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Multifocal Electroretinography Changes in Patients with Late-Stage Age-Related Macular Degeneration (AMD) After Smaller-Incision New-Generation Implantable Miniature Telescope (SING IMT): A Case Series

Dr Giacomo Boscia

Background: The smaller-incision new-generation implantable miniature telescope (SING IMT) repre- sents an advancement over the previous model, WA-IMT, serving as a unilateral prosthetic device for patients with late-stage age-related macular degeneration (AMD).
Purpose: This study aims to report changes in multifocal electroretinography (mfERG) 6 months post–SING IMT implantation.

Methods: In this case series, we prospectively evaluated a cohort of phakic patients with late-stage AMD who underwent SING IMT implantation at the Ophthalmology Unit, University of Bari Aldo Moro, Italy. We assessed best-corrected distance visual acuity (BCDVA) and best-corrected near visual acuity (BC-NVA) preoperatively and at 6 months postoperatively. Additionally, mfERGs were conducted using Retimax (CSO, Florence, Italy).

Results: All four treated patients showed an increase in both BCDVA and BCNVA at the 6-month follow-up. Additionally, all eyes demonstrated increased P1 density at this time point, with the greatest augmentation observed at the central fixation point, gradually diminishing across the five concentric rings. While all patients displayed a general increase in P1 amplitude, the third patient exhibited a slight decrease in the foveal region. Conclusions: In this case series with four cases, the new generation implantable miniature telescope, SING IMT, demonstrates promising results in enhancing mfERG parameters in patients with late-stage AMD. Six months post-surgery, we observed an augmentation in both P1 density and amplitude, predominantly at the fixation point and gradually tapering in the surrounding concentric rings.

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V3xV: A novel Video-based Viral Vector Volumetric analysis for improving dosing precision in subretinal gene therapy

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PURPOSE

Accurate subretinal viral vector delivery is essential for successful retinal gene therapy. This study presents V3xV, a video-based approach designed to quantify subretinal bleb volume in real time, aiming to improve dosing precision.

METHODS

High-resolution surgical video recorded subretinal bleb formation during simulated gene therapy injections. A custom software pipeline processed each frame, employing edge detection and hemispherical cap modeling to calculate bleb volumes with theoretical precision of ±0.1 μL. The system also included a machine learning component trained to distinguish subretinal delivery from vitreous extrusion by analyzing bleb morphology and expansion characteristics. All procedures were calibrated with standardized reference grids, ensuring consistent measurements.

RESULTS

V3xV achieved high accuracy and reproducibility in bleb volume assessments, providing immediate feedback during injection trials. Surgeons reported improved confidence in achieving targeted doses, as the real-time analysis enabled rapid adjustments to the injection rate. The machine learning algorithm demonstrated reliable differentiation between subretinal and vitreous delivery, reducing procedural variability that can compromise gene therapy outcomes.

CONCLUSIONS

V3xV demonstrated reliable, real-time quantification of subretinal bleb volumes and delivered valuable feedback on injection location. These features have the potential to advance subretinal gene therapy by enhancing dose consistency and minimizing off-target delivery. Future clinical validation will determine its performance in live surgical contexts, where precise dosing can optimize therapeutic effects and patient outcomes. This approach may serve as a foundation for developing more accurate and standardized delivery methods in retinal gene therapy.

FINANCIAL DISCLOSURE: YES

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Microvascular changes as detected by OCTA in eyes with rhegmatogenous retinal detachment repair, comparison between macula-on and macula-off cases

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Introduction: Rhegmatogenous retinal detachment(RRD) refers to the separation of the sensory retina from the retinal pigment epithelium(RPE) caused by a retinal break. Pars plana vitrectomy with either gas or silicone oil tamponade has been the mainstay of treatment for RD repairs. The aim of this study is to microvascular changes in eyes which have undergone PPV repair of RRD as reported by OCTA.

Methods: This study included 45 patients with retinal detachment, 21 macula-on and 24 macula-off. OCT-angiography images were obtained and retina map mode was applied to measure the central retinal thickness while assessment of microvasculature was performed by analysing vessel density in the superficial and deep capillary network. FAZ measurements were also performed using the OCTA integrated software.

Results: A statistically significant difference was found between the CRT of the macula-on and macula-off group as well as a weak but statistically significant correlation between BCVA and FAZ area ($r = 0.21$, $p = 0.018$). Inferior detachment showed a modest but statistically significant reduction in deep vessel density(dVD) ($32.16 \pm 5.22\%$) compared to other quadrants (p 0.05). There was a significant difference in dVD between fellow and affected eyes both in the macula-on ($p = 0.01$) and macula-off group (p 0.01), while sVD was significantly different in the macula-off group ($p = 0.03$) and not in the macula-on ($p=0.61$).

Conclusion: This study adds to current literature and underlines the possible effect of the location of the RRD on retinal perfusion as shown by the dVD and a potentially distinct impact of sVD in macula-off detachments. Inferior RDs are more often associated with chronic cases and potential PVR involvement, a finding that requires further research.

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OCT-Guided Epiretinal Membrane Surgery with the Preoperative Retinal Evaluation System for Surgery (PRESS)

Dr David Almeida, Eric Chin, Vinit Mahajan

Purpose: To evaluate the integration of optical coherence tomography (OCT)-guided membrane peeling with the Preoperative Retinal Evaluation System for Surgery (PRESS) classification in epiretinal membrane (ERM) surgery and assess surgical outcomes.

Methods: A prospective, consecutive interventional case series of 137 eyes undergoing ERM surgery. ERMs were classified according to the PRESS system using preoperative spectral-domain OCT. The surgical approach was tailored based on PRESS classification and OCT-identified submembrane spaces (SuMS). Main outcome measures included first-attempt success rate, surgical complications, and visual acuity improvement.

Results: PRESS classification distribution was: Class 1 (31.4%), Class 2 (45.2%), Class 3 (15.3%), and Class 4 (8.1%). First-attempt grasp success varied significantly by PRESS class: Class 1 (95.3%), Class 2 (82.1%), Class 3 (71.4%), Class 4 (81.8%) (p0.01). Mean visual improvement was greatest in Class 1 (3.4 lines) and Class 2 (3.1 lines) compared to Class 3 (2.5 lines) and Class 4 (2.3 lines) (p0.01). No macular breaks occurred in any cases. The rate of petechial hemorrhages was significantly lower in Class 1 (23.3%) versus Class 2 (47.9%) patterns (p0.01).

Conclusions: Integration of OCT guidance with the PRESS classification system provides a systematic framework for surgical planning in ERM cases. This combined approach allows for more precise risk stratification and technique selection, potentially improving surgical outcomes across membrane phenotypes. The method appears to reduce complications while maintaining high success rates.

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Do You Really Know Your Gene Therapy Dose? V3xV Analysis Reveals Critical Gaps in Subretinal Delivery Precision

Dr David Almeida

Purpose: Gene therapy holds immense promise for treating retinal diseases, yet a fundamental question remains: How accurate is our dosing? Current methods lack ±0.1 μL-level precision and cannot reliably distinguish between successful subretinal delivery and vitreous extrusion in real-time. We introduce V3xV (Video-based Viral Vector Volumetric) analysis to address this critical gap in treatment standardization.

Methods: Novel software combining high-resolution video capture with hemispherical modeling and machine learning was developed to provide real-time volumetric analysis during subretinal gene therapy delivery. The system incorporates frame-by-frame analysis, automated bleb detection, and tissue displacement pattern recognition. Testing evaluated volumetric accuracy and ability to differentiate between successful subretinal delivery and inadvertent vitreous extrusion.

Results: V3xV demonstrated theoretical accuracy of ±0.1 μL in volume measurement compared to current methods (±0.5 μL with OCT-based measurement, ±1.0 μL with visual estimation). The system achieved 98% accuracy in differentiating between subretinal and vitreous delivery within 100ms of injection initiation. Real-time feedback allowed immediate procedural adjustments based on quantitative measurements rather than subjective assessment.

Conclusions: V3xV reveals concerning variability in current gene therapy delivery methods while offering a solution for standardization. This technology could significantly impact treatment efficacy and safety by enabling precise dosing verification. Given the expected costs of gene therapy, ensuring accurate delivery becomes a clinical and economic necessity.

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A case of ocular trauma with apparently preserved ocular morphology

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PURPOSE: We describe the case of a patient with ocular trauma with apparently preserved ocular morphology, but who actually had a scleral rupture discovered during surgery.

METHODS: A 43-year-old woman had blunt trauma to the right eye (RE) while at work. The trauma had apparently not affected her ocular morphology. Visual acuity (VA) was hand movements at 2 meters. Slit-lamp biomicroscopy showed a hypo reactive pupil to light. Funduscopy revealed severe vitreous haemorrhage that was confirmed by ocular ultrasound and computed tomography of the orbit, but no evidence of ocular burst or intraocular foreign body was found.

RESULTS: When performing scleral buckling, a rupture of the ocular wall with leakage of intraocular content was detected in the upper nasal quadrant at the level of the muscle insertions. The scleral discontinuity was sutured, with cryopexy at the perforation margins and placement of the band over the scleral tear. A 23G pars plana vitrectomy with endophotocoagulation was performed and the vitreous cavity was filled with silicone oil. Three months later, the silicone oil was removed and cataract surgery was also performed. Three years later, Optical Coherence Tomography revealed normal macular anatomy, macular thickness of 282µ and retinal nerve fibre layer thickness of 90µm. VA was restored to 0.7.

CONCLUSIONS: The proper management of a patient with ocular trauma has important clinical, medical-legal and prognostic implications. Closed ocular trauma does not always allow for standard treatment, sometimes requiring modification of the procedure due to surgical findings not detected in the pre-surgical examination.

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Surgical management of ocular coloboma cases in a rare ocular diseases reference unit

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Purpose:

To analyze the diagnosis, treatment and surgical management of coloboma cases in our Andalucia reference unit.

Methods:

Ocular coloboma is a rare anomaly that arises due to an abnormality in embryogenesis. This malformation includes anomalies from an iris coloboma to clinical anophthalmos. Coloboma is etiologically heterogeneous, and it could be spontaneous, inherited or syndromic. We analyzed coloboma cases to learn how to diagnosis, monitoring and treat complications in these especial patients.

Results:

We evaluated 29 eyes of 19 patients. Bilateral coloboma was present in 66% of subjects. The mean age of diagnosis was before the first year. The most frequent cases were the chorioretinal coloboma. The 17% of patients have a syndrome diagnosis. The 13% of eyes need surgery and the retinal detachment (RD) was the most common complication. The single operation success rate was 87%. Recurrence of retinal detachment occurred in 3 eyes (13%).

Conclusions:

The chorioretinal coloboma affects the retinal pigment epithelium, the neurosensorial retina and the choroid. These patients have and increased risk of RD and choroidal neovascularization (CNV). Complete vitrectomy along the margin of the coloboma and diode laser provides and effective treatment for RD in coloboma patients.

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Surgical Retina

Postoperative ellipsoid zone reflectivity predicts short-term visual acuity after vitrectomy for retinal detachment

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Purpose: To investigate the predictors of visual acuity gain after retinal detachment surgery.

Methods: Single-center, retrospective, longitudinal study. Patients undergoing vitrectomy with gas tamponade for primary rhegmatogenous retinal detachment with macular involvement were included. Presence of cataract, epiretinal membrane and internal limiting membrane peeling were exclusion criteria. Ellipsoid zone reflectivity was calculated at the foveal center using the Plot Profile function in ImageJ®, from macular OCT images obtained 6 weeks after surgery. Prediction of BCVA at 3 months was the primary outcome. rEZR 6 weeks after surgery, baseline BCVA, age, macular morphologic stage and duration of symptoms before surgery were studied as independent variables. Sequential linear models were used for analysis.

Results: Data from 82 patients with a mean age of 62 years (29% female) were analyzed. BCVA (LogMAR) improved from 1.30 (±0.92) before surgery to 0.36 (±0.28) and 0.28 (±0.27) at 6 and 12 weeks after surgery, respectively (p0.0001). rEZR at 6 weeks was the strongest predictor of BCVA at 3 months after surgery (β=-0.55, 95% CI -0.87 to -0.22), followed by preoperative BCVA (ß=0.16, 95% CI 0.05 to 0.27); R^2=0.6. The remaining variables were not significant in the univariate analysis and were not included in the multivariate model.

Conclusions: Preoperative BCVA and rEZR at 6 weeks predict short-term visual acuity gain after vitrectomy for macula-off retinal detachment.

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Surgical Retina

Sticky Oil Syndrome: Early vs. Late Management

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Purpose:
Heavy silicone oil has been used for decades in retinal surgery to maintain attachment, but it can cause complications. A rare yet significant one is sticky oil syndrome, characterized by abnormal adherence of silicone oil bubbles to the retina during removal. This may result from a compartmental syndrome of the inner retina caused by surface tension of the oil.
This study describes two cases of sticky oil syndrome and evaluates different surgical approaches for its removal.

Methods:
We present two cases of sticky oil syndrome after silicone oil removal. Residual adherent silicone oil droplets were observed in both patients.
The first case involved a 60-year-old male, in whom the retained silicone oil was successfully removed during the same surgery. The second case was a 24-year-old female, in whom removal was performed after a delayed period of seven months.
Surgical approaches included aspiration with an Avocat cannula, displacement with perfluorocarbon liquid, and internal limiting membrane (ILM) peeling.

Results:
Despite different techniques, ILM peeling was ultimately required for complete removal.
The patient with early removal maintained good visual potential (achieving logMAR 0.1). The patient with delayed removal initially had logMAR 0.5, but vision deteriorated until surgical treatment.

Conclusions:
Early removal of sticky oil syndrome is recommended, as OCT changes persist even after silicone oil elimination, leading to inner retinal atrophy. Prompt surgical management may prevent long-term retinal damage and vision loss.

Financial disclosure: None

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Safety and Efficacy of OCU410ST—a Novel Modifier Gene Therapy—for Treatment of Stargardt Disease: Phase 1/2 Study Update

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Purpose: Stargardt disease, the most common inherited macular dystrophy, leads to progressive bilateral central vision loss due to ABCA4-related retinopathies. Symptoms begin in childhood and worsen over time and affect an estimated 44,000 patients in the U.S. OCU410ST is a novel gene therapy that delivers human RORA via subretinal injection, thereby modulating inflammation, oxidative stress, lipid metabolism, and complement activation. With no approved treatment available, OCU410ST could be the first one-time gene therapy for Stargardt. We present safety and efficacy results from the Phase 1 GARDian trial (NCT05956626).

Methods: This multicenter, open-label, dose-escalation study followed a 3+3 design, enrolling 9 subjects with BCVA 50 ETDRS letters (20/100 Snellen) and a detectable outer nuclear layer on SD-OCT. Subjects received a single 200-µL subretinal injection of OCU410ST in the eye with worse visual acuity at a low (3.75×10^{10} vg/mL), medium (7.5×10^{10} vg/mL), or high (2.25×10^{11} vg/mL) dose. Primary endpoints included safety, and exploratory endpoints included change from baseline in BCVA and atrophic lesion size.

Results: OCU410ST showed a favorable safety profile with no treatment-related SAEs. Among 7 evaluable subjects (with up to 12 months of data), lesion growth was 52% slower in treated eyes (0.257 ± 0.198 mm²) vs. untreated eyes (0.536 ± 0.170 mm²). BCVA improved by 2 lines (10 ETDRS letters) in treated eyes compared to untreated eyes.

Conclusions: OCU410ST appears to be safe and well-tolerated and has demonstrated a possible reduction in lesion size, suggesting a slowing of disease progression which may preserve vision in early to advanced cases of Stargardt disease. Further clinical development is warranted.

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Long-Term Safety and Efficacy of OCU400: A Novel Modifier Gene Therapy for Retinitis Pigmentosa – 2-Year Results from a Phase 1/2 Study

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Purpose: Retinitis pigmentosa (RP) is a group of inherited retinal dystrophies caused by mutations in over 150 genes, leading to progressive vision loss. The only approved gene therapy for RP benefits about 1% of patients, leaving the majority with no therapeutic options. OCU400 is a first-in-class modifier gene therapy utilizing NR2E3 overexpression to restore retinal homeostasis. This study evaluated the long-term safety, tolerability, and efficacy of OCU400 in subjects with RP due to NR2E3 or RHO mutations.

Methods: This Phase 1/2, multicenter, dose-escalation study enrolled 18 adults with genetically confirmed RP. Subjects received a single subretinal injection of OCU400 at a low (1.66 x 10^{10} vg/mL), medium (3.33 x 10^{10} vg/mL), or high (1.66 x 10^{11} vg/mL) dose in the eye with worse visual acuity. Primary outcomes were safety and tolerability. Secondary outcomes included changes from baseline in BCVA, LLVA, and a mobility test (MT).

Results: No serious adverse events related to OCU400 were observed. At one year, 89% (16/18) of treated eyes demonstrated preservation or improvement in BCVA or LLVA or MT scores from baseline, and 78% (14/18) demonstrated preservation or improvement in MT scores from baseline. 80% (8/10) of RHO mutation subjects experienced either preservation or improvement in MT scores from baseline. At two years, treated eyes maintained a significant 10-letter LLVA gain (p 0.01), consistent across multiple mutations.

Conclusions: OCU400 demonstrated long-term safety and efficacy, supporting its unique gene-independent mechanism. The only gene-agnostic, BLA-enabling Phase 3 trial (liMeliGhT, NCT06388200) is actively recruiting.