Fundus Autofluorescence in Ampiginous Choroiditis

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ABSTRACT: Fundus autofluorescence (FAF) is being increasingly employed in the evaluation of retinal diseases. We report the first description of FAF findings during the natural history of ampiginous choroiditis and correlate these findings to fundus photography, infrared imaging, and cross-sectional optical coherence tomography. In a patient with a 12-month recurring, relapsing course of ampiginous choroiditis, there was a predictable pattern of FAF findings. At the time of presentation with a whitish-yellow, creamy clinical lesion, FAF reveals a diffuse, subtle hyperautofluorescence at the site of activity. As the clinical lesion fades, the FAF takes on a more intense, discrete, coalesced hyperautofluorescence, which decreases and becomes stippled over time, eventually giving way to a patch of hypoautofluorescence at the site of inactivity. Examination over the patient’s long course suggests that FAF evolves predictably during exacerbations and remissions, and the FAF findings reveal activity well after the clinical lesion resolves. FAF is a simple, noninvasive, and effective modality for following the evolution of ampiginous choroiditis.


INTRODUCTION

Ampiginous choroiditis, also known as relentless placoid chorioretinitis, is an inflammatory condition of the retinal pigment epithelium (RPE) and inner choroid distinct from the related conditions of serpiginous choroiditis or acute posterior multifocal placoid pigment epitheliopathy (APMPPE). To date, there is only one report describing fundus autofluorescence (FAF) imaging in ampiginous choroiditis, and it describes the finding at a single snapshot in time, during which the disease was quiescent. We present a case of ampiginous choroiditis with a long, relapsing course in which FAF was well-documented and effectively highlighted the exacerbations and remissions of the disease, helping to guide management.
chronic, unrelenting, recurrent course of inflammations and remissions during which there was a consistent pattern noted on clinical exam and FAF. At the time of symptom onset, there is a clinically evident whitish-yellow lesion. At this time, FAF reveals a subtle, diffuse hyperfluorescence at the site of new activity. Cross-sectional OCT of the active lesion (Figure 3P) reveals reflectance changes of the outer nuclear layer and photoreceptor inner segment/outer segment (IS/OS) junction with irregularity and granularity in the reflectivity from the RPE. Over the course of weeks, this hyperautofluorescence decreases, acquiring a stippled character, until ultimately, all that remains is a patch of hypoautofluorescence at the site of prior activity. On cross-sectional OCT, areas of resolved inflammation exhibit disruption and irregularity of outer retina/RPE, although as seen in Figure 3R, there is partial restoration of the anatomy, including restoration of the IS/OS junction. Infrared (IR) imaging reveals hyperreflectivity in the areas of activity, which also fades slowly over time. However, the IR findings are less discrete and evolve less during the natural course of the disease (Figure 3).

**DISCUSSION**

First described in 2000 by Yanuzzi and colleagues, ampiginous choroiditis (previously termed relentless placoid chorioretinitis) is an inflammatory condition similar but phenotypically distinct from serpiginous choroiditis or APMPPE.\(^1\) Ampiginous choroiditis has a male predominance and generally presents in the 3rd or 4th decade of life.\(^2\) Patients present with painless blurry vision, floaters, or metamorphopsia. Examination reveals creamy white to yellow lesions at the level of the RPE that are usually smaller in size (less than 0.5 disc diameter) than those seen in APMPPE. In contrast to serpiginous choroiditis, the lesions are often bilateral though asymmetric. They may be found both in the posterior pole, and unlike in APMPPE or serpiginous choroiditis, also in the mid- and far periphery. Areas of prior activity exhibit atrophy and pigmentary change.\(^2\) Unlike APMPPE, the disease exhibits a prolonged, relapsing course, often with vision loss, which can be mitigated by steroid or immunosuppressive therapy.\(^1-3\)

Like serpiginous choroiditis and APMPPE, ampiginous choroiditis is an inflammatory condition of the outer retina, RPE, and inner choroid. Fundus autofluorescence (FAF) is an imaging modality that takes advantage of the natural fluorescence of the retina, owing largely to the lipofuscin accumulation within the RPE. As such, it is emerging as a simple, noninvasive means to assess the topography and functional status of the RPE in retinal disease. Case series and case reports have described the FAF signals in serpiginous and APMPPE.\(^4-7\) In a series by Yeh et al, a single patient with ampiginous choroiditis was examined during an inactive phase and exhibited widespread hypoautofluorescence on FAF.\(^4\) There are no prior reports evaluating FAF in patients with active ampiginous choroiditis or evaluating the FAF findings during the natural history of the disease.

We present a case of a 27-year-old woman with ampiginous choroiditis who exhibited a chronic, re-

**Figure 1.** Fundus photograph at time of presentation reveals pigmentary changes involving both the posterior pole and periphery bilaterally, more prominent in the left eye (B) than in the right (A).
curring course over a 12-month period that was documented by fundus photograph, FAF, IR, and OCT imaging. Initially, there is a clinically evident whitish lesion at the level of the RPE, which generally lasts days. In the area of activity, FAF initially reveals a very subtle, diffuse hyperautofluorescence. Within approximately 1 week, by which time the clinical lesion has often faded, this area acquires a more intense, discrete, and coalesced hyperautofluorescence, which over several weeks decreases, becoming a stippled hyperautofluorescence that eventually gives way to a patch of hypoautofluorescence. Quiescent areas with pigmentary change on examination and window defects on FA are, as described by Yeh et al., hypoa autofluorescent on FAF. In our patient, areas that exhibited hyperautofluorescence on FAF corresponded to patches of early hypofluorescence and late hyperfluorescence on FA. IR findings similarly show hyperreflectance during the active phase, which lasts longer than the clinical lesion and slowly fades. Compared to FAF, the IR findings are much less prominent and exhibit less of an evolution over the course of the disease. The FAF features noted in this case of ampiginous choroiditis are similar to those noted previously in APMPPE and serpiginous choroiditis, reflecting the similar pathophysiologic basis of these diseases.

Over the course of its lifetime, each RPE cell phagocytoses over 3 billion photoreceptor outer segments. Among the molecules in the outer segments is a pyridinium bisretinoid, A2E (N-retinyl-N-retinylidene ethanolamine), a byproduct of the retinaldehyde pathway. A2E and other substances compose lipofuscin, which is degraded and cleared by RPE cells. Lipofuscin is a potent fluorophore visualized by FAF. Hypoautofluorescence therefore usually reflects reduced RPE lipofuscin due to RPE or photoreceptor loss or blockage by media opacities, luteal pigment, intra- or subretinal edema or lipid, hemorrhage, or

Figure 2. Three weeks after symptom onset, on June 18, 2011, fundus examination revealed diffuse pigmentary changes bilaterally (A-B) and a subtle area of whitening in the macula of the right eye (A). Fundus autofluorescence exhibited widespread hypoa autofluorescence at the areas of pigmentary change bilaterally (C-D), as well as an area of hyperautofluorescence in the right eye (C). Fluorescein angiography at 20.3 seconds (E), 26.2 seconds (F), 2 minutes, 54.6 seconds (G), and 10 minutes, 43.8 seconds (H), and of the left eye at 40.3 seconds (I) and 10 minutes, 28.3 seconds (J) shows window defects bilaterally. There is early blockage (E-F) and late leakage (G-H) in the area of new activity.
Figure 3. On January 25, 2012, 2 days after onset of new symptoms in the right eye, fundus photography revealed two new white lesions at the inferior macula and below the fovea (A, yellow arrows). Fundus autofluorescence (FAF) revealed a subtle diffuse hyperautofluorescence in the area of new activity (B, yellow arrows). There was widespread hypoautofluorescence in areas of inactivity (B), as well as stippled hyperautofluorescence in areas of resolving prior activity (B, red arrow). Infrared (IR) photography showed a subtle hyperreflectivity at both sites (C, yellow arrows). One month later, on March 2, 2012, the clinical lesions had resolved (D), and FAF showed a smaller, more intense and discrete patch of hyperautofluorescence in this area (E, yellow arrows). IR exhibited less hyperreflectivity than previously (F, yellow arrows). On May 7, 2012, clinical exam revealed a new area of activity (G, yellow arrow) corresponding on FAF to a subtle, new, diffuse area of hyperautofluorescence (H, yellow arrow) and an area of hyperreflectivity on IR (I, yellow arrow). The clinical lesions had resolved by May 18, 2012 (J, yellow arrow), but FAF (K, yellow arrow) revealed intense, coalesced hyperautofluorescence. IR also revealed increased hyperreflectivity compared to May 7, 2012 (L, yellow arrow). The clinical findings remained stable 3 weeks later on June 8, 2012 (M). There was markedly decreased hyperautofluorescence on FAF (N, yellow arrow), though the hyperreflective region on IR remained unchanged (O, yellow arrow). Cross-sectional OCTs of an active lesion on May 7, 2012 (P, red arrows) reveals irregularity of the IS/OS junction and irregularity and increased reflectivity at the RPE level. There was a thin area of subretinal lucency. Two weeks later, on May 18, 2012 (Q, red arrows), this subretinal lucency had resolved, and there was loss of the IS/OS junction with persistent hyperreflectivity and irregularity of the RPE layer. Long afterwards, cross-sectional OCT through the resolved lesion (R, red arrows) exhibits irregularity of the photoreceptor and RPE layers, although there is a hint of restoration of the outer retinal architecture, including the IS/OS junction.
increased RPE melanin. Hyperautofluorescence reflects increased lipofuscin in RPE or other cells such as macrophages, accumulation of other fluorophores in the retina, subretinal fluid causing separation of the outer segments from the RPE and thus impeding outer segment turnover, or decreased luteal pigment or other absorbing materials.

In our patient, the hyperautofluorescence noted during active disease may reflect impaired lipofuscin turnover due to RPE dysfunction. This is consistent with our findings on cross-sectional OCT of increased reflectivity and irregularity of the RPE layer, coupled with irregularity of the photoreceptor IS/OS layer early in the active phase (Figure 3P). There was also a small sliver of subretinal lucency (Figure 3P) noted in the area of new activity. The cause of this lucency is unclear, and we suspect that such a tiny sliver of fluid would not cause any blocking of autofluorescence. The early hypofluorescence seen on FA in active lesions may indicate blockage of the choroidal signal by increased lipofuscin in RPE cells or transient swelling of the RPE cells. As the active cycle continues, FAF hyperautofluorescence initially increases, and on OCT, the RPE hyperreflectivity and irregularity persists, while the IS/OS junction is lost (Figure 3Q). As the lesions resolve and become inactive, FAF hyperautofluorescence decreases, ultimately leaving behind hypoa autofluorescent patches on FA. In these areas of resolved activity, OCT exhibits persistent changes in photoreceptor and RPE layers, although there is a hint of restoration of the outer retinal architecture, including the IS/OS junction (Figure 3R). Resolved lesions present as window defects on FA.

In summary, FAF in this case of ampiginous choroiditis followed a predictable pattern of initial diffuse and subtle hyperautofluorescence first seen at the time of the clinical lesion, followed by intense, discrete hyperautofluorescence that then diminished slowly over time, ultimately leaving behind large areas of hypoa autofluorescence. The FAF findings persisted long after the fundus lesions resolved. On several occasions, the patient presented 1 week or more after symptom onset, by which point the clinical funduscopic lesions (if there were any) were not obvious; however, FAF revealed activity (negating the need for invasive FA testing), which influenced management by prompting initiation or modification of medications. These features, coupled with the simple, noninvasive nature of FAF, suggest that it is a useful modality for monitoring patients with ampiginous choroiditis.

REFERENCES