Norhayaty S[1,2], Nurul-Dalila MS[3], Evelyn-Tai LM[1,2], Liza-Sharmini AT[1,2], Zunaina E[1,2], Azhany Y[1,2,*]

[1]Department of Ophthalmology, School of Medical Sciences, Health Campus, Universiti Sains Malaysia, 16150 Kubang Kerian, Kelantan, Malaysia.
[2]Hospital Universiti Sains Malaysia,16150 Kubang Kerian, Kelantan, Malaysia.
[3]Hospital Raja Perempuan Zainab II, 15100 Kota Bharu, Kelantan, Malaysia.

Retinitis punctata albescens presenting with tunnel vision: Diagnostic dilemmas

***Abstract*— Tunnel vision is a classic sign among patients with advanced glaucoma. However, other conditions such as retinitis pigmentosa, optic neuritis and rod-cone dystrophy may be characterized by similar visual field defects. A 52-year-old lady with a family history of glaucoma presented with bilateral gradual loss of peripheral vision for two years. She claimed to have poor night vision about 20 years prior to this presentation. Her visual acuity was 6/7.5 in both eyes. The anterior chamber depth was moderate bilaterally, with Schaffer grading on gonioscopy of grade I to II. The intraocular pressure was 14 mmHg in both eyes. The optic discs appeared normal. Fundus examination showed scattered hypopigmented changes sparing the fovea. Humphrey visual field test revealed bilateral constricted visual fields. She was diagnosed with retinitis punctata albescens (RPA) based on her symptom of poor night vision, supported by the diffuse hypopigmented changes in her fundi. The management of this condition involves careful counselling regarding the genetic nature of the disease and its progressive course. We discuss this case to illustrate the importance of a thorough history taking and careful fundus examination in the workup of patients presenting with tunnel vision.**

Received 24 Jan 2017.
Revised 08 March 2017.
Accepted 03 April 2017.
Published Online 01 June 2017

*Corresponding author:
Azhany Yaakub
E-mail: azhany@usm.my

***Keywords* — Tunnel vision, retinitis punctata albescens, fundus albipunctatus, glaucoma, retinitis pigmentosa**

1 INTRODUCTION

Tunnel vision, defined as constriction of the visual field resulting in loss of peripheral vision**,** is a sign which, although classically associated with advanced glaucoma, may be present in a variety of other conditions [1]. Some lesser known associations of tunnel vision are retinitis pigmentosa [2], brain tumors [3], optic neuropathy [4] and perchloroethylene toxicity [5]. We highlight the case of a lady with retinitis punctata albescens (RPA) who presented with symptoms mimicking end-stage glaucoma.

2 CASE REPORT

A 52-year-old lady presented with the complaint of bilateral gradual loss of peripheral vision for two years. Her vision worsened dramatically over the past one year, resulting in impairment of her daily activities. She had poor night vision since about twenty years prior to this presentation. Her elder sister was previously diagnosed with angle closure glaucoma, and had undergone both laser and glaucoma surgery. She denied any symptoms suggestive of high intraocular pressure such as eye pain or headache. She had no family history of night blindness or parental consanguinity.

Ocular examination revealed a best corrected visual acuity of 6/7.5 in both eyes. The anterior segment of both eyes were normal except for the anterior chamber depths, which were moderate based on Van Herick asssessment. Schaffer grading on gonioscopy was grade I to II bilaterally. Intraocular pressure was 14 mmHg bilaterally. Fundoscopy revealed pink, non-glaucomatous optic discs, with a vertical cup-to-disc ratio of 0.3 bilaterally. There were scattered hypopigmented changes (white spots) in all 4 retinal quadrants, sparing the foveal area (Figure 1), with no retinal vessel attenuation. Humphrey visual field 10-2 analysis showed constricted visual fields bilaterally, sparing only the central field (tunnel vision) (Figure 2).

A diagnosis of RPA was made based on her symptom of poor night vision, supported by the diffuse hypopigmented changes in her fundi. Presence of progressive peripheral visual field loss excludes the diagnosis of fundus albipunctatus. A pedigree chart of her family was

drawn and her family members were advised to undergo ocular genetics screening. She was counselled regarding the complications of the disease, including cataract, and advised to avoid ultraviolet radiation exposure by wearing sunglasses outdoors. She was given a follow up date for optical coherence tomography and electroretinogram (ERG), to look for reduction in scotopic and photopic responses. Unfortunately, she defaulted.

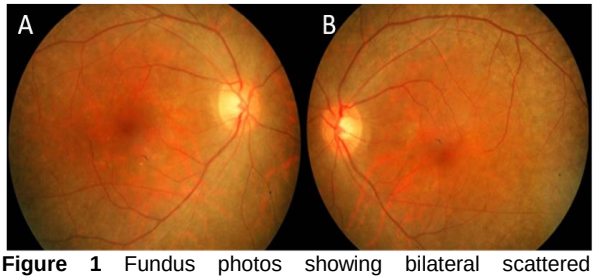

Figure 1 Fundus photos showing bilateral scattered hypopigmented changes in all 4 retinal quadrants with foveal sparing. (A) right eye, (B) left eye.

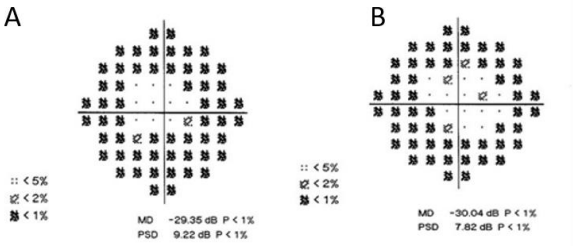

Figure 2 Humphrey visual field SITA-standard 10-2 analysis showing constricted visual fields bilaterally, also called tunnel vision. (A) right eye, (B) left eye.

3 DISCUSSION

RPA is a rare variant of retinitis pigmentosa characterised by glistening white spots in the fundus. It has been postulated to be linked to mutations in the gene encoding cellular retinaldehyde-binding protein 1, similar to retinitis pigmentosa [6, 7]. RPA is genetically heterogeneous, caused by defects in the retinal degeneration slow gene on chromosome 6p [8], in the rhodopsin gene on chromosome 3 [9] or in rd6 on chromosome 11q23 [10]. RPA and another condition, fundus albipunctatus, may have similar clinical presentation [11]; however, they may be differentiated based on various features as listed in Table I.

This case illustrates a patient with RPA who presented with clinical features mimicking glaucoma. Classic retinitis pigmentosa tends to be associated with tunnel vision in late stages, due to photoreceptor degeneration [2, 12, 13]. In glaucoma, although a similar visual field deficit may occur, the underlying cause is optic nerve damage, with loss of retinal ganglion cells [14-16]. Both these conditions may affect a similar age group; thus, clinical history alone could lead to a misdiagnosis [17].

In this case, a strong family history of angle-closure glaucoma and gonioscopy findings of a narrow angle made the diagnosis of glaucoma highly probable. Retinitis pigmentosa is usually associated with secondary open angle glaucoma; only in 1% of cases is retinitis pigmentosa associated with secondary angle closure glaucoma [18]. Fundus examination is essential to differentiate these conditions. Additional symptoms, such as presence of early-onset night blindness, also support the diagnosis of retinitis pigmentosa. It is essential to obtain a thorough drug history, as application of certain medications, such as pilocarpine, may induce symptoms of night-blindness [19].

As this genetic condition is irreversible and progressive, the visual prognosis is generally poor. In most cases, there is no treatment for this condition. However, specific disease subtypes have shown response to gene therapy and 9-*cis*-retinoids [20-23]. The clinician's role is to impart realistic expectations to the patient regarding the natural history of the disease and to manage its complications, such as cataract and macular oedema. Genetic counselling is also required, and family members should be screened.

4 CONCLUSIONS

Bilateral tunnel vision and poor night vision in a patient with a hypopigmented fundus should prompt the clinician to consider retinitis pigmentosa. The management of this condition involves careful counselling regarding the genetic nature of the disease and its progressive course.

CONFLICTS OF INTEREST

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

Table I: Differentiating features of retinitis punctata albescens and fundus albipunctatus [11, 24].

Differentiating Features	Retinitis punctata albescens	Fundus albipunctatus
Genetic mutation	Mutations in retinaldehyde-binding protein 1.	Mutations in retinol dehydrogenase 5.
Symptoms	Night blindness begins at 3 to 4 years of age. Progressive loss of peripheral visual fields.	Congenital stationary night blindness. Non-progressive loss of peripheral visual field.
Signs	Scattered whitish-yellow spots, most numerous at the equator and usually sparing the macula. Optic nerve pallor, constriction of retinal vessels, pigment deposits or macular degeneration may be present.	Multiple subtle, tiny, symmetrical yellow–white spots at the posterior pole, sparing the fovea. Retinal blood vessels, optic disc, peripheral fields and visual acuity usually remain normal.
Electroretinogram (ERG)	ERG profiles show a reduced scotopic response and a slight reduction in the amplitude of the photopic responses. Elevated dark adaptation threshold occurs after 45 minutes of dark adaptation.	ERG is variably abnormal; both cones and rods may be affected. Scotopic ERG responses are reduced after a 30–40-min period of dark adaptation, but typically normalise after prolonged dark adaptation.

REFERENCES

[1] Hu CX, Zangalli C, Hsieh M, Gupta L, Williams AL, et al. What do patients with glaucoma see? Visual symptoms reported by patients with glaucoma. *Am J Med Sci*. 2014; 348(5):pp.403-409.

[2] Ivanov I, Vollmer A, Nguyen N, Trauzettel-Klosinski S. Is visual exploration training beneficial in tunnel vision? *Invest Ophthalmol Vis Sci*. 2013A; 54(15):pp.2769.

[3] Schwartz K, Chang HT, Nikolai M, Pernicone J, Rhee S, et al. Treatment of glioma patients with ketogenic diets: report of two cases treated with an IRB-approved energy-restricted ketogenic diet protocol and review of the literature. *Cancer Metab*. 2015; 3(1):pp.1.

[4] Kleinberg TT, Uretsky S, Flanders AE, Bilyk JR, Murchison AP. Black as night. *Surv Ophthalmol.* 2015; 60(3):pp.269-273.

[5] Onofrj M, Thomas A, Pad C, Rotilio D. Optic neuritis with residual tunnel vision in perchloroethylene toxicity. *Clin Toxicol.* 1998; 36(6):pp.603-607.

[6] Fishman GA, Roberts MF, Derlacki DJ, Grimsby JL, Yamamoto H, et al. Novel mutations in the cellular retinaldehyde-binding protein gene (RLBP1) associated with retinitis punctata albescens. *Arch Ophthalmol*. 2004; 122(1):pp.70-75.

[7] Morimura H, Berson EL, Dryja TP. Recessive mutations in the RLBP1 gene encoding cellular retinaldehyde-binding protein in a form of retinitis punctata albescens. *Invest Ophthalmol Vis Sci.* 1999; 40(5):pp.1000-1004.

[8] Kajiwara K, Sandberg MA, Berson EL, Dryja TP. A null mutation in the human peripherin/RDS gene in a family with autosomal dominant retinitis punctata albescens. *Nature Genet*. 1993; 3(3):pp.208-212.

[9] Souied E, Soubrane G, Benlian P, Coscas GJ, Gerber S, et al. Retinitis punctata albescens associated with the Arg135Trp mutation in the rhodopsin gene. *Am J Ophthalmol.* 1996; 121(1):pp.19-25.

[10] Hawes NL, Chang B, Hageman GS, Nusinowitz S, Nishina PM, et al. Retinal degeneration 6 (rd6): a new mouse model for human retinitis punctata albescens. *Invest Ophthalmol Vis Sci.* 2000; 41(10):pp.3149-3157.

[11] Littink KW, van Genderen MM, van Schooneveld MJ, Visser L, Riemslag FC, et al. A homozygous frameshift mutation in LRAT causes retinitis punctata albescens. *Ophthalmol.* 2012; 119(9):pp.1899-1906.

[12] Travis GH. Mechanisms of cell death in the inherited retinal degenerations. *Am J Hum Genet.* 1998; 62(3):pp.503-508.

[13] Hamel C. Retinitis pigmentosa. *Orphanet J Rare Dis.* 2006;1(1):pp.40.

[14] Osborne NN, Melena J, Chidlow G, Wood JP. A hypothesis to explain ganglion cell death caused by vascular insults at the optic nerve head: possible implication for the treatment of glaucoma. *Br J Ophthalmol.* 2001; 85(10):pp.1252-1259.

[15] Quigley HA, Dunkelberger GR, Green WR. Retinal ganglion cell atrophy correlated with automated perimetry in human eyes with glaucoma. *Am J Ophthalmol*. 1989; 107(5):pp.453-464.

[16] Harwerth RS, Carter-Dawson L, Shen F, Smith EL, Crawford M. Ganglion cell losses underlying visual field defects from experimental glaucoma. *Invest Ophthalmol Vis Sci*. 1999; 40(10):pp.2242-2250.

[17] Ofri R, Narfström K. Light at the end of the tunnel? Advances in the understanding and treatment of glaucoma and inherited retinal degeneration. *Vet J.* 2007; 174(1):pp.10-22.

[18] Badeeb O, Trope G, Musarella M. Primary angle closure glaucoma and retinitis pigmentosa. *Acta Ophthalmol.* 1993; 71(6):pp.727-732.

[19] Schiffer H. Comparative study between timolol and pilocarpine in the treatment of open-angle glaucoma (author's transl). *Klin Monbl Augenheilkd*. 1979; 175(1):pp.91-94.

[20] Batten ML, Imanishi Y, Tu DC, Doan T, Zhu L, Pang J, et al. Pharmacological and rAAV gene therapy rescue of visual functions in a blind mouse model of Leber congenital amaurosis. *PLoS Med.* 2005; 2(11):pp.333.

[21] Van Hooser JP, Aleman TS, He Y-G, Cideciyan AV, Kuksa V, et al. Rapid restoration of visual pigment and function with oral retinoid in a mouse model of childhood blindness. *Proc Natl Acad Sci.* 2000; 97(15):pp.8623-8628.

[22] Maeda A, Maeda T, Palczewski K. Improvement in rod and cone function in mouse model of Fundus albipunctatus after pharmacologic treatment with 9-cis-retinal. *Invest Ophthalmol Vis Sci.* 2006; 47(10):pp.4540-4546.

[23] Rotenstreich Y, Harats D, Shaish A, Pras E, Belkin M. Treatment of a retinal dystrophy, fundus albipunctatus, with oral 9-cis-β-carotene. *Br J Ophthalmol*. 2010; 94(5):pp.616-621.

[24] Katsanis N, Shroyer N, Lewis R, Cavender J, Al-Rajhi A, et al. Fundus albipunctatus and retinitis punctata albescens in a pedigree with an R150Q mutation in RLBP1. *Clin Genet.* 2001; 59(6):pp.424-429