

Ghosts Drusen In Geographic Atrophy Areas

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PURPOSE

We observed on SD-OCT distinctive hyperelective pyramidal or dome-shaped structures (HPS), in GA areas on AMD patients.
 Our purpose was to analyze the multimodal imaging features of these HPS

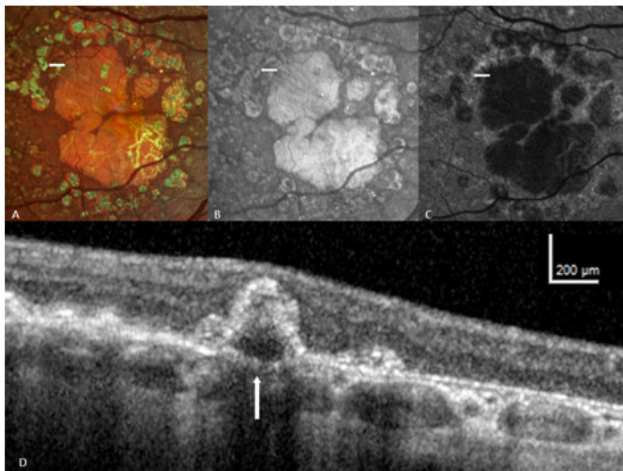


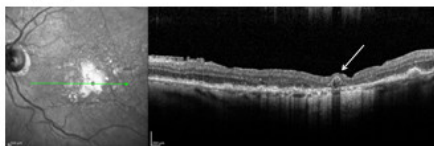
Figure 1: Multimodal, infrared, fundus autofluorescence and SD-OCT of hyperelective pyramidal structures (HPS). A: Multicolor image appearance of HPS in GA. B: IR image shows a hyperelective lesion surrounded by a background of hyperelective area. C: On FAF, HPS appears as a relatively hyperfluorescent area (arrow), in comparison with the adjacent atrophy. D: SD-OCT scan shows the hyperelective pyramidal structure characterized by a hyperelective center.

METHODS

We reviewed retrospectively the charts of all consecutive patients presenting HPS on SD-OCT in GA, between May and October 2012 at the Creteil University Eye Clinic.

Criteria :

- 1) Age ≥ 50 years old,
- 2) Presence of GA due to AMD with a diameter larger than 175 μ m, with no signs of CNV, intraretinal or subretinal fluid, or hemorrhage,
- 3) Multimodal imaging examinations, including IR reflectance, FAF, SD-OCT and Multicolor (Spectralis HRA+SD-OCT, Heidelberg Engineering).
- 4) Patients with previous treatment for neovascular AMD, refractive error of more than -6 diopters, or any other retinopathy in the study eye, were excluded.



RESULTS

A total of **36** eyes of 25 patients (20 women; mean age 82.9 years) with GA were included; Mean size of GA area was 8.66 mm²/eye.

A total of **96** HPS in GA were analyzed by SD-OCT.

SD-OCT features:

- On SD-OCT, these lesions, localized in GA, appeared as hyperelective dome-shaped or pyramidal structures (HPS).
- The Peripheral Part of HPS was hyperelective in all HPS (96/96; 100%).
- The Center of HPS was heterogeneously hyperreflective in 66/96 HPS (69%) and hyporelective in 30/96 HPS (31%).
- Mean height of HPS was **91** \pm 50.9 μ m (range 42 to 291 μ m).

On MultiColor imaging, performed in 7 eyes, HPS showed a peculiar **greenish** reflectivity

On IR images, HPS in GA appeared as hyporelective lesions surrounded by hyperelective halos, within an area of background hyperelectivity due to GA in all eyes

On FAF, HPS were either heterogeneously hyper-autofluorescent in 41% of cases (39/96), or were hypo-autofluorescent in 59% (57/96) of cases;

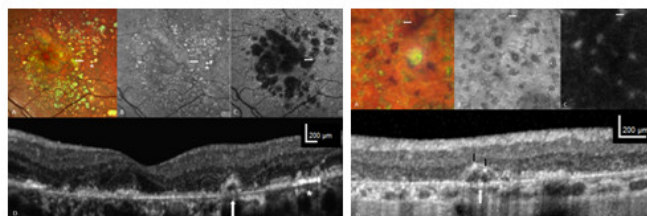


Figure 2: Multimodal, infrared, fundus autofluorescence and SD-OCT of hyperelective pyramidal structures and adjacent colored drusen.

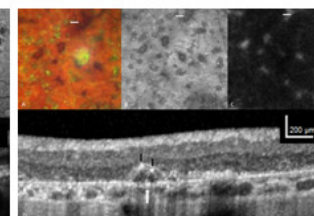


Figure 3: Multimodal, infrared, fundus autofluorescence and SD-OCT of hyperelective pyramidal structures bordered by numerous hyperelective pin-point.

DISCUSSION

These HPS could be compared with RPD. Differently from RPD, HPS appear as heterogeneous hyperreflective structure on SD-OCT and no hyperautofluorescence was noted

Alternatively, HPS could be compared with soft drusen. On SD-OCT, soft drusen appear as homogeneous and soft elevation of RPE. Their reflectivity is homogeneous, reflecting their lipid composition. HPS appear to be yellowish too, but their internal reflectivity was variable, reflecting the heterogeneous composition of the material underlying the RPE elevations. We hypothesize that HPS may be "late-stage" of degraded soft drusen, and the external pyramidal structure may correspond to the skeleton of soft drusen in a GA area.

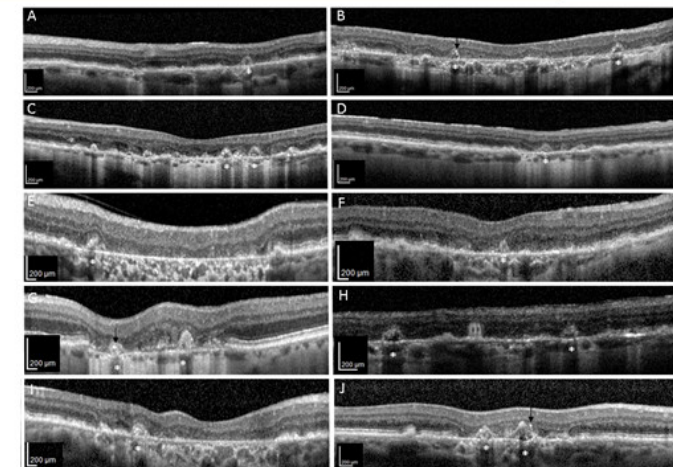
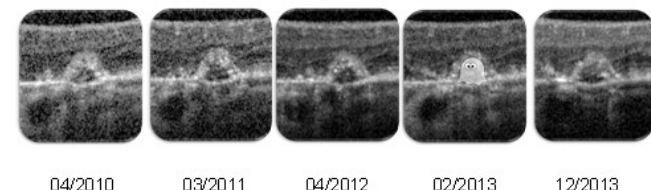


Figure 4: Spectral-domain optical coherence tomography of hyperelective pyramidal structures (HPS): multiple scans in different positions. A: Hyperelective pyramidal structure in geographic atrophy. B: The peripheral part is hyperelective. C: The center is homogeneously hyperreflective in most cases (panels C, E, F, G, H, I, J), and less frequently hyporelective (panels A, B, D). The retinal pigment epithelium appears disorganized with posterior shadowing. Note some hyperreflective pin-points on the borders of some HPS (black arrows, panels B, G, J).

Our study has several limitations. The series presented here is relatively small, and we lack long-term follow up of these HPS. Next step should be to analyze the natural history of these HPS.



CONCLUSION

We describe here multimodal imaging of distinctive HPS observed in GA areas in AMD. Because these HPS in GA were visible in "dead areas" of the macula, and because these HPS presented a dome-shaped appearance, we suggest the term of "ghost drusen".



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