oubraham@icloud.com

#381-A0247

www.creteilophtalmo.fr

Optical Coherence Tomography Angiography visualizes morphological changes in choroidal neovascularization after anti-VEGF therapy: Loading phase versus Pro-Re-Nata Regimen

HASSIBA OUBRAHAM, MD, 1 ALEXANDRA MIERE, MD, 1, FRANCESCA AMOROSO, MD, 1, PAULINE BUTORI, MD, 1, POLINA ASTROZ, MD, 1, OUDY SEMOUN, MD, 1 CAMILLE JUNG, MD, PHD, 2, SALOMON Y. COHEN, MD, PHD, 1,2 ERIC H. SOUIED, MD, PHD, 1,2

(1) Retina Créteil, University Paris Est Créteil, Créteil, France

(2) Clinical Research Center, GRC Macula, and Biological Ressources Center, Centre Hospitalier Intercommunal de Créteil, Créteil, France

Purpose: To compare the morphological neovascular network changes after anti-vascular endothelial growth factor (anti-VEGF) therapy in treatment-naive and treated patients with age-related macular degeneration (AMD), by means of optical coherence tomography angiography (OCTA).

Methods: Consecutive patients with neovascular AMD underwent multimodal imaging, including OCTA (AngioPlex, CIRRUS HD-OCT model 5000; Carl Zeiss Meditec, Inc, Dublin, OH) at baseline and in the three following months. Treatment naive AMD patients undergoing anti-VEGF induction phase were included in Group A, while previously treated patients were included in Group B. Two independent masked readers performed a qualitative and quantitative assessment. Qualitative analysis of OCTA choriocapillaris images at baseline and at each follow up visit consisted in morphological criteria from recent literature : visualization of a high flow network, of a feeder vessel, small ramifications, large vessels, anastomotic arcade, as well as the presence of a dark halo. Quantitative analysis of CNV size was performed on the same segmentation, using a free image analysis software (Image J, open-source Imaging Processing software, 2.0.0-rc-43/1,51K).
OCTA changes were then correlated with best-corrected visual acuity (BCVA) and exudation signs on structural spectral domain (SD-OCT). Inter-reader agreement was also investigated.

Results Twenty-five eyes of twenty-four patients were enrolled: 13 eyes of AMD treatment-naive patients and 12 eyes of AMD patients treated by anti-VEGF therapy were included (mean age 78.91). Mean follow-up was of 3±1 months. Baseline overall BVCA was 62.66 letters (Snellen equivalent ≈ 20/50).
Qualitative analysis. At each visit a high flow network in the choriocapillaris segmentation was visualized in all cases (25/25). None of the morphological criteria (listed above) did change in a statistically significant manner in either group during follow up (p* between 0.12 and 1)
Quantiative analysis. Group A showed a statistically significant decrease in lesion area (p=) from baseline to month 3. Conversely, in group B no significant change in lesion area was observed during anti-VEGF therapy. Moreover, a slight increase of lesion area in group B was noted, which was not always associated with persisted of exudative signs on SD-OCT.

- McNemar Significance Probability

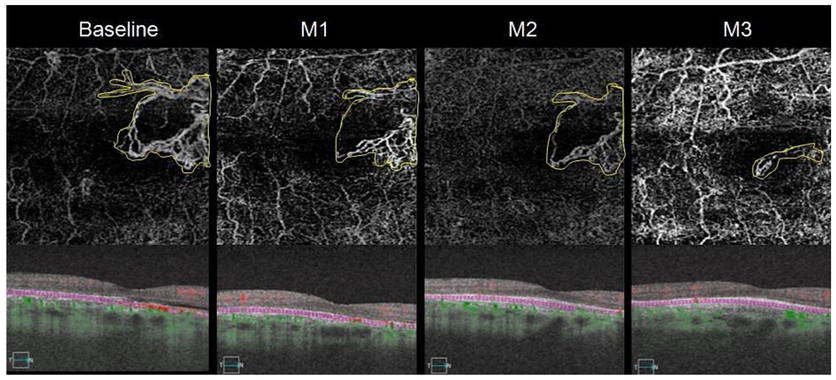

Figure 2. OCT-Angiography follow up during the loading phase of anti-VEGF therapy of a treatment naïve 85 year old man. Each panel represents a monthly OCT Angiography flow image and corresponding B-scan. Qualitative analysis in this patient revealed the persistence of a high flow neovascular membrane, harboring an anastomotic arcade, with large vessels but without visible feeder vessel nor dark halo at baseline and during follow up. Quantitative analysis demonstrated that at baseline, the area in the choriocapillaris segmentation averaged 1,462 mm2. Under anti-VEGF therapy, this area decreased to 0,447 mm2, ***thus by 69,42 %***. This decrease has been noticed on the overall cohort of treatment naïve in a statistically significant manner (**p=0.0229**, Figure 1).

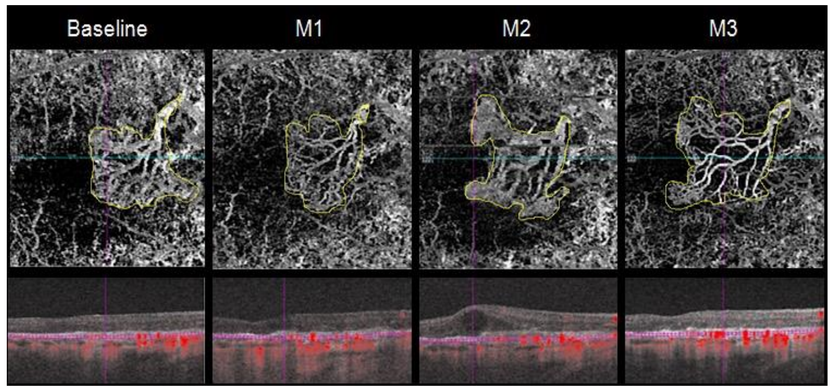

Figure 3. OCT-Angiography 3 months follow up after anti-VEGF therapy of the right eye of an 82 year old man 82 years-old man undergoing a pro re nata (PRN) regimen. Each panel represents a monthly OCT Angiography flow image and corresponding B-scan. Qualitative analysis in this previously treated patient revealed the presence of a high flow network in the choriocapillaris segmentation, characterized at baseline by large vessels, as well as small ramifications, an anastomotic arcade and no dark halo. Note the morphological changes in this patients during follow up, with a progressive disappearance of small ramifications, vessel enlargement and a persistence of the anastomotic arcade. Quantitative analysis demonstrated that at baseline the area in the choriocapillaris segmentation averaged 1.47 mm2. Under anti-VEGF therapy in PRN regimen, the initial area increased to 1.7 mm2, thus by **13.52 %** despite treatment. On the overall cohort of treated patients, CNV area tended to increase by 4,7% (p=0.9292, Figure 1).

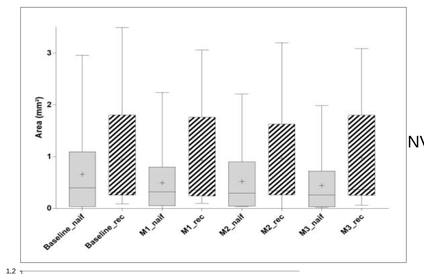

Figure 1-A :
NVC Flow-area follow-up under Anti-VEGF treatment

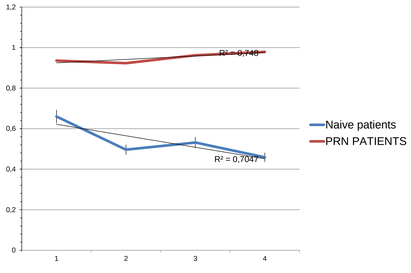

Figure 1-B :
NVC Flow-area follow-up under Anti-VEGF treatment

Figure 1(A&B). Box-and-whisker plot showing the comparison of CNV size, measured on OCT Angiography images, in treatment naïve patients undergoing the loading phase versus treated patients undergoing treatment according to a pro-re-nata regimen
Note at baseline the treatment naïve patients (grey box) had a smaller lesion size than the patients that had already been treated by anti-VEGF (stripped box). During the loading phase, treatment naïve patients showed a statistically significant decrease in CNV size (p=0.0229), while the treated patients undergoing PRN regimen demonstrated a slight increase in lesion size (p=0.9292) at month 3.

Conclusion: Qualitative OCTA analysis of anti-VEGF treatment-response in patients during the loading phase versus previously treated patients and followed according to a PRN regimen shows individual morphological changes, which do not differ statistically in the two categories. Quantitative OCTA analysis does however provide interesting insights on the therapeutic response in immature, versus mature, neovascular membranes.

References:

1. *Miere A, Querques G, Semoun O, Amoroso F, Zambrowski O, Chapron T, Capuano V, Souied EH. OPTICAL COHERENCE TOMOGRAPHY ANGIOGRAPHY CHANGES IN EARLY TYPE 3 NEOVASCULARIZATION AFTER ANTI-VASCULAR ENDOTHELIAL GROWTH FACTOR TREATMENT. Retina. 2017 Jan 10.*
2. *Miere A, Querques G, Semoun O, El Ameen A, Capuano V, Souied EH. OPTICAL COHERENCE TOMOGRAPHY ANGIOGRAPHY IN EARLY TYPE 3 NEOVASCULARIZATION. Retina. 2015 Nov;35(11):2236-41.*
3. *Jia Y, Tan O, Tokayer J, et al. Split-spectrum amplitude-decorrelation angiography with optical coherence tomography. Opt Express 2012;20:4710-4725.*

The authors have no financial disclosures