions are frequently unilateral with a little preference to affect visual acuity. Central vision is normal in more than 70% of the cases (12). They have been reported to occur commonly in the sixth decade of life with a propensity for females (13). Our case demonstrates a significant clinical finding in early life with a mild decrease in visual acuity. ODM is a benign, slow-growing tumor that generally does not affect visual acuity.

Nevertheless, in the current case, compression by ODM may result in ischemic axonal loss, which may cause a clinically decrease in visual acuity. Although in the present case, visual acuity reduced recently, imaging findings failed to document critical tumor-related vision loss as mentioned above; also, over 2 years of follow-up support melanocytoma stability. ODM usually has a characteristic ophthalmoscopic feature of densely pigmented mass overlying the optic disc that may extend for a variable distance into the adjacent retina (12). The risk factors for visual loss rise if the patient experiences complications, including ischemic optic neuropathy associated with tumor necrosis, retinal vein occlusion, juxtapapillary choroidal neovascularization, or on rare occasions, malignant transformation into melanoma (12, 13). Various degrees of visual field defects can be seen in ODM consisting of an enlargement of the blind spot or substantial visual field deterioration. Also, visual field defects are present at the first visit in 80% of the cases (14). Besides, SW-AF, a noninvasive procedure according to excited endogenous lipofuscin by an exterior blue light in retinal pigment epithelium, is demonstrated to be useful for determining ODM. Guerra et al. reported that ODM becomes apparent as a prominent hypo-SW-AF lesion, and the adjacent retina was iso-autofluorescent (11). At the same time, Reznicek et al. reported that melanoma has distinct and luminous hyper-SW-AF for overlying cellular lipofuscin (15, 16). Although in most melanomas, the lesions are constant,



Journal of Pediatrics Review

Figure 1. Images of optic disc melanocytoma

Rright: Color fundus photograph shows melanocytoma presenting as an elevated brownish-black pigmented lesion, involving most of the optic disc and adjacent retina in left eye; Left: Short-wave autofluorescence image, the melanocytoma reveals hypo-autofluorescence corresponding to the pigmented masses and adjacent retina.

Table 1. Reviewed literature of published cases of complicated ODM with their respective significant comments

Authors	Publication Year	Study Design	Complication (s)	Comments
Takahashi (17)	1979	Two case reports	Malignant transformation	Escalating pigmentation, progressive visual loss, and the leakage in the fluorescein angiogram detected in malignant transformation.
Juarez et al. (18)	1980	Five case report		Light and electron microscopy of five melanocytomas from four patients confirmed the malignant change.
Shield et al. (19)	1990	Case report		Histopathology features of malignant melanoma developing in conjunction with a lesion that possessed typical clinical manifestation of an ODM.
Archdale & Magnus (20)	1993	Two case reports		Two cases of ODM whose visual function was significantly affected by malignant transformation.
De Potter et al. (6)	1996	Case report		Abruptly severe visual loss after 5 years that showed malignant transformation.
Meyer et al. (21)	1999	Case report		Fourfold tumor enlargement and vision loss after a 5-year period was a sign of transformation to malignant melanoma.
Shields et al. (1)	2004	Cases series		Although related visual loss occurred in 18% of 115 patients after 10 years and minor tumor enlargement occurred in 11% of patients after 5 years, and in 32% of patients after 10 years, the malignant transformation was documented in 2 patients (2%).
Shukla et al. (9)	2012	Case report		Transformation of ODM into melanoma can occur over 33 years.
Salinas-La Rosa (22)	2017	Case report		Malignant transformation of ODM into melanoma associated with the ocular ischemic syndrome and oculocardiac reflex.
Baartman et al. (23)	2019	Case report		Severe vision loss raise concern for malignant transformation as it provides higher resolution optic nerve images by 7-T magnetic resonance imaging.
Yamaguchi et al. (24)	1987	Case report	Tumor necrosis	Scattered pigment dispersion in the vitreous caused by the necrosis of the melanocytoma in an eye with ODM.
Lauritzen et al. (25)	1990	Case report		Tumor necrosis was the possible mechanisms responsible for seeding extracellular pigment or melanin-containing macrophages into the overlying vitreous.
Shields et al. (26)	2001	Case report		Abrupt visual loss in a patient with a melanocytoma does not necessarily imply malignant transformation with central retinal vascular obstruction.
Font & Chaqués-Alepuz (27)	2011	Case report		Vitreous seeding due to tumor necrosis with the dissemination of tumor debris and melanin produced an inflammatory reaction, trabecular plugging, and ocular hypertension.
Mazzuca et al. (28)	2012	Case report		Progressive retinal invasion and vitreous seeding from ODM.
Rishi & Venkatesh (29)	2012	Case report		Rapid visual loss and retinal vascular occlusion associated with ODM caused by tumor necrosis.
Ackuaku-Dogbe et al. (30)	2013	Case report		Report a case of necrotic melanocytoma in association with polycystic liver disease and peripheral neurofibromatosis.
Guo et al. (31)	2014	Case report		A 17-year-old man with ODM underwent spontaneous rupture and seeding of the vitreous with pigmented cells.
Asorey-García et al. (32)	2015	Case report		ODM may present with significant complications leading to significant visual loss.
Agarwal et al. (33)	2005	Case report		Necrotic melanocytoma of the optic disc with central retinal vascular obstruction.

Authors	Publication Year	Study Design	Complication (s)	Comments
Gupta et al. (34)	1995	Case report	ODM progressive mass enlargement without malignant transformation	A clinically typical melanocytoma that grew progressively for 6 years without any document of malignancy.
Takahashi et al. (35)	1984	Case report	Retinal arterial obstruction	Central retinal artery occlusion occurred in ODM with vision deteriorated to blindness.
Usui et al. (36)	1990	Cases series	Ischemic optic neuropathy	Sudden loss of visual acuity occurred, presumably due to anterior ischemic optic neuropathy induced by melanocytoma in one patient.
Tran et al. (37)	2006	Case report	Choroidal neovascular membrane	Submacular surgery is potentially treatable for large choroidal neovascular membrane associated with ODM.
Guirou et al. (38)	2018	Case report		Melanocytoma of the optic disc complicated by neovascularization
Urrets-Zavalia et al. (39)	2015	Case report		Intravitreal bevacizumab was influential in the treatment of choroidal neovascular membrane neovascularization and edema, complicating ODM.
Rouvas et al. (40)	2018	Case report		ODM coexisting in conjunction with polypoidal choroidal vasculopathy, promising treatment with PDT combined with intravitreal aflibercept injections.
Kamisasanuk et al. (41)	2012	Case report		Intravitreal bevacizumab can be a beneficial treatment for copy-number variation associated with ODM.
Thanos et al. (42)		Case report		Severe vision loss with optic disc neovascularization after hemiretinal vascular obstruction associated with ODM.
García-Arumí et al. (43)	1994	Case report	ODM associated with neuroretinitis	Leber's neuroretinitis associated with ODM should be included in the differential diagnosis of neuroretinitis.
Besada et al. (44)	2002	Case report	Compressive optic neuropathy	A case report highlighting the potential impact of ODM on optic nerve head anatomy that can lead to subtle changes in the visual fields in a monocular patient.
Demirci et al. (45)	2003	Case report	Bilaterally in infancy	Bilateral ODM may be associated with optic disc hypoplasia and central nervous system abnormalities such as meningioma and hypopituitarism.

ODM: Optic Disc Melanocytoma; PDT: Photodynamic Therapy.

Journal of Pediatrics Review

subtle enlargement and malignant transformation have been described (15). Hence close follow-up is necessary to ascertain its benign growth.

Pathologically, ODM is a benign hamartoma, built up highly pigmented round to oval nevus cells comprising giant round cytoplasmic melanosomes with sparse cytoplasmic organelles (13). Although the tumor grows slowly with little tendency to melanoma formation, vision-threatening complications rarely occur because of its growth, compression, tumor necrosis, and malignant transformation.

According to previous reports, an increase in tumor thickness can be a marker of malignant transformation of melanocytoma, imply melanoma development after a few years of the initial appearance (1-9). Other concerns are developing vitreous seeding and vision disturbance. Although widely optic nerve tumor involvement with decreased vision can suggest malignant transformation, ischemic tumor necrosis may occur in benign melanocytoma (12). Fine enlargement has been found over the extent of several years in 10–15% of cases, but a malignant transformation is estimated to occur in 1–2% of cases (1, 43). Some of the complicated ODM with their respective publisher findings are listed in Table 1. In conclusion, cases with ODM need yearly follow-up to detect earlier complications with photographic documentation.

Ethical Considerations

Compliance with ethical guidelines

Informed consent was obtained from the human subject of this study.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Authors contributions

All authors contributed to preparing this article.

Conflicts of interest

The authors declared no conflict of interest.

Acknowledgements

The authors would like to acknowledge the staff of Clinical Research Development Unit of Sari Bu-Ali Sina Hospital

References

1. Shields JA, Demirci H, Mashayekhi A, Shields CL. Melanocytoma of optic disc in 115 cases: The 2004 Samuel Johnson Memorial Lecture, part 1. Ophthalmology; 2004; 11(9):1739-46. [DOI:10.1016/S0161-6420(04)00543-3]

2. Eldaly H, Eldaly Z. Melanocytoma of the optic nerve head, thirty-month follow-up. In Seminars in Ophthalmology 2015; 30(5-6):464-9. [DOI:10.3109/08820538.2013.874485] [PMID]

3. Punjabi OS, Lin CF, Chung HS, Gill MK. Melanocytoma of the optic disc associated with visual field defects: Clinical features and imaging characteristics. Ophthalmic Surgery, Lasers and Imaging Retina. 2011; 42:e75-e80 [DOI:10.3928/15428877-20110804-06] [PMID]

4. Rai S, Medeiros FA, Levi L, Weinreb R N. Optic disc melanocytoma and glaucoma. Semin Ophthalmol. 2007; 22(3):147-150. [DOI:10.1080/08820530701457209] [PMID]

5. Kita Y, Holló G, Murai A, Kita R, Hirakata A. Optical coherence tomography angiography findings of an optic disc melanocytoma in a glaucoma eye. International Ophthalmology. 2019; 39(3):677-682. [DOI:10.1007/s10792-018-0839-9] [PMID]

6. De Potter P, Shields CL, Eagle RC, Shields JA, Lipkowitz JL. Malignant melanoma of the optic nerve. Archives of Ophthalmology. 1996; 114(5):608-12. [DOI:10.1001/archopht.1996.01100130600020] [PMID]

7. Erzurum S, Lee J, Territo C, O'Grady R. Primary malignant melanoma simulating a melanocytoma optic nerve. Archives of Ophthalmology; 1992; 110:684-6. [DOI:10.1001/archopht.1992.01080170106034] [PMID]

8. Krohn J, Kjersem B. Stereo fundus photography in the diagnosis of optic disc melanocytoma. Acta Ophthalmologica. 2011; 89(6):e533-e534 [DOI:10.1111/j.1755-3768.2010.02049.x] [PMID]

9. Shukla SY, Shields JA, Eagle RC, Shields CL. Transformation of optic disc melanocytoma into melanoma over 33 years. Archives of Ophthalmology. 2012; 130(10):1344-7. [DOI:10.1001/archophthalmol.2012.740] [PMID]

10. Mohmad Z, Kah TA, Yong KC, Halim WH, Yong TK. Melanocytoma of the optic nerve head-a diagnostic dilemma. Clinics and Practice. 2011; 1(3):123-5. [DOI:10.4081/cp.2011.e60] [PMID] [PMCID]

11. Guerra RL, Marback EF, Silva IS, Maia Jr OD, Marback RL. Autofluorescence and spectral-domain optical coherence tomography of optic disk melanocytoma. Arquivos Brasileiros de Oftalmologia. 2014; 77(6):400-2. [DOI:10.5935/0004-2749.20140100] [PMID]

12. Shields JA, Demirci H, Mashayekhi A, Eagle RC, Shields CL. Melanocytoma of the optic disk: A review. Survey of ophthalmology. 2006; 51:93-104. [DOI:10.1016/j.survophthal.2005.12.011] [PMID]

13. Zimmerman LE, Garron LK. Melanocytoma of the optic disc. International Ophthalmology Clinics. 1962; 2(2):431-40.[DOI:10.1097/00004397-196206000-00010]

14. Al-Rashaed S, Abboud EB, Nowilaty SR. Characteristics of optic disc melanocytomas presenting with visual dysfunction. Middle East African Journal of Ophthalmology. 2010; 17(3):242-5. [DOI:10.4103/0974-9233.65488] [PMID] [PMCID]

15. Zhang CF, Dong FT, Chen YX, Du H, Han BL. Clinical manifestation and follow-up of melanocytoma of the optic disc. [Zhonghua yan ke za zhi] Chinese Journal of Ophthalmology. 2009; 45(4):296-300. [PMID]

16. Reznicek L, Stumpf C, Seidensticker F, Kampik A, Neubauer AS, Kernt M. Role of wide-field autofluorescence imaging and scanning laser ophthalmoscopy in differentiation of choroidal pigmented lesions. International Journal of Ophthalmology. 2014; 7(4):697-703. [PMCID] [PMID]

17. Takahashi T. Clinicopathological findings of melanocytomas on the optic disc (author's transl). Klinische Monatsblatter fur Augenheilkunde. 1979; 175(1):47-55. [PMID]

18. Juarez CP, Tso MO. An ultrastructural study of melanocytomas (magnocellular nevi) of the optic disk and uvea. American Journal of Ophthalmology. 1980; 90(1):48-62. [DOI:10.1016/S0002-9394(14)75076-7]

19. Shields JA, Shields CL, Eagle RC Jr, Lieb WE, Stern S. Malignant melanoma associated with melanocytoma of the optic disc. Ophthalmology. 1990; 97(2):225-30. [DOI:10.1016/S0161-6420(90)32601-5]

20. Archdale TW, Magnus DE. Melanocytoma of the optic disc. Journal of the American Optometric Association. 1993; 64(2):98-103. https://europepmc.org/article/med/8436802

21. Meyer D, Ge J, Blinder KJ, Sinard J, Xu S. Malignant transformation of an optic disk melanocytoma. American Journal of Ophthalmology. 1999; 127(6):710-4. [DOI:10.1016/S0002-9394(99)00065-3]

22. Salinas-La Rosa CM. Malignant transformation of optic nerve melanocytoma into melanoma associated with ocular ischemic syndrome and oculo cardiac reflex: Case report and review of the literature. Seminars in Ophthalmology. 2017; 32(2):253-6. [DOI:10.3109/08820538.2015.1046558] [PMID]

23. Baartman BJ, Ahmad B, Srivastava S, Jones S, Singh AD. Melanocytoma or juxta papillary melanoma? Retinal Cases and Brief Reports. 2019; 13(1):15-17. [DOI:10.1097/ICB.0000000000000520] [PMID]

24. Yamaguchi K, Shiono T, Mizuno K. Pigment deposition in the anterior segment caused by melanocytoma of the optic disc. Ophthalmologica. 1987; 194(4):191-3. [DOI:10.1159/000309764] [PMID]

25. Lauritzen K, Augsburger JJ, Timmes J. Vitreous seeding associated with melanocytoma of the optic disc. Retina. 1990; 10(1):60-2. [DOI:10.1097/00006982-199010010-00011] [PMID]

26. Shields JA, Shields CL, Eagle RC Jr, Singh AD, Berrocal MH, Berrocal JA. Central retinal vascular obstruction secondary to melanocytoma of the optic disc. Arch Ophthalmol. 2001; 119(1):129-33. [DOI:10-1001/pubs.Ophthalmol]

27. Font RL, Chaqués-Alepuz V. Giant optic disk melanocytoma complicated with massive intraocular seeding. Archivos de la Sociedad Española de Oftalmología. 2011; 86(5):158-61. [DOI:10.1016/j.oftal.2010.10.011] [PMID]

28. Mazzuca Jr DE, Shields CL, Sinha N, Bianciotto CG, Fox G, Shields JA. Progressive retinal invasion and vitreous seeding from optic disc melanocytoma. Clinical & Experimental Ophthalmology. 2012; 40(1):e123-5. [DOI:10.1111/j.1442-9071.2011.02720.x] [PMID]

29. Rishi P, Venkatesh R. Central retinal artery occlusion secondary to optic disk melanocytoma. Retinal Cases and Brief Reports. 2012; 6(2):212-5. [DOI:10.1097/ICB.0b013e318234cd05] [PMID]

30. Ackuaku-Dogbe EM, Osei-Kontoh G, Alford AM. Necrotic melanocytoma associated with polycystic liver disease and cutaneous neurofribomata. Journal of the West African College of Surgeons. 2013; 3(4):92-3. [PMCID] [PMID]

31. Guo H, Li Y, Chen Z, Guo X. Vitreous seeding from a large optic disc melanocytoma. Journal of Neuro-Ophthalmology. 2014; 34(3):276-7. [DOI:10.1097/WNO.0000000000000134] [PMID]

32. Asorey-García A, Méndez-Hernández CD, Santos-Bueso E, García-Feijoo J. Pigment dispersion syndrome associated with optic nerve melanocytoma. Archivos de la Sociedad Española de Oftalmología. 2015; 90(10):484-6. [DOI:10.1016/j.oftal.2015.04.005] [PMID]

33. Agarwal S, Shanmugam MP, Gopal L, Krishnakumar S, Biswas J. Necrotic melanocytoma of the optic disk with central retinal vascular obstruction. Retina. 2005; 25(3):364-7. [DOI:10.1097/00006982-200504000-00019] [PMID]

34. Gupta V, Gupta A, Dogra MR, Pandav SS. Progressive growth in melanocytoma of the optic nerve head. Indian Journal of Ophthalmology. 1995; 43(4):198-200. [PMID]

35. Takahashi T, Isayama Y, Okuzawa I. Unusual case of melanocytoma in optic disk. Japanese Journal of Ophthalmology. 1984; 28(2):171-5. [PMID]

36. Usui T, Shirakashi M, Kurosawa A, Abe H, Iwata K. Visual disturbance in patients with melanocytoma of the optic disk. Ophthalmologica. 1990; 201(2):92-8. [DOI:10.1159/000310133] [PMID]

37. Tran H V, Bovey E H, Uffer S, Zografos L. Peripapillary choroidal neovascularization associated with melanocytoma of the optic disc: A clinicopathologic case report. Graefe's Archive for Clinical and Experimental Ophthalmology. 2006; 244(10):1367-9. [DOI:10.1007/s00417-006-0270-1] [PMID]

38. Guirou N, Napo A, Yakoura K A, Sylla F, Saye G, Traoré L, et al. Melanocytoma of the optic disc complicated by neovascularization. Journal Français D'Ophtalmologie. 2018; 41(5):e191-e192. [DOI:10.1016/j.jfo.2017.08.025] [PMID]

39. Urrets-Zavalia J A, Crim N, Esposito E, Correa L, Gonzalez-Castellanos M E, Martinez D. Bevacizumab for the treatment of a complicated posterior melanocytoma. Clinical Ophthalmology. 2015; 9:455-9. [DOI:10.2147/OPTH.S80152] [PMID] [PMCID]

40. Rouvas A, Gouliopoulos N S, Moschos M M, Theodossiadis P. Optic disk melanocytoma associated with polypoidal choroidal vasculopathy lesions, after combination treatment of photodynamic therapy and intavitreal aflibercept (Eylea), a case report. BMC Ophthalmol. 2018; 18(1):1-6. [DOI:10.1186/s12886-018-0927-7] [PMID] [PMCID]

41. Kamisasanuk T, Uchino E, Sakamoto T. Choroidal neovascularization of optic disk melanocytoma treated with bevacizumab. European Journal of Ophthalmology. 2012; 22(3):503-5. [DOI:10.5301/ejo.5000060] [PMID]

42. Thanos A, Gilbert AL, Gragoudas ES. Severe vision loss with optic disc neovascularization after hemiretinal vascular obstruction associated with optic disc melanocytoma. JAMA Ophthalmol. 2015; 133(10):e151502. [DOI:10.1001/jamaophthalmol.2015.1502] [PMID]

43. García-Arumí J, Salvador F, Corcostegui B, Mateo C. Neuroretinitis associated with melanocytoma of the optic disk. Retina. 1994; 14(2):173-6. [DOI:10.1097/00006982-199414020-00012] [PMID]

44. Besada E, Shechtman D, Barr RD. Melanocytoma inducing compressive optic neuropathy: The ocular morbidity potential of an otherwise invariably benign lesion. Optometry. 2002; 73(1):33-8. [PMID]

45. Demirci H, Shields CL, Shields J A. Bilateral optic disk melanocytoma in a 10-month-old infant. American Journal of Ophthalmology. 2003; 136(1):190-2. [DOI:10.1016/S0002-9394(03)00088-6]