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Idiopathic macular hypoplasia: A report of four cases and refinement of the phenotype of so-called ateliotic macula

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PURPOSE. *To refine the phenotype of idiopathic macular hypoplasia, also referred to as ateliotic macula, by describing a series of cases with this diagnosis.*
METHODS. *A review of the clinical characteristics of four patients as documented in medical records with regard to refractive error, visual acuity, anterior segment examination, retinal findings, and ancillary tests such as electroretinography (ERG).*
RESULTS. *All patients had oval circumscribed or diffuse areas in the posterior pole where the retina appeared not to have developed normally; the fovea was involved in three patients with reduced visual acuity, and one patient had parafoveal lesions with preserved visual acuity. There were three males and one females. Patients' age ranged from 4 to 16 years. Errors of refraction ranged from severe myopia to hypermetropia and mild astigmatism. The anterior segment was normal in all patients. Three patients had strabismus and two had nystagmus. ERG was normal in the one patient in whom it was performed. One patient was mosaic for trisomy of chromosome 9.*
CONCLUSIONS. *The term idiopathic macular hypoplasia can be applied to a spectrum of abnormalities in which a localized area of the posterior pole has a primordial or underdeveloped appearance. Lesions involving the fovea result in poor acuity. Generalized retinal dysfunction is absent. At least one of the genes involved in macular development may be located on chromosome 9. (Eur J Ophthalmol 2006; 16: 741-4)*

KEY WORDS. *Macular hypoplasia, Ateliotic macula, Congenital, Children, Myopia*

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INTRODUCTION

DePool et al used the term ateliotic macula to describe a congenital retinal anomaly characterized by a primordial or unfinished appearance of the macula, congenital vision loss that improves with time in some patients, and evidence in some cases of cone and sometimes rod dysfunction (1). A genetic etiology was not discovered in any of their cases and the diagnosis was predominantly based on the appearance of the macula and the absence of retinal and systemic features associated with other diseases. Pian et al described three patients with paramacular solitary oval football or torpedo-shaped chorioretinal lesions located temporal to the fovea in one or both eyes (2). They postulated that these lesions were congenital in nature and caused by incomplete differentiation of the arcuate axonal bundles along the horizontal raphe during the development of the macular architecture.

We present five patients with clinical features compatible either with a diagnosis of ateliotic macula or with paramacular colobomata, and compare the findings in our patients to those previously reported. We propose the term idiopathic macular hypoplasia to designate this group of anomalies.

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METHODS

The charts of five patients were reviewed and record was made of visual acuity, refractive error, fundus appearance, and anterior segment examination. Because of the small number of patients and the anonymous nature of this chart review, informed consent was not obtained. ERG had been performed on one patient as part of the clinical work-up. Fundus photographs were available on all patients.

RESULTS

The clinical ocular characteristics of the patients are listed in Table I. Additional clinically relevant details in Case 1 include the presence of a hypoplastic left heart syndrome and mosaicism for trisomy 9.

All patients had decreased visual acuity in the affected eyes except Case 4 in whom the lesion was paramacular. All patients also had equal and reactive pupils without an afferent defect, and a normal anterior segment examination. Hypoplastic macular lesions were bilateral in three patients.

ERG was performed in one patient and disclosed normal scotopic and photopic responses. Three patients had strabismus and two had nystagmus. Follow-up was available on Cases 1, 3, and 4, who showed no significant change in the appearance of the macular lesions up to 5 years after diagnosis. Although we do not have long-term follow-up in Case 2 to document stability of vision, we included this patient because we believe this represents the best ophthalmoscopic example of ateliotic macula.

DISCUSSION

All patients in this report have a variable degree of macular hypoplasia. The edges of the hypoplastic area are generally well-outlined, but may not be sharp. A variety of individual abnormalities ranging from a paramacular lesion similar to what had been reported as paramacular coloboma (2) in Case 3 to ill-defined atrophic areas involving the region between the vascular arcades were noted. Associated retinal findings include prominence of choroidal vessels, foveal hypoplasia, and a mild pigmentary disturbance in the underdeveloped area. The abnormalities appear to be congenital and stable as we were able to observe in three patients. Most of our cases were referred for diagnosis of retinal lesions that could not be categorized into

TABLE I - CLINICAL FINDINGS AT LAST EYE EXAMINATION IN FOUR PATIENTS WITH IDIOPATHIC MACULAR HYPOPLASIA

Case	Age,	Sex yr	VA OD VA OS	Refraction	Fundus	ERG
1	9.5	M	20/60 20/40-2	6.5+3.00x130 --3.00+1.00x30	Macular staphylomatous lesions OU, unchanged over 4 years; normal optic nerve head and retinal vasculature OU (Fig. 1)	Not done
2	16	F	20/170 20/20	-6.00+1.5x95 -2.00+0.50x65	Staphylomatous macula with foveal hypoplasia, prominent choroidal vessels OD (Fig. 2); normal fundus OS	Not done
3	8	M	20/20 20/20	+1.00 +1.00	Round, well circumscribed atrophic lesion inferotemporal to the fovea at evel of RPE; mildly excavated with slight pigmentary disturbance OS (Fig. 3)	Not done
4	8	M	20/70 20/80	+0.75+2.00x105 Plano+2.75x85	Round large lesions in macular area OU; unchanged over 5 years; patient with nystagmus since age 4 mo	Not done

VA = Visual acuity; OD = Right eye; OS = Left eye; OU = Both eyes

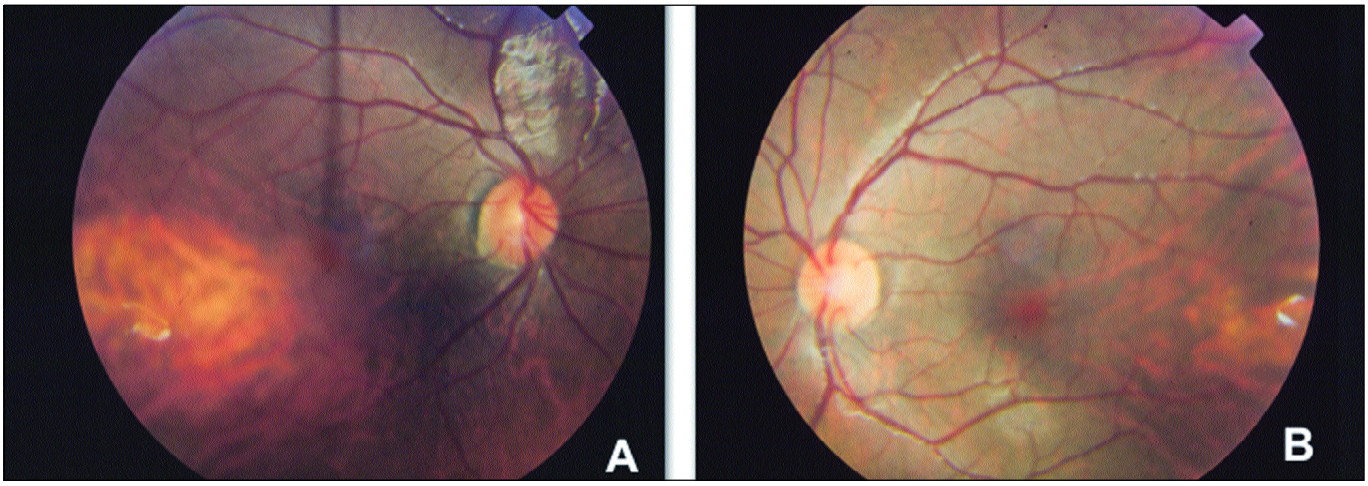

Fig. 1 - *Right* (**A**) *and left* (**B**) *posterior poles of Case 1. The optic nerve heads are normal. Large oval hypoplastic areas are present temporal to the center of the macula in both eyes. The choroidal vessels are more visible in the hypoplastic areas.*

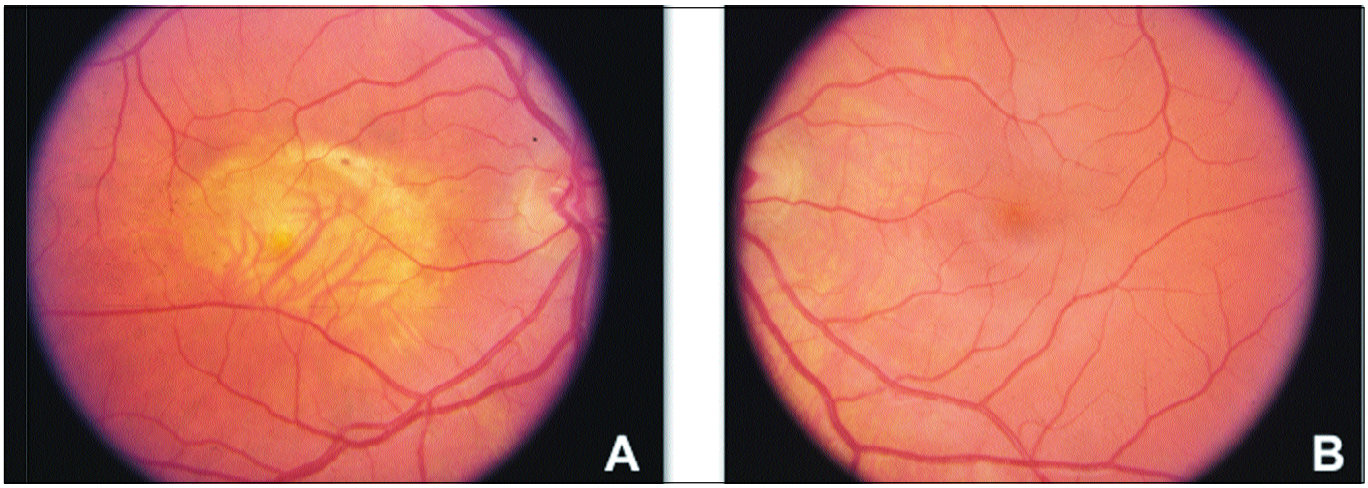

Fig. 2 - *Right fundus of Case 2* (**A**) *has a prominent area of hypoplasia that occupies the whole macula. We believe this represents the best example of idiopathic macular hypoplasia. The left fundus* (**B**) *is normal.*

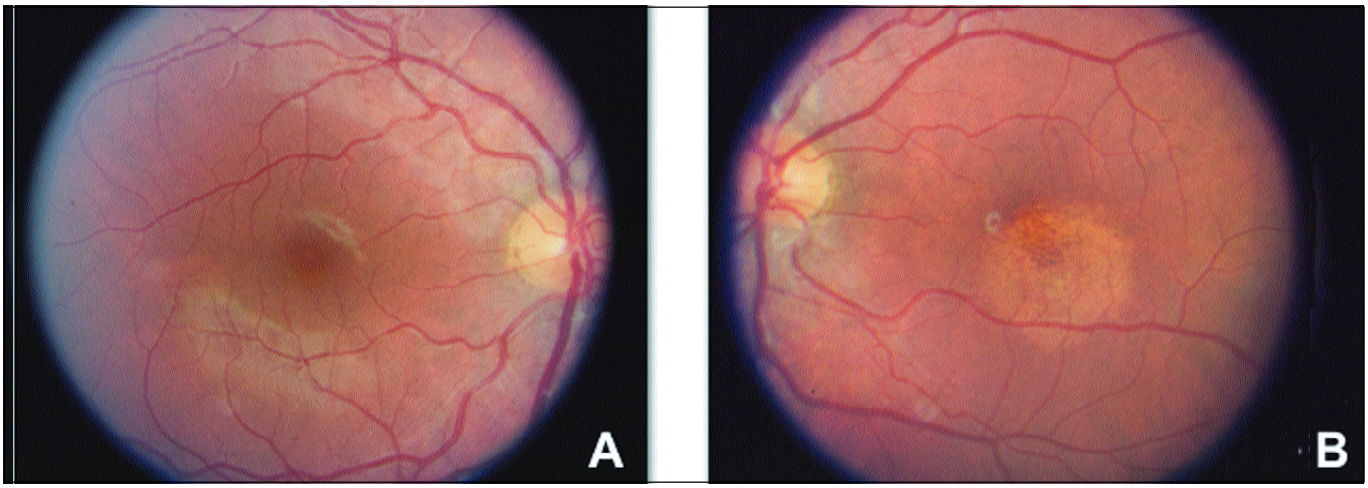

Fig. 3 - *A 2-disc-diameter round area of chorioretinal atrophy with some fine pigment mottling is present inferotemporal to the left fovea* (**B**) *of this patient. The right fundus* (**A**) *is normal.*

specific known disease entities; this was also the case with the series reported by DePool et al (1). One patient was referred because of nystagmus.

Familial cases of idiopathic macular hypoplasia include a large family with autosomal recessive high myopia and a congenital macular anomaly reported by Iqbal and Jalili (3), and another similar but smaller family of Egyptian origin described by DePool et al (1). All other reported cases, including the ones in this report, were isolated, and no inference as to mode of inheritance or underlying genetic mechanisms can be made except in Case 1 of the present report. This patient was mosaic for trisomy 9, indicating the possible location of at least one gene involved in macular development on this chromosome. The possible role of environmental factors in the development of macular hypoplasia is unclear; one patient's mother had gestational diabetes, but we are uncertain about the role of this abnormality in the etiology of the macular hypoplasia.

Our cases are similar in age and visual function to those reported by DePool et al (1). None of our cases had an abnormal anterior segment examination, while one of DePool et al's cases had a Peters' anomaly and another had microcoria. There does not seem to be predilection to the occurrence of a hypoplastic macula in either sex. While there were more females in DePool et al's series, there were more males in our series.

ERG recordings in one of our patients were normal indicating the lack of a generalized retinal dysfunction. There were minor ERG abnormalities in some patients in the other series (1). We concur with DePool et al with respect to the stability of the disease and the possibility of improvement of vision in some patients with age and amblyopia therapy. Longer follow-up is needed to confirm these findings.

Macular hypoplasia, macular coloboma, or foveal hypoplasia can be present in a number of disorders including North Carolina macular dystrophy, progressive bifocal chorioretinal atrophy, Sorsby macular dystrophy, Knobloch syndrome (4), Leber congenital amaurosis, aniridia, and oculocutaneous albinism. We have carefully excluded the above conditions in our patients, mostly on clinical grounds. ERGs were not performed in all patients because they were not deemed to be clinically indispensable.

Retinal photoreceptors develop in a centrifugal fashion starting in the macular area (5). Genes involved in the development of the fovea remain largely unexplored. We did not analyze any of the genes that are known to cause a congenital anomaly of the macula like *CRX* (6). It is possible that the anomalies we have observed are due to reduced density of macular ganglion cells (7). We suspect that our patients represent a genetically heterogeneous group with the common clinical feature of underdevelopment of the macular area. The presence of myopia in some of our cases is not surprising; eyes with congenital poor vision can fail to emmetropize and become significantly myopic. In Case 1, the responsible gene may be involved in the development of other organs, and the macular lesions will be associated with other syndromes.

The clinical recognition of this group of congenital macular abnormalities is essential to the provision of an accurate diagnosis and counseling about prognosis and therapy.

None of the authors has any financial or proprietary interest in this study.

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