Abstract 169

A FEASIBILITY STUDY TREATING OPHTHALMIC ARTERY STENOSES IN PATIENTS WITH GEOGRAPHIC ATROPHY: SAFETY, ANATOMICAL, AND FUNCTIONAL OUTCOMES

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Age-related macular degeneration (AMD) is a progressive, multifactorial disease and one of the leading causes of irreversible vision loss in older adults. With over 200 million people affected globally, the burden of AMD is expected to increase substantially in coming decades. Geographic atrophy (GA), the advanced stage of nonexudative AMD, leads to degeneration of the retinal pigment epithelium (RPE), photoreceptors, and underlying choroid, and accounts for a significant proportion of legal blindness in developed countries.

Despite recent therapeutic advances targeting the complement cascade, such as C3 and C5 inhibitors, the benefit remains limited. These therapies slow GA lesion growth by less than 20% over one year and fail to prevent the progressive decline in visual function, which continues at approximately five letters per year. Therefore, more effective and function-preserving treatments are urgently needed.

Recent evidence has implicated choroidal hypoperfusion as a contributing factor in AMD pathogenesis. Thinning of the choroid has been consistently associated with disease progression, including both GA and macular neovascularization. Doppler imaging and histologic data suggest that this thinning may be due in part to upstream vascular compromise, particularly involving the ophthalmic artery (OA), which supplies the choroid.

Histopathological studies and high-resolution magnetic resonance angiography (MRA) have demonstrated OA stenoses in patients with AMD. These stenoses correlate with reduced ocular blood flow and greater disease severity. Case reports and retrospective studies have suggested that OA angioplasty might improve visual outcomes in such patients. Given this background, the present study aimed to evaluate the safety, feasibility, and exploratory functional outcomes of OA balloon angioplasty in patients with GA secondary to AMD and confirmed OA stenosis.

Study Design and Oversight
This was a prospective, first-in-human, single-arm interventional study conducted in Argentina. The protocol was reviewed and approved by an independent ethics board (Comité de Ética en Investigación Clínica, IRB #00010971) and the Argentine regulatory agency ANMAT. All participants provided informed consent, and the study was registered on clinicaltrials.gov (NCT05091476).

Participants
Eligible participants were aged ≥60 years with confirmed GA secondary to AMD in one or both eyes, BCVA of 20/80 or worse in the study eye, and significant OA stenosis confirmed by MRI and CT

imaging. Exclusion criteria included active exudation, media opacities preventing imaging, uncontrolled systemic disease, renal insufficiency, and anticoagulation. Patients were required to have stable systemic history for at least six months following any vascular or cardiac events.

Intervention
The OA angioplasty was performed using the investigational OPTiC System™ (OcuDyne, Inc.), a balloon catheter device designed for safe and targeted intervention of the OA via a transfemoral approach. After preoperative imaging and final eligibility confirmation, the interventional neuroradiology team performed balloon dilation of the OA stenosis under general anesthesia. Patients were monitored postoperatively for 18–36 hours before discharge.

Assessments
Safety was evaluated through documentation of adverse events from the time of consent through all follow-up visits. Neurological assessments, including NIH Stroke Scale (NIHSS), were performed pre- and post-procedure and at Month 3.

Ophthalmologic assessments included:

BCVA (ETDRS at 4m)

MNRead testing (Reading Acuity, Reading Speed, Critical Print Size)

Spectral-domain OCT (SD-OCT) for subfoveal choroidal thickness (SFChT)

Fundus autofluorescence for GA lesion area

The Impact of Vision Impairment (IVI) Questionnaire

Visits occurred at Week 1, Week 4, Month 3, and Month 6 post-procedure. Images were reviewed independently by the Boston Image Reading Center.

Study Population
Seventeen subjects (64.7% female; mean age 75.1 years) were enrolled. All had late-stage AMD with GA, mean baseline BCVA of 31.9 ETDRS letters (approx. 20/230), and large GA lesion areas. Eleven subjects completed the procedure and full follow-up.

Comorbidities were common: 64.7% had a history of smoking (mean 37 smoking years), 52.9% had hypertension, 41.2% vascular disease, and 76.5% were overweight (BMI ≥25). Mean baseline GA area in study eyes was 12.8 mm^2.

Safety Outcomes
No serious systemic or ocular adverse events occurred. Four systemic events (injection site inflammation, hematoma, hemoptysis, and UTI) were all resolved without sequelae. Five mild ocular events included four suspected microemboli and one suspected reperfusion injury. All were asymptomatic, self-limited, and resolved without intervention.

Visual Acuity and Reading Performance

Mean BCVA improved significantly from baseline at all visits. At 6 months, study eyes showed a mean gain of +6.7 ETDRS letters (p=0.003). Fellow eyes showed no such improvement. One subject lost two letters; all others had stability or gain.

Seven study eyes and nine fellow eyes completed MNRead testing. Study eyes showed a 28.5% increase in reading speed, a 3.4% improvement in reading acuity, and a 5.1% improvement in critical print size by Month 6. Fellow eyes declined in all reading metrics.

Choroidal Thickness
SFChT increased significantly at Week 1 (p=0.002) and Week 4 (p=0.004), then gradually declined toward baseline but remained elevated through Month 6. Compared with fellow eyes, treated eyes showed statistically significant improvement in SFChT early after treatment.

Patient-Reported Outcomes
IVI scores improved across all domains in study eyes. Statistically significant gains were observed in Reading & Accessing Information and Mobility & Independence subscales. Emotional Well-being showed a modest, non-significant decline by Month 6, consistent with the emotional toll of progressive vision loss.

This prospective feasibility study is the first to investigate OA balloon angioplasty as a treatment for GA in patients with confirmed OA stenosis. The procedure was safe and well-tolerated, with no serious adverse events. Exploratory analyses showed improvements in BCVA, reading performance, choroidal thickness, and quality of life — outcomes that are rarely seen in GA with current therapies.

The increase in SFChT following OA angioplasty supports the hypothesis that improving ocular perfusion may help preserve retinal structure and function in AMD. Given the modest benefits of current anti-complement therapies and the lack of vision-improving options, OA angioplasty may represent a novel and promising approach.

Larger randomized studies are warranted to confirm these findings, assess long-term safety, evaluate GA progression more precisely, and clarify the role of ocular hypoperfusion in the pathogenesis and progression of AMD. If validated, OA angioplasty could become a paradigm-shifting treatment for this otherwise untreatable form of vision loss.

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