# Incidence and quantification of geographic atrophy associated with neovascular age-related macular degeneration at initial presentation

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**Purpose** : To identify and quantify geographic atrophy (GA) associated with neovascular age-related macular degeneration (AMD) at initial presentation using a novel fundus autofluorescence (FAF) semi-automated software and to correlate the results with demographical and clinical datas.

**Methods** : Retrospective data analysis of all patients who first attended the retina department of a single academic medical center between August 2012 and August 2013 with new diagnosis of neovascular AMD. Best corrected visual acuity, fundus photographs, infrared pictures, fundus autofluorescence (FAF) imaging, and Spectral domain optical coherence tomography (Spectralis HRA+OCT, Heidelberg Engineering, Germany) were performed, associated with fluorescein angiography (FA) and indocyanine green angiography (ICGA). Identification of GA, when present, was independently performed by 3 readers. Quantification of atrophy areas was done on FAF frames using Region Finder Analyser, a semi automated software embedded in Spectralis device.

**Results** : 206 eyes of 173 patients (mean age : 79.7 ± 9.1 years) were included. 91 eyes (44.2%) had type I choroidal neovascularization (CNV), 43 (20.9%) had type II, and 24 (11.7%) had mixed pattern CNV lesions. Polypoidal choroidal vasculopathy was diagnosed in 16 (7.7%) and chorioretinal anastomosis (CRA) in 32 (15.5%) of cases.

Analyze of FAF frames showed that GA was associated with neovascular AMD in 46 eyes (22.2 %). Mean size of GA was 1.23 mm2 +/−1.76 mm2 (range 0.03 - 7.39) and foveal involvement was found in 42 %. Quantification of GA was not possible or difficult in several cases : presence of macular hemorrhage (9.3%), unsatisfactory quality of FAF frames (20.4%), FAF imaging not performed (7.3%). In theses cases, combined imaging, with infra red, OCT, and angiography, identified the presence of atrophy in 2 % of eyes. In total, taking into account datas both from Region Finder Analyser and multimodal imaging, we have detected **GA in 24.3% of eyes newly diagnosed with exudative AMD**.

Patients presenting atrophy at baseline were older (82.0 vs 78.8 years, p=0.019) and visual acuity (VA) was significantly lower ( 0.72 vs 0.57 logMAR, p=0.004). Controlateral eye was also affected with exudative AMD in case of atrophy (48.0% of cases, p=0.019). No significant difference were found considering patient's lens status and vitamin supplementation. Subset analysis of frequency for each CNV type associated with GA found a higher incidence of type II and CRA (30%).

The sensitivities of each imaging type to determine areas of GA are described in table 1. OCT was as sensitive as FAF for measuring areas of GA > 250 µm of largest diameter.

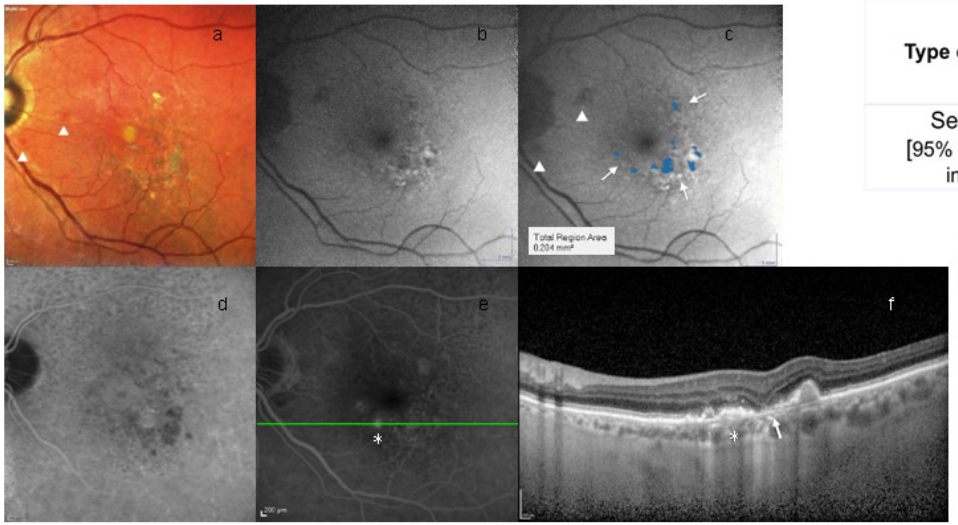


***Figure 1*** : *Multicolor imaging (a), FAF (b), Region Finder Analyser (c), late phase ICGA (d), late phase FA (e), and SD OCT scan (f) of the left eye of a 87-year-old-woman showing GA with chorio retinal anastomosis (CRA) at phase1 (erosion sign) at baseline . VA was 20/80.* Hemorrhages (arrowheads) and GA (arrows) are seen as low FAF. Areas of absent autofluorescence corresponding to GA are measured using Region Finder Analyser. Typical "hot spot" is not well defined on late ICGA. FA shows areas of hyperfluorescence with well-demarcated margins corresponding to GA and a focal hyperfluorescence corresponding to CRA (asterisk). The corresponding (eye-tracked) SD-OCT shows both GA with RPE loss and increased choroidal reflectivity, and CRA, with small, focal RPE erosion over a localized RPE elevation filled with a hyperreflective material.

| Type of imaging | FA | FAF | SD-OCT | FAF, GA > 250 µm | SD-OCT, GA > 250 µm |
|---|---|---|---|---|---|
| Sensitivity [95% confidence interval] | 79.6% [65.7% - 89.8%] | 100.0% [ 92.3% - 100.0%] | 90.4% [ 79.0% - 96.8%] | 70.2% [ 55.1%- 82.7%] | 69.2% [ 54.9%- 81.3%] |

**Table 1** : *Sensitivity of each imaging type (fluorescein angiography (FA), fundus autofluorescence (FAF) and spectral domain optical coherence tomography (SD-OCT) to determine areas of geographic atrophy (GA) of any sizes or more than 250 µm of largest diameter*

**Conclusion:**

GA is associated with neovascular AMD in 1/4 of cases at initial presentation, which is different compared to results previously reported in the literature (1,2). Combined imaging, including Region Finder Analyzer software is an effective tool to identify and quantify atrophic retinal areas at diagnosis.

Rate of enlargment over time of GA as well as its influence on visual acuity in eyes with CNV is not known but could be determined with the help of Region Finder software.

1. *Grunwald JE et al., Risk of geographic atrophy in the comparison of age-related macular degeneration treatments trials. Ophthalmology 2014;121:150-61.*
2. *Kumar N et al., Retinal pigment epithelial cell loss assessed by fundus autofluorescence imaging in neovascular age-related macular degeneration. Ophthalmology 2013;120:334-41*