Abstract Title
Paravascular Inner Retinal Defects in a Moderate Myope Diagnosed With Glaucoma

Abstract
A myopic patient has an incidental finding of paravascular inner retinal defects OD corresponding to a visual field defect previously diagnosed as glaucomatous. These defects are important to consider as potential confounders in glaucoma management.

I. Case History

• Patient demographics: 71 year old Caucasian male
• Chief complaint: concern for glaucoma
• Ocular history
  o Moderate myopia and presbyopia
  o Moderate normal tension glaucoma OD, low risk glaucoma suspect OS
  o Posterior vitreous detachment OU
  o Cataracts OU
  o Lattice degeneration OS
• Medical history
  o Spondylosis of cervical spine
  o Hiatal hernia
  o Gastroesophageal reflux disease
  o Hypertension
  o Hyperlipidemia
• Medications
  o Hydrochlorothiazide
  o Simvastatin
  o Timolol Maleate 0.5% BID
  o Travoprost Z 0.004% QHS

II. Pertinent Findings

• Initial visit with finding:
  o BCVA 20/25 OD, OS through habitual glasses
  o Intraocular pressure
    ▪ OD: 16 mmHg
    ▪ OS: 14 mmHg
  o Ophthalmoscopy
    ▪ Moderate cup to disc ratio
      • OD: 0.5H/0.55V
      • OS: 0.55
  o Humphrey Visual Field 24-2 SITA Standard
    ▪ OD: progressive superior nasal defect compared to baseline
    ▪ OS: scattered shallow defects inferior nasal, stable to baseline
  o Cirrus High Definition-Optical Coherence Tomography (HD-OCT): Retinal Nerve Fiber Layer and Optic Nerve Head
- OD: abnormal thin superior and inferior quadrants, abnormal thin superior nasal and inferior temporal sectors, stable to baseline
  - Cirrus HD-OCT 5 Line Raster scan oriented at 45 degrees over optic nerve head
    - OD: thick, prominent rim tissue
  - Cirrus HD-OCT 5 Line Raster scan oriented at 41 degrees over optic nerve head and temporal vessels along inferior arcade
    - OD: paravascular inner retinal defects
- Past exam findings
  - Refraction
    - OD: -4.50+1.00x025
    - OS: -4.75+1.25x180

III. Differential Diagnosis
- Primary
  - Moderate normal tension glaucoma OD, low risk glaucoma suspect OS with moderate myopia and confounding paravascular inner retinal defects corresponding to visual field defect right eye
- Others
  - epiretinal membrane, peripapillary retinoschisis, vitreomacular traction, vascular microfolds, paravascular microholes

IV. Diagnosis and Discussion

A paravascular inner retinal defect (PIRD) is a defect in the inner retina along major retinal vessels, most commonly in the temporal quadrant along superior temporal and inferior temporal blood vessels. As defined by Muraoka et. al in his 2015 prospective and observational case series, PIRDs were found to be disconnected from the optic disc and primarily associated with eyes with epiretinal membrane or high myopia, however, patients with glaucoma were excluded in this case series. The use of longitudinal OCT B-scans along the blood vessels revealed fissure-like spaces and cystoid holes in the areas defined as PIRDs. More recently, Hood et. al obtained en face slab images using wide-field swept source OCT scans of exclusively glaucoma patients and suspects and found hyporeflective areas surrounding blood vessels with corresponding circumpapillary holes or fissures on horizontal B-scans. These defects were found in glaucoma patients with and without the additional findings of myopia and epiretinal membrane, and unlike the Muraoka et. al case series, were found near the optic disc in some instances. Due to this differing definition criteria, Hood et. al deemed these retinal fiber layer defects along a blood vessel as paravascular defects (PDs). These results were suggestive of an association of PIRDs/PDs with not only epiretinal membrane and myopia, but also glaucoma. While the mechanism for the development of PIRDs/PDs secondary to glaucoma is unknown, Hood et. al suggested a possible tractional component of axons along blood vessels as progressive nerve fiber layer loss occurs. Review of the available literature reveals variable functional impact of these defects. A recent proposed grading system found progressive likelihood of visual field loss with increased retinal defect severity. Muraoka et. al found a majority of patients with PIRDs to have visual field defects, most commonly Bjerrum scotoma and nasal steps corresponding to PIRDs along temporal arcades. The variable impact of PIRDs/PDs on the visual field is important to be aware of as a potential confounder in glaucoma diagnosis and management.
V. Treatment and Management

In this moderately myopic patient, the recent finding of paravascular inner retinal defects confounds the glaucoma diagnosis and management. The patient’s superior nasal defect has been previously assessed and followed as glaucomatous. However, the incidental finding of PIRDs inferior temporally suggests the retinal defects may be contributory to the visual field defect independent of glaucoma. Based on limited knowledge of the pathophysiology and clinical course of PIRDs in current literature, it is unclear what the relationship is between this myopic patient’s PIRDs in lieu of his glaucoma diagnosis OD. The use of Humphrey Visual Fields and SD-OCT to continue to monitor for any progressive structural and functional changes in relation to the PIRDs as well as glaucoma is crucial to the continued management of this patient.

VI. Conclusion

It is important to consider the presence of PIRDs in glaucoma patients and suspects, particularly in those with significant myopia and epiretinal membrane. The use of SD-OCT to identify PIRD location is clinically important as the retinal finding may contribute to visual field defects in glaucoma patients. Further study of the pathogenesis and progression of PIRDs is necessary to better understand the functional impact over time. Appropriate consideration and diagnosis of PIRD and its potential to confound structural and functional findings will help minimize unnecessary treatment initiation and modification in patients that have or are suspicious for glaucoma.

References

**Residency Affiliation:** VA Palo Alto Health Care System

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**Available Images:**
- Fundus photos OD and OS
- Cirrus HD-OCT Optic Nerve Cube OD and OS
- Cirrus HD-OCT 5 Line Raster OD
- HVF 24-2 SS OD and OS

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