Opinion

Cloverleaf geographical atrophy in age-related macular degeneration

Abstract

Age-related macular degeneration (AMD) is a leading cause of visual impairment, with the dry form often progressing to geographic atrophy due to retinal pigment epithelium (RPE) loss. Fundus autofluorescence (FAF) provides a non-invasive window into RPE health and disease progression. We report a 73-year-old man with a gradual, painless visual decline, in whom wide-field FAF revealed a distinctive cloverleaf pattern of hypoautofluorescence corresponding to areas of atrophy, with surrounding reticular changes suggestive of RPE dysfunction. This case highlights the value of FAF in identifying characteristic atrophic patterns and underscores its role in monitoring disease progression in dry AMD in a clinically meaningful and patient-friendly manner

Keywords: ARMD, autofluorescence, geographical atrophy, retinal pigment

Volume 16 Issue 1 - 2026

Charu Gupta, Sandeep Kumar, Daraius Shroff
Shroff Eye Centre, New Delhi, India

Correspondence: Dr Sandeep Kumar, Shroff Eye Centre, A-9, Kailash Colony, New Delhi - 110 048, India
Tel +918287440742

Received: March 23, 2026 | **Published:** April 3, 2026

Abbreviations: AMD, Age-related macular degeneration; RPE, to retinal pigment epithelium; FAF, fundus autofluorescence; cRORA, complete RPE and outer retinal atrophy; iRORA, incomplete RPE and outer retinal atrophy.

Introduction

Age-related macular degeneration (AMD) remains a leading cause of vision loss in the elderly, often progressing silently until significant damage occurs. In its dry form, gradual retinal pigment epithelium dysfunction leads to geographic atrophy. Fundus autofluorescence offers a simple, non-invasive way to visualise and monitor these subtle yet important changes over time.

Main body

Age-related macular degeneration (AMD) remains a leading cause of visual impairment among the elderly. Clinically, it is classified into non-neovascular (dry) and neovascular (wet)forms. While neovascular AMD often presents with rapid visual decline due to choroidal neovascularization, the dry form is characterised by drusen deposition and progressive retinal pigment epithelium (RPE) dysfunction, ultimately leading to geographic atrophy.[1]

Recent advances in imaging-based classification have introduced the concepts of incomplete RPE and outer retinal atrophy (iRORA) and complete RPE and outer retinal atrophy (cRORA),[2] particularly with OCT-based consensus definitions. These stages represent a continuum of degeneration, with cRORA signifying established atrophy involving loss of RPE and photoreceptors, often correlating with significant visual impairment.

Fundus autofluorescence (FAF) has become an indispensable, non-invasive modality in the evaluation of AMD.[3] By capturing intrinsic fluorescence from lipofuscin within the RPE, FAF provides insight into metabolic stress and viability of the RPE. Hyperautofluorescent areas often indicate stressed or dysfunctional cells, whereas hypoautofluorescence reflects established RPE loss and atrophy.

We present a 73-year-old man with gradual, painless blurring of vision in both eyes over one year. Best-corrected visual acuity was LogMAR 0.60 in the right eye and 0.80 in the left eye. Anterior segment findings were unremarkable.

Wide-field FAF imaging (Figures 1A and 1B) revealed a striking cloverleaf pattern of hypoautofluorescence, corresponding to well-demarcated areas of RPE atrophy. Within these regions, increased visibility of underlying choroidal vasculature was noted, consistent with advanced atrophic change. Surrounding the atrophic zones, drusen exhibited a reticular pattern of relatively decreased autofluorescence, indicating heterogeneous RPE dysfunction.

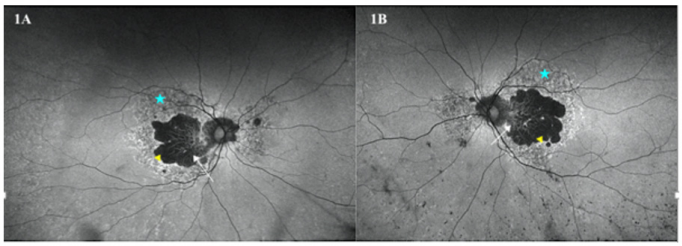

Figure 1 Wide field autofluorescence (Figures 1A &1B) shows a well-demarcated clover leaf pattern (arrowhead) of hypo autofluorescence corresponding to atrophy with choroidal visible vessels(arrow). Reticular pattern(star) of decreased fundus autofluorescence noted in both eyes.

This imaging pattern is characteristic of geographic atrophy (cRORA) in dry AMD. The cloverleaf configuration highlights the irregular and multifocal progression of atrophy,[4] reflecting localised variations in RPE vulnerability. FAF not only delineates the extent of atrophy but also identifies surrounding areas at risk, which may show transitional changes before becoming frankly atrophic.

From a clinical perspective, FAF provides a powerful tool for both diagnosis and longitudinal monitoring. Patients with geographic atrophy often report gradual visual decline, and imaging allows clinicians to objectively track enlargement of atrophic areas. This is particularly relevant in the current era, where emerging therapies for geographic atrophy necessitate precise documentation of disease progression.[5]

Management remains largely supportive, including risk factor modification and nutritional supplementation where appropriate. However, advances in therapeutics targeting complement pathways have renewed interest in early diagnosis and monitoring of atrophic changes.

Conclusion

In conclusion, this case highlights the utility of FAF in visualising distinct patterns of RPE loss in AMD. The cloverleaf configuration represents a visually striking manifestation of geographic atrophy and emphasises the role of FAF in enhancing our understanding of disease morphology and progression.

Acknowledgments

None.

Conflict of interests

No conflicting relationship exists for any author.

Funding

None.

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Citation: GuptaC, Kumar S, Shroff D. Cloverleaf geographical atrophy in age-related macular degeneration. *Adv Ophthalmol Vis Syst.* 2026;16(1):33–34. DOI: 10.15406/aovs.2026.16.00505