P. 01

Microbiota in human tears: new perspectives for the treatment of primary open-angle glaucoma.

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Purpose: To analyze the differences in the microbial profile in tears of patients with POAG and healthy subjects. The identification and characterization of the ocular microbiota in POAG will allow the development of new therapies for the prevention of glaucomatous blindness. **Methods:** Pilot, analytical, observational, case-control study in 28 patients (14 POAG vs 14 controls) matched by age and sex. DNA extraction and purification were performed using a commercial kit. DNA was quantified using an Agilent 2100 bioanalyzer (Waldbronn, Germany) and DNA was amplified by PCR from the hypervariable V3-V4 regions of the prokaryotic 16S rRNA gene. Libraries were prepared and sequencing was performed using Illumina Miseq technology. Bioinformatic analysis was performed using specific programs and statistical analysis using SPSS v25. **Results:** There were 60% of smokers in POAG group and 25% in control group. We identified 191 genera of bacteria, 88 in tears from patients with POAG and 150 in tears from control subjects, with both groups presenting 52 genera in common. Of these 52, 7 genera were significantly more abundant ($p<0.05$) in tears from patients with glaucoma (Moraxella, Actinobacillus, Klebsiella, Sphingomonadaceae, Sneathia, Brochothrix, Leuconostoc) and 8 were significantly more abundant in the control group (Paracoccus, Methylobacterium, Reyranella, Anaerococcus, Anaerostipes, Weisella (anti-inflammatory), Prevotella, Turicella). **Conclusions:** We have identified a significant number of bacteria in tears from patients with primary open-angle glaucoma. Some bacteria identified in tears from POAG are related to pathological processes, while some of those identified in tears from control subjects would be related to protection.

P. 02

Systematic Review Of Clinical Practice Guidelines For The Diagnosis And Management Of Open Angle Glaucoma

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Purpose: To assess methodological quality of Clinical Practice Guidelines (CPG) for the diagnosis and management of open angle glaucoma (OAG). **Methods:** A systematic review of CPGs for the diagnosis and management of OAG, published between January-2017 and November-2024, was carried out with a search in databases, meta-search engines, CPG development institutions, ophthalmology associations and CPG repositories. We registered the protocol in the International Prospective Register of Systematic Reviews PROSPERO: CRD42024510656. Eleven CPGs published in English/Spanish, between 2017 and 2024 were selected, and 5 authors evaluated them independently, using the AGREE-II instrument. An individual assessment by domain (AGREE-II), an overall assessment of the guide, and its use with or without modifications was performed. Additionally, a meta-synthesis of the recommendations for the most relevant outcomes of each CPG was performed. **Results:** The lowest mean scores were in applicability and rigour of development (43.2% and 46.1% respectively). The highest score (73.9%) was for domain 4 'clarity of presentation'. NICE (92.1%), IETS I(77.5%) and SNSG(75.8%) presented the best score in domain 3 'Rigour of development'. Only NICE, EGS-5-TGG, SNS, and MaHTAS are recommended, the last two with modifications when evaluating the overall quality of the analyzed CPGs. Most of the CPGs used GRADE approach for making recommendations. In the meta-synthesis, the CPGs show similar recommendations, however, we found variability in indications for selective laser trabeculoplasty and minimally invasive glaucoma surgery. **Conclusion:** NICE, IETSI and SNSG CPGs for the diagnosis and management of OAG have a high methodological quality, appraised with AGREE-II. NICE, EGS-5-TGG, IETSI and SNSG have high scores in applicability.

P. 03

Retinal Ganglion Cell Degeneration Linked to Pathogenic Tau in Alzheimer's Disease

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Purpose: Pathological tau isoforms, are elevated in the retinas of patients with mild cognitive impairment (MCI) due to Alzheimer's disease (AD) and AD dementia. These patients exhibit significant retinal ganglion cell (RGC) loss, but the presence of tau isoforms in RGCs and their impact on RGC integrity, particularly in early AD, have not been studied. **Methods:** We analyzed retinal superior temporal cross-sections from 25 MCI or AD patients and 16 age- and sex-matched cognitively normal controls. **Results:** We found a 46–56% reduction in RBPMS+ RGCs and Nissl+ neurons in the ganglion cell layer (GCL) of MCI and AD retinas ($P < 0.05$–0.001). RGC loss was accompanied by soma hypertrophy (10–50% enlargement, $P < 0.05$–0.0001), nuclear displacement, apoptosis (30–50% increase, $P < 0.05$–0.01), and prominent expression of granulovacuolar degeneration (GVD) bodies and GVD-necroptotic markers. Both pS396-tau and Oligo-tau were identified in RGCs, including in hypertrophic cells. PS396-tau+ and Oligo-tau+ RGC counts were significantly increased by 2.1–3.5-fold in MCI and AD retinas vs control retinas ($P < 0.05$–0.0001). Tauopathy-laden RGCs strongly inter-correlated ($r=0.85$, $P < 0.0001$) and retinal tauopathy associated with RGC reduction. Their abundance correlated with brain pathology and cognitive deficits. **Conclusions:** These findings identify a link between pathogenic tau in RGCs and RGC degeneration in AD, involving apoptotic and GVD-necroptotic cell death pathways. Future research should validate these results in larger and more diverse cohorts and develop RGC tauopathy as a potential noninvasive biomarker for early detection and monitoring of AD progression.

P. 04

Identification of Retinal Imaging and Molecular Biomarkers for Stargardt Disease

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Purpose: Stargardt disease (STGD1) is the most common hereditary macular dystrophy caused by ABCA4 gene mutations, leading to toxic lipofuscin accumulation in retinal pigment epithelium and progressive photoreceptor degeneration. We aimed to identify imaging/molecular biomarkers linked to disease progression, and the role of vitamin A (VitA), neuroinflammation (NINF), and toxic habits. **Methods:** A case-control observational study was performed with 14 STGD1 patients and 14 healthy controls. Ophthalmologic data were obtained via optical coherence tomography (OCT) and fundus autofluorescence (FAF). Inflammatory/neuroinflammatory mediators (interleukins (ILs) -1β, -6, tumor necrosis factor alpha (TNF-α), C-reactive protein (CRP), and procalcitonin (PCT) were measured alongside plasma VitA levels. Toxic habits and VitA intake were assessed through questionnaires. Statistical analysis was carried out using SPSS and Python programs. **Results:** STGD1 patients showed reduced OCT central subfield thickness (CST) and volume (p=0.001) and increased FAF atrophic area (AA) (p=0.0001), all correlating with impaired visual acuity (VA). A trend was found between elevated IL-1β levels and lower CST. Higher PCT levels and C3 complement component (p=0.002/p=0.05) were associated with larger FAF AAs. Excessive VitA intake was related to poorer VA (p=0.02), while elevated plasma VitA levels correlated with decreased CST and CAT (p=0.05). Alcohol consumption was linked to reduced CST (p=0.05) and smoking to a larger FAF AA (p=0.04). **Conclusion:** OCT is highly sensitive to detecting early macular changes in STGD1. High VitA intake negatively impacts vision, despite no direct association with plasma levels. Increased neuroinflammatory markers and alcohol/tobacco habits contribute to accelerated retinal degeneration in STGD1 patients.

P. 05

Generation and Characterization of iPSC-Derived iRPE from a *PROM1* c.1354dupT mutation carrier with Retinitis Pigmentosa

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Purpose: *PROM1* encodes Prominin-1, a protein vital for Retinal Pigment Epithelium (RPE) functions like autophagy and lysosomal homeostasis, and photoreceptor membrane structure in the retina. Mutations in *PROM1* are linked to Inherited Retinal Diseases (IRD), including Retinitis Pigmentosa (RP). The c.1354dupT (p.Tyr452Leufs*13) mutation in exon 13 is notably associated with RP. This study aimed to generate iPSC-derived RPE (iRPE) from a patient with this mutation for further functional analysis. **Methods:** Our group generated the iPSC line [RP]-FiPSC1-Ep5F-10 from dermal fibroblasts obtained from a patient homozygous for the c.1354dupT *PROM1* mutation. Reprogramming was performed using the Epi5 Episomal Kit and Neon Transfection System. iPSC colonies were manually picked and characterized by immunocytochemistry (SOX2, TRA-1-60 and SSEA-4) and embryoid body (EB) differentiation into three germ layers (β-III Tubulin, α-SMA and α-1 Fetoprotein). iRPE was derived from [RP]-FiPSC1-Ep5F-10 and a control line ([FiPSC] Ctrl1-Ep6F-5) from the National Bank of Cell Lines (BNLC, Spain). Differentiation used EB formation in Neural Induction Medium, followed by Retinal Differentiation Medium. iRPE cells were isolated between days 28-35 and immunocytochemistry was performed by CRALBP, RP65, BEST1 and CD133 markers. **Results:** The iPSC line [RP]-FiPSC1-Ep5F-10 showed pluripotency (SOX2, TRA-1-60 and SSEA-4) and differentiated into three germ layers. Patient-derived RPE displayed compact, polygonal colonies with CRALBP, RP65 and BEST1 expression, but lacked CD133, unlike controls. **Conclusion:** We successfully generated iRPE from a *PROM1*-mutant iPSC line created by our group. The absence of CD133 suggests mutation may impair iRPE function, potentially accelerating retinal degeneration, requiring further investigation into *PROM1's* role in RPE and IRD.

P. 06

Usefulness of the complex Rey-Osterrieth Figure test in the screening of cognitive-visual disorders in premature infants

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Purpose: To estimate the value of the Rey-Osterrieth Figure Complex (FROC) copy test in the screening of cognitive-visual disorders by the ophthalmologist during the functional ophthalmological examination in preterm children. **Methods:** An observational and retrospective study of a cohort of children with a history of prematurity (n: 144), less than 32 weeks of gestational age or less than 1500 grams of birth weight, aged between 5 and 12 years who had a complete functional ophthalmological examination including FROC. FROC was assessed in three different ways (percentiles according to normative bases, by Z-Score, by qualitative assessment according to the level of organization). The results of FROC in the three assessed ways were related to neonatal variables, with the neurodevelopmental assessment carried out by pediatricians at 20-22 months of corrected age, with neurocognitive diagnoses including visual cognitive and brain lesions present in brain ultrasound performed in neonatal period. Finally, the degree of agreement between the three ways of assessing FROC was obtained. **Results:** A statistically significant relationship was found between having an altered FROC test assessed by percentiles and having an alteration in the mental development index (Bayley II) (p=0.023) and motor development (p=0.000), having a diagnosis of neurocognitive disorder (p=0.005) and cognitive-visual (p=0.03) and severe brain injury (grade 3) (p=0.000). **Conclusions:** The FROC test assessed by percentiles could be a useful tool for ophthalmologists in the early screening of cognitive-visual disorders in children with a history of prematurity and therefore in the diagnosis of cerebral visual deficiency.

P. 07

New trends in Diabetic Retinopathy. Neurodegenerative and Neuroinflammatory Changes.

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Purpose: Type 2 diabetes mellitus (T2DM) is currently a pandemic that induces a wide spectrum of ocular complications, among them the sight threatening diabetic retinopathy (DR). Recent data raised the role of neurodegeneration/apoptosis (ND/AP) and neuroinflammation (NINF) in DR pathophysiology. We deal with evaluating ND and NINF hallmarks in proliferative DR (PDR) patients, regarding glutamate (GLUT)-induced excitotoxicity, increased caspase (CAS)-dependent apoptosis (AP), and tumor necrosis factor alpha (TNFa)-dependent NINF. **Methods**: From a total sample of 150 participants aged 40-80 years, two groups were done: T2DM2 patients with PDR (n=75) and non-diabetics as the surrogate comparative group (SCG; n=75). Vitreous body (VB) samples were collected at the time of programmed vitrectomy and processed by enzyme-like immunosorbent assay (ELISA) technique, to determining GLUT, CAS3, and TNFa. The R Core Team Statistical Computing, v. 4.2.1 was used for statistical processing. **Results:** Mean age of the study population was 54 $\pm$ 16 years. The VB from the PDRG displayed significantly higher levels of GLUT, CAS3 and TNFa ($p \leq 0.001$), as compared to the SCG. **Conclusions:** Differential expression profile of molecules involved in ND/AP and NINF was seen in VB samples of our participants, emphasizing their relevance in advanced DR pathophysiology. It is obvious that a close coupling exists between the GLUT-induced neurotoxicity, CAS-3 dependent AP and TNFa-related NINF, in advanced DR. High GLUT, CAS3, and TNFa expression levels in VB can be consider PDR biomarkers for early managing DR progression in diabetics.

P. 08

Evaluation of anti-inflammatory agents in PLGA microspheres for glaucoma treatment

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Purpose: Inflammation is present in ocular pathologies such as glaucoma. The pharmacological evaluation of the Ursodeoxycholic Acid (UDCA) and Ketorolac (KET) in the J774A.1 macrophage cell line, acting through inhibition of the NLRP3 inflammasome activation, was performed. Then, UDCA and KET were encapsulated in PLGA (polylactic-co-glycolic acid) microspheres (MS). **Methods:** J774A.1 cells were incubated for 24h with UDCA and KET (1-500 µM) to determine cell viability by MTT assay. For induction of NLRP3 inflammasome activation, cells were first primed with LPS (1µg/ml, 4h). Then, UDCA (10 µM) and KET (20 µM) were added for 30 min followed by the stimulation with Nigericine (20 µM, 1h) or ATP (5 mM, 1h). PLGA-MSs loaded with UDCA or KET were prepared according to the solvent extraction-evaporation method from an oil-in-water (O/A) emulsion. Three batches were prepared for each active substance. **Results:** UDCA and KET significantly suppressed IL-1β secretion in macrophages modulating NLRP3 inflammasome activation. Spherical MSs with an appropriate average particle size for intravitreal injection were obtained (32.80 ± 8.22 µm for UDCA and 34.18 ± 9.07 µm for KET). The MSs showed encapsulation efficiencies of 53.26 ± 3.97% for UDCA and 59.91 ± 0.18% for KET, and *in vitro* release profiles of the active substances were studied over 18 days. **Conclusion:** The inclusion of anti-inflammatory agents such as UDCA and KET in PLGA MSs is considered a promising platform for the treatment of inflammatory processes in ocular pathologies like glaucoma. **Acknowledgments:** PID2023-148219OB-C21 funded by MCIN/AEI/10.13039/501100011033. Spanish MECD (PRE2021-097692) for a PhD fellowship (C.M.L.).

P. 09

Solid Lipid Nanoparticles Enriched with the Osmoprotectant Taurine for Enhanced Glaucoma Therapy. Preliminary studies

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Purpose: The current treatment of glaucoma, a leading cause of irreversible blindness, relies heavily on topical administration of formulations with intraocular pressure-lowering drugs, which are often limited by poor bioavailability, short precorneal residence time, and ocular surface side effects. This study aims to develop solid lipid nanoparticles (SLNs) as an advanced drug delivery platform to improve therapeutic efficacy of antihypertensive drugs, while also incorporating an osmoprotectant such as taurine to mitigate ocular surface stress and enhance tolerability. **Methods:** SLNs were formulated using microfluidic techniques. Before the inclusion of taurine as osmoprotectant, immortalized human corneal epithelial cell line (hTERT-HCECs) was used to evaluate its cell viability and osmoprotective effect. Once prepared, the nano-formulations were characterized by particle size, polydispersity, zeta potential, osmolarity, pH, and surface tension. **Results:** Taurine resulted in viability values close to 80% with excellent tolerance at 20 mM being able to increase cell viability compared to. SLNs showed a mean particle size of 180,37nm, PDI of 0,198, and a z-potential of -31,16 mV. The addition of the osmoprotectant maintained near-physiological osmolarity (≈300 mOsm/L) and pH (6.8), essential for ocular comfort. Furthermore, the SLN formulation exhibited a surface tension slightly lower than that of the natural tear film (~42 mN/m), suggesting improved spreading, better retention on the ocular surface, and reduced potential for irritation and reflex tearing. **Conclusion:** SLNs enriched with the osmoprotectant taurine offer a promising strategy for glaucoma therapy by improving ocular surface compatibility, potentially reducing dosing frequency and improving patient adherence in chronic glaucoma therapy. Acknowledgment: PID2023-148219OB-C21 (MCIN/AEI/10.13039/501100011033).

Biodegradable PLGA microspheres for subconjunctival delivery of dexamethasone, α-tocopherol and ketorolac in glaucoma surgery.

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Purpose: To develop and evaluate biodegradable PLGA-based microspheres (MSs) for subconjunctival delivery of dexamethasone (DX), α-tocopherol (VE), and ketorolac (KET) as a multi-target strategy to modulate inflammation and fibrosis in glaucoma surgery. **Methods:** MSs were prepared using a solvent evaporation method. Formulations included a reference (R: DX only) and a combination of DX (80 mg) and VE (40-50-60 µl) (F1, F2 and F3). An additional set of multi-loaded formulations (F4 and F5) combined DX (80 mg), VE (60 µl), and KET (50 or 60 mg) were prepared. Particle size distribution (DLS), morphology (SEM), encapsulation efficiency (EE%), in vitro DX release (HPLC-UV), and injectability through a 30G needle were assessed. **Results:** All formulations achieved yields above 70%. All MSs were spherical, presented superficial porous and showed a unimodal distribution ranging from 24 to 29 µm. VE enhanced DX encapsulation in F1 and F2 (54,9±1.6% and 57,5±3.6%, respectively), while F3, with the highest VE content, showed lower EE% (44.1±0.98%). F3 displayed the fastest DX release, potentially improving early postoperative inflammation control. Interestingly in the DEX and KET-loaded systems (F4 and F5), DX EE% increased to over 90% in both cases, suggesting that KET may contribute to a more favorable internal distribution within the polymer matrix. KET EE% was 45.7% (F4) and 40.4% (F5). All formulations were successfully injectable through a 30G needle without aggregation. **Conclusion:** These findings support the potential of this multi-drug delivery strategy as an adjuvant for improving postoperative outcomes in glaucoma filtration surgery. **Funding:** Health Research Project PI22/00080 (ISCIII).

P. 11

Conjunctival-based Hydrogel as a Therapeutic Platform for Cell and EV Delivery

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Purpose: This study aims to develop and characterize a hydrogel based on human conjunctival extracellular matrix (Conj-ECMh), and to evaluate its capacity for delivering cells and extracellular vesicles (EVs) to the conjunctiva. **Methods:** Conj-ECMh was prepared with type I collagen, hyaluronan, fibronectin, and heparan sulfate, adjusting pH and gelation temperature. Physical characterization included light transmission (300–700 nm), elasticity via spectral-domain optical coherence tomography, enzymatic degradation using 0.1 mg/ml collagenase, and microstructural analysis by cryo-SEM. Conjunctival mesenchymal stromal cells (Conj-MSCs) were incorporated into the hydrogel and cell viability was assessed with alamarBlueHS. EVs from Conj-MSCs were isolated by precipitation, labeled with ExoGlow, and incorporated in Conj-ECMh. A total of 25–30 µl of Conj-ECMh, either alone or loaded with Conj-MSCs and/or 200 µg/ml EVs, was subconjunctivally injected into *ex vivo* rabbit eyes to assess hydrogel retention and cells or EVs delivery. Eyeballs were subjected to histopathological evaluation. **Results:** Conj-ECMh showed optical transparency, soft mechanical compliance, and a porous fibrillar structure. Conj-MSCs remained viable for seven days in the hydrogel, showing good biocompatibility with conjunctival stromal cells. Blank or loaded Conj-ECMh gelified both *in vitro* and *in situ* after subconjunctival injection. Human Conj-MSCs and ExoGlow-labeled EVs were visualized in tissue sections, indicating that they were adequately delivered. **Conclusions:** Conj-ECMh is a promising scaffold for stromal cell support, and shows potential as a delivery platform for both cells and EVs in ocular surface therapy.

P. 12

A Mice Model of Retinal Dopaminergic Depletion: Effects of 6-Hydroxydopamine at a Functional, Histological, and Molecular Level

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Purpose: Parkinson's disease (PD) is a neurodegenerative disorder marked by the loss of dopaminergic neurons. In the retina, where dopaminergic amacrine cells (DACs) regulate the activity of multiple neural components, PD can lead to visual and retinal affectations. To investigate the role of DACs, we employed 6-hydroxydopamine (6-OHDA), a neurotoxin that selectively induces dopaminergic neuron degeneration. Thus, our hypothesis proposes that intravitreal injection of 6-OHDA causes retinal dopaminergic depletion, triggering physiological, molecular, histological and behavioral alterations, resulting in impairing of the visual function. **Methods:** 6-OHDA was administered via intravitreal injection in mice (C57BL/6J). Behavioral and electroretinography (ERG) tests were performed pretreatment and 20 days after administration; ERG was also performed 90 days post administration. Molecular composition and protein expression were analyzed by high-performance liquid chromatography and western blotting 30 and 90 days after treatment. Finally, immunohistochemistry was performed to explore the connections between DAC and other retinal cells after dopaminergic depletion. **Results:** A significant decrease in visual acuity, and electroretinographic response of the animals was observed 20 days after treatment. In terms of molecular composition, changes in the concentration of some dopamine metabolites, in addition to tyrosine hydroxylase, were observed 30 and 90 days after administration of the compound. Moreover, immunohistochemical staining revealed connections between DACs and Starburst Amacrine Cells (SACs), which were affected in the treated animals. **Conclusion:** This research demonstrates that 6-OHDA induces retinal and visual changes, supporting the use of this model to study visual-related dysfunctions in Parkinson's disease.

P. 13

Clinical Outcomes of Preserflo MicroShunt Implantation After Ahmed Valve Surgery in Refractory Childhood Glaucoma

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Purpose: To evaluate the clinical outcomes of Preserflo MicroShunt (PMS) implantation with mitomycin C (MMC) in managing refractory childhood glaucoma previously treated with Ahmed Glaucoma Valve (AGV). **Methods:** This was a single-arm retrospective cohort study including 23 eyes of 22 patients with refractory childhood glaucoma and a history of AGV implantation. All patients underwent PMS implantation with intraoperative MMC (0.04% for 2.5 minutes). Primary endpoints included intraocular pressure (IOP) reduction, reduction in antiglaucomatous medications, and surgical success. 'Complete success' was defined as achieving target IOP without medications; 'qualified success' allowed for medications. Safety parameters included intra- and postoperative complications and the need for further interventions. **Results:** Median follow-up was 23 months (IQR: 18–41). Mean baseline IOP was 27.0 ± 4.3 mmHg with 3.2 ± 0.5 medications. At one year, IOP decreased to 14.1 ± 4.4 mmHg (−47.0%) with 0.4 ± 1.0 medications, and to 16.9 ± 3.6 mmHg (−40.2%) with 1.2 ± 1.5 medications at two years. Overall success rates for ≥20% IOP reduction were 91.3% at one year (69.9% complete success) and 72.7% at two years (45.5% complete success); for ≥30% reduction, they were 82.6% and 63.6%, respectively. One case of device extrusion was observed at 3 months, and another required surgical revision at 5 months. **Conclusions:** PMS implantation with MMC offers a valuable surgical option for managing refractory childhood glaucoma following AGV. The procedure achieved substantial reductions in both IOP and medication burden. Larger studies with extended follow-up are recommended to confirm its long-term efficacy.

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Evolution of iStent Implantation in Clinical Practice: A 13-Year Retrospective Study from Spain

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Purpose: To describe trends in glaucoma surgery following the implementation of the iStent, to characterize the clinical profile of patients undergoing surgery, and assess changes in this profile over time. **Methods:** This longitudinal study included patients undergoing iStent surgery at a Spanish hospital between 2010 and 2022. Data collected included intraocular pressure (IOP), antiglaucomatous medications, structural and functional test results, and other glaucoma-related variables. **Results:** A total of 145 eyes from 117 patients were included. iStent use increased from 3.4% of glaucoma surgeries in 2010 to 9.4% in 2022 ($p < 0.001$). Combined surgery was performed in 95.9% of cases, with standalone procedures in 4.1%. Most eyes (86.2%) were diagnosed with primary open-angle glaucoma. Baseline IOP was 19.2 ± 4.5 mmHg with 1.9 ± 0.8 medications. At one year, IOP decreased to 16.4 ± 2.5 mmHg with 0.6 ± 0.8 medications, and 53.9% of eyes required no medication. Over time, surgeries were increasingly performed in eyes with lower baseline IOP ($p = 0.010$) and mean deviation (MD) ($p = 0.026$), achieving better outcomes in postoperative IOP ($p = 0.010$) and delayed need for medication reintroduction ($p = 0.026$). **Conclusions:** iStent is increasingly used, primarily in combined procedures for patients with mild to moderate glaucoma. Over time, the surgical profile has expanded to earlier stages of the disease, which may enhance outcomes. Its main benefit lies in reducing the need for topical medications with a favorable safety profile.

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Functional Evaluation of the Preserflo MicroShunt Implant Over Two Years in Highly Myopic Eyes

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Purpose: The primary objectives of this study were to assess the reduction in intraocular pressure (IOP) and the decrease in topical hypotensive treatment after Preserflo MicroShunt surgery in patients with high myopia (HM) and primary open-angle glaucoma (POAG). Secondary endpoints included evaluation of changes in visual acuity, optic disc excavation, visual field, and postoperative complications. **Methods:** Retrospective interventional study of an institutional cohort of 90 patients who underwent Preserflo implantation between July 2020 and December 2022 at a tertiary glaucoma center. Data from patients with coexisting POAG and HM were specifically analyzed. **Results:** Mean IOP decreased from 19.8 ± 5.6 mmHg at baseline to 12.0 mmHg (IQR: 8.0–14.8) at year 1 ($P < 0.001$), and to 12.9 ± 2.5 mmHg at year 2 ($P < 0.001$). The mean number of antiglaucomatous medications per patient decreased from 2.72 ± 0.8 at baseline to 0.29 ± 0.7 at year 1 ($P < 0.001$) and 0.47 ± 0.8 at year 2 ($P < 0.001$). Overall surgical success was 83.3% at year 1 and 77.7% at year 2. Early adverse events included intraoperative hyphema, need for ≥2 entries, numerical hypotony, and positive Seidel test. Late adverse events were limited to bleb encapsulation. No cases of choroidal detachment or macular edema were observed. **Conclusions:** These results align with existing literature on POAG and secondary surgeries, supporting Preserflo as a safe and effective option for reducing both IOP and medication burden in patients with high myopia.

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3D Printed Collagen And Mesenchymal Stem Cells For Limbal Disease

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Purpose: The favored treatment for partial LSCD is amniotic membrane (AM), allowing the growth of the remaining limbal stem cells (LSCs). In complete LSCD, the preferred treatment is CLET. Studies showed that mesenchymal stem cell (MSC) transplantation is as safe and effective as CLET. Recent studies further demonstrate a successful differentiation of adipose-derived adult stem cells (ADSCs) to LSCs. Combining AM transplantation with LSCs results in improved treatment efficacy. A disadvantage of using AM is the variability among donors, increasing the risk of rejection in allogeneic transplants, so research is being conducted into other carriers. **Methods:** We propose the use of 3D-printed collagen as a scaffold colonized with LSCs derived from ADSCs for the treatment of complete LSCD in a rat animal model. The differentiated LSCs in AM or a 3D-printed collagen I scaffold were transplanted into a rat model of LSCD. **Results:** The epithelium closed the imposed wound in all groups. 3D-printed collagen scaffold integration was statistically superior to AM. The hADSC-derived LSCs cells further enhanced integration, indicating that they contribute to the scaffold's integration. However, the generated epithelium was conjunctival and host-derived, so the contribution of ADSC-derived LSCs was not enough for re-epithelization. **Conclusions:** The 3D-printed collagen scaffolds showed good transparency. In vitro hADSC targeted differentiation to LSCs showed faster kinetics on 3D-printed collagen and AM respect to culture plastic. 3D-printed collagen was the most efficient substrate in terms of differentiation, with the highest percentage of hADSC-derived LSC expression positive for the specific markers used (p63α and BMI-1).

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3D-printed collagen scaffold for the treatment of corneal stromal debilitating

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Purpose: The standard treatment for corneal disease is penetrating or lamellar keratoplasty, requiring a human donor cornea. Despite high success ratio of these transplants, it is estimated that only one in seventy patients worldwide can obtain a corneal donation. This highlights the need to generate a biomimetic, biocompatible and affordable artificial corneal prosthesis that can replace the donor's natural cornea. Advances in corneal tissue engineering focus on building a structure that mimics the physicochemical properties of the cornea using natural materials, such as collagen hydrogels, as it is the main component of the cornea´s extracellular matrix. **Methods:** We fabricate a 3D-printed collagen I-based biomimetic artificial corneal stroma and demonstrate its biocompatibility in a rabbit animal model. **Results:** 3D printed collagen scaffolds are transparent, and they support keratocyte phenotype maintenance and human mesenchymal stem cells directed differentiation towards keratocytes in vitro. In vivo, 3D printed scaffolds are biocompatible as well, showing integration, progressive corneal transparency and corneal hydration homeostasis. No signs of leukocyte infiltration were found, the host keratocytes did not colonize the grafts at the 4-month follow-up, and no keratocyte´s activation was detectable either. **Conclusions:** These results demonstrate the potential clinical applications of this structure as an alternative to lamellar donor corneal transplantation. Other advantages are reproducibility, possibility of planning, as there is no donor-to-donor variation, no expensive screening regimens are required, no femtosecond laser is necessary to cut the donor cornea, collagen delivery is more reliable, and a standardized and customized product with known physical properties can be achieved.

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Visual Impact of Gene Therapy in Patients with Choroideremia: A Meta-Analysis of Clinical Trials

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Purpose: To systematically review the published literature on clinical trials of gene therapy in patients with choroideremia (*CHM* gene mutation). **Methods:** A comprehensive search was conducted in MEDLINE, Cochrane, ClinicalTrials.gov, and Scopus (Elsevier) up to November 1, 2024, and was limited to studies published in English, Spanish, or French. Clinical trials evaluating the efficacy of gene therapy in patients with a confirmed molecular diagnosis were included. Methodological quality was assessed using the Cochrane Risk of Bias Tool 2.0. A random-effects meta-analysis was performed to compare best-corrected visual acuity (BCVA) in treated versus untreated eyes. The REML estimator and Hartung-Knapp adjustment were applied. Heterogeneity was assessed using the I^2 statistic and the Q test. **Results:** Eleven studies were included (n = 403; 186 treated eyes vs. 217 controls). The overall effect size was small and not statistically significant (SMD = 0.29; 95% CI: -0.32 to 0.90; p = 0.31). Heterogeneity was high (I^2 = 85.4%, p < 0.0001), indicating substantial variability among studies. No publication bias was detected (Egger's test: t = -0.82, p = 0.43). **Conclusion:** Although some individual studies reported significant visual improvements with gene therapy in choroideremia, the pooled effect was modest and not statistically significant. The high heterogeneity suggests differences in study design, follow-up duration, and inclusion criteria. More robust and standardized trials are needed to draw definitive conclusions about its efficacy.

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Glaucoma and periodontal disease, a systematic review and Meta-Analysis

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Purpose: To assess the association between periodontal disease and glaucoma in adults through systematic review and meta-analysis of observational studies. **Methods**: A systematic search was performed in PubMed/Medline, Scopus, Web of Science, Embase, Cochrane Library, LILACS, Google Scholar and journals with the highest impact in Ophthalmology, available until 28 December 2024. The study was performed in compliance with the Preferred Reporting Items for Systematic Reviews and Meta-analyses reporting guidelines. Eligible articles were independently screened and quality assessed by three reviewers. All case-control, cross-sectional, and cohort studies reporting a quantitative effect estimates and 95% confidence interval (CI) for the association between periodontal disease and glaucoma were included. Effect estimates for the association with glaucoma were pooled using random effects meta-analysis (Review Manager Version 5.4). Studies not meeting formal inclusion criteria for systematic review, but with pertinent results, were also appraised and discussed. **Results:** 327 studies were screened, and 6 studies were included in the systematic review. Pooled effect estimates indicated a positive association between periodontitis and glaucoma (OR: 2.09; 95% confidence interval [CI], 1.39 – 3.14; P=0.008; I2= 91%). **Conclusions:** Available studies showed a significative association between periodontal disease and glaucoma. Patients with periodontal disease have a higher odd to present glaucoma, compared with patients without it.

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Temporal Characterization of Photorreceptor Degeneration in R10 Mice: Functional, Structural and Behavioral Study

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Purpose: Unlike other retinal degeneration models, in R10 mice the photorreceptor maturation and degenerative periods do not overlap in time, making it possible to study therapeutic strategies for photorreceptor rescue. We characterized the progression of photoreceptor degeneration in the Rd10 mouse model of retinitis pigmentosa across different ages (P12 to P35) using a multifocal approach that includes functional, behavioral and structural evaluation. **Methods**: Rd10 x Opn4$^{-/-}$ mice were evaluated at postnatal days P12, P15, P18, P21, P25, P30, and P35. Visual function was studied using full-field ERG to measure the electrical response of the retina. Visual acuity and contrast sensitivity were evaluated behaviorally using the OptoDrum system. Retinal sections were processed for immunohistochemistry to evaluate the structural changes and photoreceptor survival. **Results**: ERG recordings showed a progressive decline in both scotopic and photopic responses starting from P21, with significant reductions by P25 and near-absence of responses by P35. OptoDrum testing revealed a parallel decline in visual acuity and contrast sensitivity, as in ERG. Immunohistochemical analysis confirmed a time dependent loss of rod and cone photoreceptors, along with thinning of the outer nuclear layer. Earlier ages showed relatively preserved structure and function, while later stages exhibited marked degeneration. **Conclusions**: Photoreceptor degeneration in Rd10 mice progresses rapidly between P21 and P35, as demonstrated by converging evidence from electrophysiological, behavioral, and histological analyses. These findings provide a temporal framework for the window of intervention in therapeutic studies.

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MYOC dominant juvenile glaucoma characterization in a zebrafish genetic model

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Purpose: Glaucoma encompasses a group of progressive optic neuropathies characterized by apoptotic degeneration of retinal ganglion cells, elevated intraocular pressure, and gradual peripheral vision loss. The MYOC gene harbors over 300 pathogenic variants associated with autosomal dominant juvenile glaucoma. Among these, the Pro370Leu (P370L) mutation stands out for causing an exceptionally severe form of juvenile glaucoma. This work aimed to investigate the role of this gain of function mutation in dominant glaucoma pathogenesis. **Methods:** To tackle this objective, a zebrafish knock-in model carrying this specific mutation was developed and functionally characterized. The mutant line was generated through CRISPR/Cas9 genome editing using ssODNs as donor DNA, followed by rhAmp genotyping for founder identification. Functional characterization involved morphological, histological, and immunohistochemical analyses of larval and adult specimens. Visual function was further assessed through optokinetic response assays. **Results:** The mutation induced a gain-of-function phenotype, manifesting as craniofacial abnormalities at 6 months of age resembling those associated with loss-of-function mutations in other zebrafish glaucoma-related genes such as cyp1b1. While the phenotype exhibited incomplete penetrance and variable expressivity linked to genetic background, homozygous individuals demonstrated more pronounced pathological features. Histological studies and optokinetic testing revealed endoplasmic reticulum stress in anterior ocular segment structures and early signs of visual dysfunction. **Conclusion:** These results corroborate the validity of this experimental model for glaucoma research.

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Therapeutic Potential of MP-004 in Slowing Retinal Degeneration in Rho$^{+/P23H}$ Mice

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Purpose: Retinitis pigmentosa (RP) is a genetically heterogeneous retinal degenerative disease for which no effective general treatment currently exists. The novel compound MP-004 exerts its therapeutic potential by interacting with the modulator FKBP12 and ryanodine receptors, thereby regulating calcium leakage and endoplasmic reticulum stress, and reducing oxidative stress.
Methods: MP-004 (n=19) or PBS (n=15) eyedrops were administered to Rho$^{+/P23H}$ (P23H) mice, (model of RP) on alternate days (M-X-F), beginning at postnatal day 21 for up to 7 months and still going. Wild-type (WT) mice served as degeneration reference. Retinal function was assessed at 3, 4, 5, and 7 months using electroretinography (ERG). Retinal structure was evaluated at 6 months via optical coherence tomography (OCT).
Results: At 3 months under scotopic conditions, MP-004-treated mice showed better a-wave preservation than PBS-treated mice, although both were reduced compared to WT. The b-wave was moderately reduced in both groups, with slightly improved responses in MP-004-treated mice. Under photopic conditions, no significant differences were observed between the MP-004 and control P23H mice, though signs of hyperexcitability appeared in both RP groups compared to the WT. Sex-based analysis showed MP-004-treated mice had better retinal responses than PBS controls, with significant improvements in males at 4, 5, and 7 months. No effect was observed in females. OCT imaging on P23H male mice showed reduced retinal degeneration, particularly in the outer nuclear layer, in MP-004-treated animals.
Conclusion: MP-004 partially preserved retinal function and structure in Rho$^{+/P23H}$ mice, indicating its potential as a therapeutic agent to slow RP progression.

P. 23 – O. 01

Alzheimer's Disease Through Tears: A Systematic Review

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Purpose: To analyze the main findings in tears related to Alzheimer's disease (AD), as well as the value of tear biomarkers and their contribution to the early diagnosis of the disease.

Methods: A comprehensive search of the medical literature was conducted using "MESH" terms in PubMed and Scopus up to April 2024. This review followed the PRISMA 2020 Statement guidelines and was registered (INPLASY2024120034). All papers selected were written in English and 93 studies were included in this systematic review.

Results: We observed significant alterations in the concentration of proteins, microRNAs, and extracellular vesicles (EVs) in AD patients compared to healthy controls. Elevated levels of Aβ38, Aβ40, Aβ42, t-Tau, and p-Tau were found in patients with mild cognitive impairment (MCI) and AD. Lactoferrin showed reduced levels in AD patients, proposed as a potential disease marker. The presence of microRNA-200b-5p was associated with AD, differentiating it from subjects with MCI. Preliminary studies suggest that EVs contain specific proteins and microRNAs associated with neurodegeneration. Advanced techniques such as Raman spectroscopy and ELISA showed significant differences in tear composition between groups. The most commonly used collection methods were Schirmer strips and capillary tubes, with no consensus on the most suitable method.

Conclusion: These findings reinforce the potential of tears as a non-invasive tool for the early diagnosis of the disease. The review highlights the necessity for additional research to standardize methods collection and analysis, and to validate the identified biomarkers in larger populations. Ultimately, tears could become an essential tool for management of AD.

P. 24 – O. 02

Citicoline and CoQ10 modulate retinal inflammation in mouse model of ocular hypertension

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Purpose: To investigate the anti-inflammatory effects of the combination of citicoline and CoQ10 in an experimental model of ocular hypertension (OHT). **Methods:** Four groups of mice were used: vehicle (Veh, n=6), Citicoline and CoQ10 (CitQ10, n=6), laser vehicle (LG+Veh, n=12), and laser CitQ10 (LG+CitQ10, n=12). The combination was administered daily with gelatin 15 days prior to laser induction and for 3 days post-induction in CitQ10 and LG+CitQ10 groups. The Vehicle and LG+Veh groups received neutral gelatin. OHT was induced in the left eye by laser photocoagulation and both eyes were evaluated. Retinal whole-mounts were processed at 3 days with: 1) Anti Iba-1 to quantify the signs of microglial activation (number of Iba-1+ cells; retinal area occupied by Iba-1+ cells; cell body area of Iba-1+ cells; arbor area of Iba-1+ cells and number of Iba-1+ Vertical processes between OS and OPL); 2) Anti-P2RY12 to differentiate activated from resting microglia. 3) Anti-GFAP to quantify the retinal area occupied by GFAP+ cells in NFL-GCL. **Results:** In the laser CitiQ10 group, the Citicoline + CoQ10 compound revealed: i) an IOP decrease at 24 h and 3 days post-laser; ii) reduced signs of microglial activation (cell body area, arbor area, microglia number, P2RY12 expression); and iii) reduced signs of macroglial activation (decreased GFAP+ area). **Conclusions:** Oral administration of Citicoline and CoQ10 can decrease signs of glial activation in OHT eyes, attenuating the neuroinflammatory processes in glaucoma.

P. 25 – O. 03

Topical Administration of Preimplantation Factor (sPIF) as a Potential Therapy for Retinitis Pigmentosa.

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Purpose: Retinitis Pigmentosa (RP) is a group of inherited retinal dystrophies and a leading cause of hereditary blindness. Its genetic heterogeneity (>3000 mutations in >60 genes) complicates the development of universal treatments. Gene-independent therapies represent a valuable strategy to treat a wide variety of RP. Preimplantation Factor (PIF) is an embryonic and placental peptide with immunomodulatory and neuroprotective functions. Its potential as a topical treatment has been explored. **Methods:** rd10 mice were daily treated with sPIF eye drops (0.67 mg/mL) or vehicle from postnatal day (P)15 to P28. Visual function was assessed via electroretinography (ERG), and retinal structure was evaluated by immunofluorescence. Primary microglial cultures were treated with LPS (33 ng/mL) and/or sPIF (1.8 µM). Cytokine secretion (TNF-α, IL-6) was quantified by ELISA, and RNAseq was performed to assess differential gene expression. **Results:** Eye drop sPIF-treated mice showed significantly higher ERG amplitudes in both mixed and photopic responses compared to control mice. Retinal histology revealed better preservation of the structure and number photoreceptors in the central retina. Furthermore, sPIF reduced macroglial reactivity ($GFAP^+$) and the number of activated microglia ($Iba1^+/CD68^+$) in the outer retinal layers. In primary microglia culture, sPIF reduced TNF-α and IL-6 secretion upon LPS stimulation RNAseq analysis revealed that differentially expressed genes between LPS and LPS+sPIF conditions were mainly associated with hypoxia-related pathways. **Conclusions:** Topical sPIF administration ameliorates RP progression by preserving retinal structure and visual function, likely through anti-inflammatory and stress-modulating effects. These findings support sPIF as a promising, non-invasive therapeutic candidate for RP.

P. 26 – O. 04

Role of HMGB1 in Retinitis Pigmentosa Progression: Therapeutic Potential of the BoxA Antagonist in Retinal Degeneration.

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Purpose: Retinitis Pigmentosa (RP) is a group of retinal dystrophies responsible for most cases of hereditary blindness. Despite its genetic heterogeneity (>3000 mutations and >80 genes), common molecular and cellular alterations drive retinal neurodegeneration. This study investigates HMGB1, a nuclear protein released extracellularly during cellular stress and immune cell activation, which stimulate Toll-like receptors (TLRs) to propagate sterile inflammation. The hypothesis posits HMGB1 as an alarmin amplifying neuroinflammation in RP and contributing to retinal degeneration. **Methods:** In the RP rd10 mice model, BoxA, a HMGB1 peptide that antagonizes extracellular HMGB1, was administrated by intravitreal injection (1 µL, 1 mg/mL). Immunofluorescence was performed in flat-mounted and cryosections of retinas. Visual function was assessed by electroretinogram (ERG). Microglial primary cultures were exposed to 33 ng/mL LPS or Pam3CSK4 (TLR4 and TLR2 ligands, respectively) in presence or absence of BoxA (150 ng/mL). Cytokine released was measured by ELISA. **Results:** In rd10, cytoplasmic HMGB1 location, previous step to extracellular secretion, was detected in reactive microglia of the subretinal space and in infiltrating monocytes, while photoreceptors showed increased nuclear levels of HMGB1. BoxA-treated mice exhibited preserved retinal structure, increased photoreceptor survival, and enhanced ERG amplitudes (mixed/photopic responses) compared to controls. In vitro, BoxA suppressed TNF-α and IL-6 secretion in LPS/Pam3CSK4-stimulated microglial cultures, indicating HMGB1-TLR pathway modulation. **Conclusion:** These results demonstrate that HMGB1 inhibition mitigates retinal inflammation and neurodegeneration preserving visual function, supporting BoxA as a potential treatment for RP.

P. 27 – O. 05

Diagnostic Performance of Artificial Intelligence-Assisted Fundus Imaging in Glaucoma Detection: A Systematic Review and Meta-Analysis

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Purpose: *To systematically review the literature on the diagnostic performance of AI algorithms applied to fundus imaging for glaucoma detection, comparing them with assessments made by experienced ophthalmologists, in order to evaluate their efficacy and clinical utility in the early diagnosis of the disease.* ***Methods:*** *A systematic review and meta-analysis was conducted by collecting articles published in databases such as Medline and Scopus. Observational or experimental studies involving patients diagnosed with or suspected of having glaucoma were included. Various AI algorithms, including machine learning and deep learning models, were analyzed. Their performance was evaluated using area under the curve (AUC), sensitivity, specificity, and accuracy. Data were analyzed both qualitatively and quantitatively, using diagnostic accuracy analysis, diagnostic odds ratio (DOR), and summary ROC curves of the different models evaluated.* ***Results:*** *A total of 582 articles were initially identified, from which 36 studies were selected. Sensitivities ranged from 0.447 to 0.997, and specificities from 0.547 to 0.998. Bivariate analysis estimated a pooled sensitivity of 0.880 and specificity of 0.905, with an AUC of 0.95, indicating high discriminative power. Public datasets showed better performance (sensitivity 0.904, DOR 100.3, AUC 0.956) compared to private datasets, although with greater heterogeneity (I^2 = 28.2% vs. 9.3%). The overall DOR was 72.86, confirming the high diagnostic performance of AI models in glaucoma detection.* ***Conclusion:*** *AI models applied to fundus imaging demonstrate high diagnostic performance in detecting glaucoma. The summary AUC of 0.95 confirms their discriminative ability. However, moderate heterogeneity among studies was observed.*

P. 28 – O. 06

Ophthalmic Administration of Adalimumab Encapsulated in Lipid Nanocarriers for Retinitis Pigmentosa

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Purpose: To develop and evaluate a non-invasive ocular delivery system using nanostructured lipid carriers (NLCs) loaded with adalimumab (ADA), an anti-TNFα monoclonal antibody, for the treatment of retinitis pigmentosa (RP). **Methods**: NLCs were prepared via hot-melt homogenization and characterized for size, zeta potential, and morphology. The encapsulation efficiency and release profile of ADA were assessed. *In vitro* and *ex vivo* toxicity studies were conducted using retinal and red blood cells. Corneal permeation and ocular distribution were evaluated in swine and murine models. The therapeutic efficacy of NLC-ADA eye drops was tested in *rd10* mice, a model of RP, by assessing visual function, retinal degeneration, and inflammation. **Results**: NLC-ADA exhibited excellent physicochemical properties, with high encapsulation efficiency and sustained drug release. In vitro and ex vivo studies showed no significant toxicity. NLC-ADA demonstrated good corneal permeation and high retinal distribution in mice. In rd10 mice, NLC-ADA eye drops improved retinal function, reduced photoreceptor degeneration, and decreased inflammation. Specifically, NLC-ADA reduced M1 microglial activation, macrophage infiltration, and the levels of NLRP3 inflammasome components. **Conclusion**: NLC-ADA eye drops offer a promising non-invasive therapeutic option for RP, effectively delivering ADA to the retina and mitigating inflammation and degeneration. This approach could be extended to other inflammation-related retinal diseases, providing a safe and efficient alternative to current invasive treatments.

P. 29 – O. 07

Diabetes Complications: Diabetic Retinopathy and the Potential Benefits of Saffron

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Purpose: Diabetic retinopathy (DR) is one of the most frequent microvascular complications of diabetes and a leading cause of vision loss. The aim of this study was to evaluate the potential neuroprotective effects of Repron®, a chemically characterized saffron extract, and its by-products (petal and stamen extracts), on retinal cells under hyperglycemic stress and in a type 1 diabetic mouse model.
Methods: In vitro, human retinal pigment epithelial cells (ARPE-19) were exposed to hyperglycemic conditions and treated with Repron® or saffron by-product extracts. Cell viability and morphology were analyzed. In vivo, type 1 diabetes was induced in wild-type mice (3 months old) via intraperitoneal streptozotocin (STZ) injection (150 mg/kg). After confirmation of hyperglycemia, mice were treated orally with Repron® (10 mg/kg in drinking water) for two weeks. Retinal function and structure were evaluated through behavioral (Prusky Water Maze), functional (ERG), and morphological (OCT and fluorescein angiography) assessments. **Results:** In vitro results showed a significant protective effect of both Repron® and saffron by-product extracts against hyperglycemia-induced damage in ARPE-19 cells. Preliminary in vivo data also suggested a trend toward improved retinal function and morphology in saffron-treated diabetic mice compared to untreated controls. **Conclusion:** Saffron Repron® and its by-products exhibit protective activity on retinal cells exposed to hyperglycemic damage, supporting their potential as adjunctive nutraceutical strategies for DR. Further long-term studies are needed to validate these findings and explore their translational relevance in diabetic patients.

P. 30 – O. 08

Gut microbiota changes in a large family with central areolar choroidal dystrophy

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Purpose: Central areolar choroidal dystrophy (CACD) is an inherited retinal dystrophy caused by mutation in the peripherin-2 gene (PRPH2), essential for the morphogenesis and structure of the outer segment discs of photoreceptor cells. In Spain, 61 patients of the same family have been diagnosed with CACD caused by the mutation p.Arg195Leu in the PRPH2 gene. Emerging evidence suggests that gut microbiota influences eye diseases. In this study, we have characterized for the first time the gut microbiome in patients with CACD and their cohabitant relatives. **Methods:** Thirty-four members of the Spanish family carrying the Arg195Leu mutation in PRPH2 and twenty-five cohabitant counterparts were recruited to participate in the study. Written informed consent was obtained from all participants according to the Helsinki Declaration, and the ethics committee of the University of Alicante (UA-2022-07-20_2). Fecal samples were collected throughout a Sample Collection Microbiome Kit. Genomic DNA was isolated from 1 ml aliquots using the QIAmp PowerFecal ProDNA kit. DNA concentrations were measured with the Qubit 2.0 Fluorometer, and its purity was assessed using the NanoDrop 1000 spectrophotometer. **Results:** The principal component analysis (PCA) showed substantial overlap between the microbial profiles of affected and unaffected individuals, with no significant differences in alpha diversity among groups, indicating similar abundance of different bacterial taxa within samples. Beta diversity analyses utilizing the Bray-Curtis dissimilarity matrix revealed no significant differences between affected and unaffected members, indicating no differences in taxa composition between groups. However, the taxonomic composition analysis demonstrated significant differences in the relative abundance of microbial taxa, with increase of the potentially proinflammatory genus *Parabacteroides* and *Dorea* in the CACD patients as compared to their cohabitant relatives. **Conclusion:** This study establishes a correlation between suffering from inherited retinal dystrophy and gut microbiome signatures in humans, providing insights into the potential role of the gut microbiome in retinal pathogenesis and progression, as well as novel diagnostic biomarkers and therapeutic strategies targeting the gut-eye axis in retinal dystrophies.

P. 31 – O. 09

Temporal dynamics of gene expression following optic nerve crush in a rodent model

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Purpose: The study of genes expressed by specific cell populations or involved in distinct cell death pathways can be highly relevant for the development of neuroprotective strategies. The aim of this study is to perform a temporal analysis of gene expression changes in both injured and contralateral retinas following optic nerve crush (ONC) in rats. **Methods:** ONC injury was induced in the left eye of Sprague-Dawley rats. Naïve retinas, injured, and their fellow-contralateral retinas were collected at 1- or 7-days post-injury for RNA extraction, and gene expression was analyzed using the QuantSeq technique (n=6/timepoint). **Results:** ONC induces a significant downregulation of the RGC-specific gene Pou4f1 at both 1- and 7-days post-injury; however, the expression of the intrinsically photosensitive RGC gene Opn4 remains unaltered. At 24 hours post-injury, *Casp3*, *Tnfr12a* and *Stat3*, genes associated with apoptosis and inflammation, are already upregulated, and their expression remains elevated by 7 days post-injury. However, genes related to necroptosis (*Ripk1*, *Ripk3*, *Mlkl*), pyroptosis (*Gsdmd*), and ferroptosis (*Gpx4*) were not altered after injury. Comparison between 1 and 7 days after injury revealed downregulation of the RGC-associated genes *Rbpms*, *Pou4f1*, and *Thy1*, whereas genes involved in cell death pathways did not show significant temporal variation. Additionally, no significant differences in the expression of death pathway genes were found between contralateral and naïve retinas. **Conclusion:** ONC injury downregulates RGC-associated genes and activates cell death pathways, primarily through apoptosis and inflammation, contributing to retinal neurodegeneration.

Retinal Microglia Quantification in the APP$^{NL-F/NL-F}$ Alzheimer's Model Using An Automated Image Analysis Tool

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Purpose: To analyze age-dependent morphological changes in retinal microglial cells in the APP$^{NL-F/NL-F}$ mouse model of Alzheimer's disease, using a custom-developed expert system specifically designed for automated imagen analysis and quantification of retinal glial morphology. **Methods:** Retinal wholemounts from wild-type and APP$^{NL-F/NL-F}$ mice aged 6, 9, 12, 15, 17, and 20 months (n=6 per group) were analyzed. Microglial features were quantified in the outer (OPL) and inner (IPL) plexiform layers using our software. The tool integrates soma detection, quantification, skeletonization, and arborization measurements—these last two being automated for the first time. The system enables rapid and reproducible quantification across a wide range of image quality levels. A *p*-value of <0.05 was considered statistically significant. **Results:** APP$^{NL-F/NL-F}$ mice showed a progressive increase in microglial soma area across all ages and layers compared to WT controls. Concurrently, a progressive reduction in arborization area was also observed, along with decreased structural complexity as measured by skeletonization consistent with a reactive microglial phenotype. These alterations suggest a chronic reactive phenotype in retinal microglia as the disease progresses. **Conclusion:** A novel expert system was developed for the standardized and automated analysis of retinal microglia, incorporating the first known implementation of automated skeletonization and arborization quantification. The tool demonstrated high accuracy, scalability, and robustness to image quality, allowing for harmonized measurement criteria and optimized sample use. Application to the APP$^{NL-F/NL-F}$ model revealed age-dependent morphological changes consistent with progressive microglial activation, supporting its utility as a standardized tool for investigating neuroinflammatory alterations in neurodegenerative disease models.

P. 33 – O. 11

Exploration of the Use of Luminescent Nanoparticles as a Potential Diagnostic Tool: Distribution and Effects in Mouse Retinas

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Purpose: Retinitis pigmentosa (RP) is the leading cause of hereditary blindness, caused by over 3000 mutations across more than 80 genes. The different forms of RP result in the progressive death of photoreceptors and neuroinflammation. We hypothesize that neuroinflammation causes an increase in the temperature of the retina and adjacent tissues, and that such temperature changes can be monitored using Ag_2S nanoparticles (NPs). The optical properties of Ag_2S NPs convert them into promising contrast agents and thermometric probes. This work evaluates the feasibility of using NPs in vivo in the mouse eye. **Methods:** NPs were synthesized by thermal decomposition, combining silver and sulfur ions, with an added amphiphilic copolymer to enhance biocompatibility and preserve photoluminescence. NPs were administered by intravitreal injection and visualized in the eye using near-infrared (NIR) hyperspectral imaging. Their influence on visual function and retinal structure was assessed using electroretinography (ERG) and optical coherence tomography (OCT). The biodistribution of NPs in the eye of the wild-type (WT) and in that of RP model (rd10) mice was determined using NIR imaging and immunofluorescence. **Results**: OCT and ERG analysis showed no significant alterations due to the presence of NPs. In WT animals, NPs were detected and localized in the choroid, ciliary processes, lens, and vitreous humor. Occasional NP assemblies were found in the retina. NPs administrated to rd10 mice exhibited similar locations. **Conclusion:** Ag_2S NPs do not cause evident alterations of retinal function and structure. NPs based on Ag_2S hold potential as a diagnostic tool for RP.

P. 34 – O. 12

Analysis Of The Sex-Related Inflammatory Response To Glaucoma In Mice.

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Purpose: Glaucoma is one of the leading causes of irreversible blindness worldwide. Cytokine signalling has been involved in the glaucoma-related neuroinflammation, but despite the sex differences described, most research has been conducted in males. Therefore, we have analysed sex-related dimorphisms in the neuroinflammatory response of mice retinas to an increase of ocular hypertension (OHT), used for modelling glaucoma. **Methods:** C57BL/6 adult male and female mice were employed, and their retinas assigned to control (NAÏVE), OHT-induced (OHT) and contralateral (CONTRA) groups. Retinal concentrations of pr o-inflammatory (IFN-γ, IL-1β, IL-6, IL-8) and anti-inflammatory (IL-10, IL-4, VEGF) cytokines were measured via multiplex and ELISA at several time points post-procedure. **Results:** Sexual dimorphisms in baseline retinal cytokine levels were detected, with females showing higher levels of anti-inflammatory cytokines than males. OHT induced a remarkable increase in IL-6 levels in both sexes, more marked in the short-term and among females, while a decrease in IL-1β and IL-8 content was found in both sexes. A decrease in retinal IL-4 and IL-10 levels was observed following OHT in females, whereas among males IL-10 levels increased after OHT. Retinal VEGF levels were diminished following OHT in both males and female mice, with a short-term transient increase in females. Comparable but less pronounced effects were observed in the CONTRA retinas. **Conclusion:** Sex-differences at basal anti-inflammatory retinal cytokines were observed, with females showing increased levels, probably due to the protective effects of estrogens; additionally, females also showed a more pronounced disruption of the inflammatory homeostasis in response to OHT.

P. 35 – O. 13

Inflammation Of Glial Cells In The Visual Pathway In An Animal Model Of Glaucoma.

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Purpose: Inflammation of the retina and multiple nuclei of the visual pathway are observed in glaucoma, a neurodegenerative disease that results in vision loss due to the degeneration of the axons of the retinal ganglion cells. Hereby, this study focused on the temporal progression of the activation of glial cells along specific relay nuclei of the visual pathway. **Methods:** An experimental model of glaucoma was performed on C57/BL6 male and female adult mice. Specifically, an increase in ocular hypertension (OHT) was unilaterally induced in the left eye (OHT eye) through laser photocoagulation, while the right eye was not surgically manipulated and remained normotensive (CONTRA eye). Intraocular pressure (IOP) was registered at several time points until sacrifice, 15 and 28 days post-laser induction. At these time points brains were removed and the dorsolateral geniculate nucleus (dLGN), superior colliculus (SC), and visual cortex (V1), selected for immunohistochemical analysis of specific markers of microglial and macroglial cells, Iba-1, and GFAP, respectively. **Results:** Present results show an increase in the presence of active microglial morphotypes, both in male and female animals, mainly in the right hemisphere, which receives 95% of the retinal projections, of the three nuclei mentioned above, at day 28, and in day 15 at a milder extend. Similar results were achieved for GFAP expression. **Conclusions:** These preliminary results suggest that the neuroinflammation processes described within the retina in this model of glaucoma, progress along the optic tract impacting on these relay nuclei; despite their physiological implications remain to be elucidated.

P. 36 – O. 14

Visual Distorsiometry: An Alternative Tool For Measuring Visual Quality

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Purpose: Presbyopia is a leading visual dysfunction affecting population from the fourth decade of life onwards, causing difficulty in clearly visualizing at close distances that is usually corrected with multifocal lenses (with glasses, contact lenses or surgical procedures). Moreover, ageing is related with visual impairment by visual scattering due to loss of cornea and/or lens transparency, that is enhanced by presbyopia correction. One of the higher demanding visual activities is night-time driving, where visual impairment related with age and presbyopia correction reduce contrast sensitivity and increase photic phenomena perception. However, it is difficult to evaluate these night-time driving disabilities in non-real conditions. For this reason, new techniques to assess and quantify visual impairment related with presbyopia correction are necessary. **Methods**: This project develops a new technique to measure and quantify visual disability, assessing the impact of presbyopia correction at night driving. **Results**: A new night-driving "set-up" has been developed to measure different vision quality related parameters (glare, starburst, halo perception and contrast sensitivity) grouped as visual distorsiometry. **Conclusion**: It is possible to measure visual impairment related with presbyopia correction and its impact in night driving in a set-up that recreates real conditions. These measurements can help to improve presbyopia patients visual care, making them feel the visual disturbances and knowing the less visual disturbing option to correct their ametropia – the best in decreasing glare, starburst and halo perception and improving contrast sensitivity– to guarantee their night driving safety

P. 37 – O. 15

Characterization of Axon Initial Segment alterations in Retinal Ganglion Cells during axonal degeneration

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Purpose: Glaucoma is a neurodegenerative disease that causes irreversible vision loss due to the death of retinal ganglion cells (RGCs). The axon initial segment (AIS) is a highly specialized structure responsible for generating the action potential in CNS neurons. Ankyrin G (AnkG/ANK3) is a pivotal scaffold protein organizing the AIS components. Therefore, the aim of this study is to characterize anatomically the AIS in RGCs and to investigate AIS alterations in RGCs in a model of axonal degeneration.

Methods: Control, retinal explants (0h, 2h, 6h, 24h, 72h) and primary RGC cultures from adult rats were performed and analyzed using immunohistochemistry with anti-AnkG antibody to label AIS and anti-Neurofilament-L antibody to label the RGCs and their axons.

Results: In control retinas, large RGCs exhibit a trend toward longer AIS lengths and distance between the soma and AIS. At 2h and 6h explants, AnkG becomes punctate and disorganized, and many RGCs did not show AnkG in their axons. By 24h, AnkG is dispersed in the soma and axon. At 72h, AnkG is mostly in the soma and nearly lost from degenerating axons. In pure cultures of RGCs, AnkG appears to be dispersed throughout the soma as well as in neurites.

Conclusion: These findings highlight the importance of the AIS in the integrity of RGCs and its potential disruption in neurodegenerative diseases such as glaucoma. Furthermore, the results open new avenues for future research that could lead to the development of innovative treatments for glaucoma.

P. 38 – O. 16

Effect of N-acetyl Cysteine (NAC) Treatment on Retinal Function in PRPH2-Related Mouse Models

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Purpose: Mutations in the PRPH2 gene lead to progressive photoreceptor degeneration and vision decline. Oxidative stress contributes to this process, suggesting antioxidants like N-acetylcysteine (NAC) – a glutathione precursor with antioxidant properties – may offer neuroprotection. We evaluated the long-term effects of NAC on retinal function and structure in two PRPH2 mutant mouse models.
Methods: Heterozygous PRPH2 WT/KI (knock-in) and WT/KO (knock-out) mice were given NAC (7 mg/mL) in drinking water from birth, while matched controls received water only. Retinal function was assessed using electroretinography (ERG) at multiple time points to evaluate electrical responses of the retina. Additionally, retinal structure was measured using optical coherence tomography (OCT), and optomotor reflex testing was performed for evaluating visual acuity at different timepoints.
Results: In both PRPH2 mutant models NAC treatment had beneficial effects. This was evidenced by improvement in some of the parameters measured by ERG, such as scotopic a-, b-, and c-waves, and photopic a- and b-waves even if no improvements were observed in visual acuity tests, as optomotor thresholds remained similar between treated and untreated groups throughout the study. Notably, improvements in WT/KO mice were evident as early as 1 month, whereas in WT/KI the greatest differences between control and treated groups were most evident by 3 months, consistent with a faster degenerative course in the WT/KO genotype.
Conclusion: Chronic NAC treatment provided significant functional protection in PRPH2 mutant retinas. NAC-treated mice retained better ERG responses at early to mid stages compared to untreated controls. These findings support the potential of NAC to slow retinal degeneration in PRPH2-related disease.

P. 39 – O. 17

Inhibitory effect of cones over rods mediated by retinal horizontal cells: observation from experimental visual evoked potencial (VEP) in humans

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Objective: The aim of the present work was to analyze the response of the human visual cortex by means of Visual Evoked Potentias, to a lateral inhibition process mediated by retinal horizontal cells. **Methods:** 9 subjects underwent pVEP (pattern Visual Evoked Potential) electrophysiological tests designed by the members of the team. The protocols established by ISCEV standards for electrode placement were followed. Each subject was dark-adapted for 20 min prior to the start of the test, in order to be adapted to scotopic conditions. After adjusting visual acuity to the distance from the screen, ring-pattern stimuli of different sizes (2-5º from the fovea) were applied; in addition, foveal stimuli were also applied with different configurations: center-radial, center-black, center-red. The stimulation frequency was set at 1 Hz, averaging 150 responses for each ring/foveal stimuli combination. Power Lab device and LabChart software were used. **Results**: A decrease in the amplitude of the N135 VEP wave evoked by the patterned rings was observed when the foveal region was stimulated with red light, compared with no foveal stimulation. Such a decrease was observed only for ring diameters corresponding to the axon length of horizontal retinal cells. **Conclusions**: Stimulation of the foveal region of the retina (high cone density) induces the inhibition of the light response induced by rod stimulation in the perifovea, a phenomenon that can only be explained by the activity of horizontal retinal cells connecting cones with rods. This work demonstrates for the first time the inhibitory role of cones on rods through horizontal retinal cells and their effect on visual cortical responses.

P. 40 – O. 18

Neuroretinal Dysfunction Associated with the Pharmacological Interaction of Protease Inhibitors, Phosphodiesterase Type 5 Inhibitors, and Recreational Abuse of Isopropyl Nitrite

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Purpose: Alkyl nitrite-associated retinopathy, commonly known as *poppers retinopathy*, is an emerging ophthalmological entity linked to the recreational use of these substances. Since the early 21st century, a significant increase in the incidence of this condition has been observed, particularly among young adults who use recreational drugs. Despite its growing prevalence, the etiopathogenesis of this condition remains unclear. This study aims to evaluate the electrophysiological alterations in the outer retina induced by the combined administration of a protease inhibitor (Ritonavir), a phosphodiesterase type 5 inhibitor (Sildenafil), and Isopropyl nitrite— a pharmacological triad proposed as a potential trigger of this form of retinopathy. **Methods:** Forty C57BL/6J mice were used. Each animal received a single intraperitoneal dose of Ritonavir (50 mg/kg) and Sildenafil citrate (50 mg/kg), followed by inhalational exposure to Isopropyl nitrite (0.25 ml/kg). Retinal function was subsequently assessed using electroretinography (ERG), with a focus on the photopic response of photoreceptors. **Results:** A significant reduction in the amplitude of cone-mediated photopic ERG responses was observed, suggesting a selective impairment of the outer retina induced by the administered pharmacological combination. **Conclusions:** These findings suggest that retinopathy associated with sopropyl nitrite inhalation may be mediated by pharmacological interactions, particularly in the presence of agents such as protease inhibitors and phosphodiesterase type 5 inhibitors. This experimental model provides a foundation for future research into the underlying pathogenic mechanisms of this emerging clinical condition.

P. 41 – O. 19

New insights of interleukin-1 beta secretion in dry eye disease.

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Purpose: Dry eye disease (DED) is a multifactorial disorder characterized by tear film instability and chronic ocular surface inflammation. Primary open-angle glaucoma (POAG) is a progressive optic neuropathy in which chronic inflammation has also been implicated. Interleukin-1 beta (IL-1β) is a key pro-inflammatory cytokine activated via the inflammasome and caspase-1 pathway. This study aimed to compare tear IL-1β levels between patients with DED and POAG to evaluate its role as a biomarker of disease-specific inflammatory activity. **Methods:** An observational study included 86 participants: 42 with DED and 44 with POAG without ocular surface involvement. All underwent OSDI questionnaire, Schirmer I test, fluorescein break-up time (BUT), Oxford grading, and tear meniscus height (TMH) assessment. Reflex tears were collected and IL-1β levels quantified by ELISA. Statistical analyses were performed using IBM SPSS Statistics version 30. **Results:** The mean age was 60.5 ± 14.3 years in the DED group and 62.6 ± 14.2 years in the POAG group, with no statistically significant difference ($p = 0.496$). The DED group was predominantly female (88.1%), while the POAG group had a more balanced sex distribution, with statistically significant differences ($p = 0.0007$). IL-1β levels were significantly higher in DED patients than in those with POAG, regardless of OSDI severity, tear volume, BUT, TMH, or epithelial staining. The most statistically significant difference was found in the global comparison ($p < 0.0001$). Conclusion: Elevated tear IL-1β levels in DED compared to POAG suggest inflammasome-driven ocular surface inflammation, supporting its role as a potential biomarker and therapeutic target.

The Retina as a Biomarker in Vascular Dementia: OCT and OCTA

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Purpose: This pilot study investigates differences in retinal layer thickness and vascular alterations between patients with vascular dementia (VD) and healthy controls using optical coherence tomography (OCT) and OCT angiography (OCTA). **Methods:** Twelve VD patients and 16 age-matched healthy subjects without prior ocular disease were included. All participants underwent comprehensive ophthalmologic exams, OCT, and OCTA (Heidelberg Engineering, Germany). Retinal layer thicknesses in the macular region—including the retinal nerve fiber layer (RNFL), ganglion cell layer (GCL), inner plexiform layer (IPL), inner nuclear layer (INL), outer plexiform layer (OPL), outer nuclear layer (ONL), and retinal pigment epithelium (RPE)—were measured based on ETDRS sectors. SD-OCTA images of the superficial vascular complex (SVC), intermediate capillary plexus (ICP), and deep capillary plexus (DCP) were analyzed using AngioTool to assess vascular parameters. Statistical comparisons were performed using the Mann-Whitney U test ($p<0.05$). **Results:** VD patients showed significant RNFL thinning in the central macula ($p<0.05$), OPL thickening in the nasal inner ($p<0.001$) and outer ($p<0.05$) rings, and ONL thickening in the temporal region ($p<0.05$). A general trend toward increased retinal layer thickness was observed. Vascular analysis revealed a significant increase in vessel area in the ICP ($p<0.05$) and DCP ($p<0.001$), and greater vessel length in the ICP ($p<0.0001$) and DCP ($p<0.05$). No significant differences were found in the SVC. **Conclusion:** VD patients exhibit detectable retinal structural and microvascular changes on OCT and OCTA. These non-invasive imaging modalities may serve as supportive tools for diagnosis and monitoring, though larger studies are needed to validate their clinical applicability.

P. 43 – O. 21

Metabolomic and molecular signature in tears of patients with primary open-angle glaucoma. A pilot study

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Purpose: Glaucoma is a complex neurodegenerative disease, causing irreversible blindness, with primary open-angle glaucoma (POAG) being the most common clinical type. Elevated intraocular pressure (IOP) is the main risk factor, and early diagnosis is critical, because no cure exists for glaucoma neurodegeneration (GND). Outstanding research is needed for potential neuroprotection strategies to better eye and vision care.
Methods: A total of 30 participants were divided into: 1) POAG-G (n=11) and 2) CG (n=19). Ophthalmological examination was done to all participants, including IOP determination, optical coherence tomography (OCT) imaging, and visual field (VF) performance. Tear samples were collected by capillarity for metabolomic (1H-NMR) and molecular (enzyme-like immunosorbent assay -ELISA-) techniques. Firstly, the spectra were acquired and multivariate statistical analysis was done to identify discriminative metabolomic features between groups. Next, proinflammatory mediators IL-1β and IL-18 were measured using ELISA. Statistical analysis was done by SPSS 24.0 program.
Results: No significant differences in age, sex, or race, were observed. Outstanding differences in the ophthalmic examination were found between groups (<0.05). Metabolomic data revealed significantly elevated levels of phenylalanine, phenylacetate, leucine, taurine, glycine, urea, and glucose in the POAG-G vs the CG ($p<0.05$). Furthermore, the IL-1β and IL-18 were significantly higher in the POAG-G vs the CG ($p<0.05$).
Conclusions: Tear samples are very useful as diagnostic biofluid for glaucoma. We have described herein the tear metabolomic and molecular signature of the POAG patients, with special emphasis in the amino acid and proinflammatory profiles, suggesting their potential as biomarkers for glaucoma managing

P. 44 – O. 22

Leukocyte Populations in the Vitreous and Retina of Patients with Retinal Detachment

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Purpose: Retinal detachment (RD) disrupts the eye's immune-privileged environment, triggering an inflammatory response that involves lymphocytes, monocytes, and macrophages, potentially influencing visual recovery after surgery. This study aims to characterize immune cell populations in vitreous and retinal samples from RD to improve our understanding of the immunological mechanisms involved. **Methods:** Vitreous and retinal samples from 12 patients were collected during RD surgery and processed using spectral cytometry to identify different immune cell types. Single viable leukocytes were isolated through cell sorting enrichment, processed for cytospin preparation, and stained with hematoxylin-eosin for visualization via light microscopy. **Results:** Vitreous samples showed higher cell counts (60.1%) and a greater diversity of leukocytes, including monocytes, macrophages, and neutrophils. Retinal samples had a lower cell count (8.02%) with fewer monocytes and macrophages. Cell sorting enrichment significantly increased the percentage of viable leukocytes in retinal samples to 97.9%. Spectral cytometry revealed similar percentages of T and NKT cells in vitreous and retinal samples, but a higher proportion of B cells (50% vitreous, 40% retina) and γδT cells (15% vitreous, 10% retina). **Conclusion:** Our findings demonstrate the value of spectral cytometry and cell sorting in characterizing the inflammatory response following RD. Preliminary data reveal distinct immune cell profiles in vitreous and retinal tissues, underscoring the importance of including both tissues for comprehensive immune profiling. This approach is essential for a thorough understanding of the ocular immune microenvironment, as immune dynamics may influence the severity of inflammation and impact recovery outcomes.

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Corneal Regeneration using Mesenchymal Progenitors Cultivated on Contact Lenses

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Purpose: To develop a prototype of a combinational ophthalmic therapy using mesenchymal progenitor cells and contact lenses as a scaffold for corneal regeneration. This approach could serve as an alternative to current treatments such as keratoplasty and amniotic membrane transplantation. **Methods:** The hMSC-hTERT-GFP cell line was cultured on contact lenses from different groups, classified according to their polymer composition and water content. Cell viability was evaluated on various commercial hydrogels, analyzing their adhesion capacity and potential application as advanced ocular therapies. The contact lenses were studied to identify those with greater biocompatibility as cellular scaffolds, aiming to enable rapid, safe, and effective clinical translation. Once the cell culture was established on the lenses, the constructs were characterized using phase-contrast, confocal, and electron microscopy. **Results:** Mesenchymal cells exhibited a higher degree of confluence in the central area of the contact lens, with lower cell density observed at the periphery. The material that supported positive cell adhesion was a silicone hydrogel from Group I. Additionally, both cell proliferation and motility on the substrate were confirmed. **Conclusion:** This study lays the groundwork for the development of a new generation of combinational medical devices, composed of a contact lens and a progenitor cell population, thus opening an innovative avenue for treatment.

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Intraoperative Anterior Segment OCT to Evaluate Tube–Endothelium Distance in Preserflo Surgery

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Purpose: To describe the usefulness of intraoperative anterior segment optical coherence tomography (OCT) in predicting the final tube–endothelium (T–E) distance following Preserflo MicroShunt implantation. **Methods:** A total of 14 eyes undergoing Preserflo™ (Santen, Osaka, Japan) implantation were included. All cases underwent intraoperative anterior segment OCT with a cross-sectional scan of the device, and postoperative anterior segment OCT was performed the following day (Spectralis OCT, Heidelberg). Measurements of the tube–endothelium distance (T–E) and tube length (TL) within the anterior chamber were recorded. Intraoperative and postoperative measurements were compared using Pearson correlation analysis. **Results:** The mean intraoperative T–E distance was 625.26 µm (SD 366.60), and the postoperative T–E distance was 561.16 µm (SD 364.62), with no statistically significant difference ($p = 0.54$). Intraoperative TL was 1386 µm (SD 701.82), and postoperative TL was 1433.91 µm (SD 713.55), with a statistically significant difference ($p = 0.029$). A strong correlation was observed between intraoperative and postoperative T–E measurements ($r = 0.992$, $p = 0.008$), as well as between intraoperative and postoperative TL ($r = 0.984$, $p = 0.016$). **Conclusions:** An excellent correlation was found between intraoperative and postoperative measurements. These results support the usefulness of intraoperative OCT in determining postoperative tube–endothelium distance after Preserflo implantation.

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Shifts in Glaucoma Surgical Approaches in Spain: Experience from a Tertiary Hospital (2010-2022)

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Purpose: To analyze glaucoma surgeries performed over a 13-year period at a tertiary hospital affiliated with the Spanish National Health System, with the aim of evaluating temporal trends. **Methods**: This retrospective observational study included glaucoma surgeries performed in a tertiary glaucoma unit in Spain between 2010 and 2022. Data collected included date and type of surgery, whether it was standalone or combined, and patient demographics such as age, sex, and glaucoma subtype. Surgeries performed in individuals under 18 years of age were excluded. Annual comparative analysis was conducted to identify evolving patterns in surgical practice. **Results**: A total of 12,944 surgeries were analyzed, including 9,428 isolated cataract surgeries and 2,975 glaucoma procedures. Traditional glaucoma surgeries—trabeculectomy, glaucoma drainage devices (GDD), and cyclodestruction—decreased from 93.2% to 23.6% of total glaucoma procedures during the study period. Conversely, minimally invasive glaucoma surgery (MIGS) and minimally invasive bleb surgery (MIBS) increased markedly, rising from 3.8% in 2010 to 74.7% in 2022. Combined surgeries also increased from 39.0% in 2010 to 44.2% in 2022, with 86.4% of these involving MIGS or MIBS in the final year. **Conclusions**: A significant shift in glaucoma surgical trends was observed over the last decade, with MIGS and MIBS becoming the predominant techniques. This change reflects a broader transition toward less invasive surgical approaches, while traditional surgeries have declined in frequency.

P. 48 – O. 26

Preservation of Corneal Epithelial Identity and Structure in Cultures Derived from ASA Surgery

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Purpose: To evaluate cell barrier formation and the structural characteristics of cell cultures derived from human corneal epithelial cells obtained from advanced surface ablation (ASA) refractive surgery. **Methods:** Epithelial tissue collected during ASA refractive surgery was enzymatically dissociated using 0.05% trypsin/EDTA and cultured under optimized conditions. Both primary cultures and first-passage subcultures were maintained in culture for 7 days. The expression of the corneal epithelial cell marker CK3, as well as the barrier components ZO-1 and E-Cadherin, was evaluated in native tissue and cell cultures by qPCR and immunofluorescence. Atomic force microscopy (AFM) was used to analyze and compare the surface organization and the preservation of microscopic structural features characteristic of the corneal epithelium in native tissue, primary cultures, and subcultures. **Results:** qPCR analysis confirmed the expression of key genes associated with epithelial identity and adhesion in all samples. Both primary and first-passage cultures retained CK3 protein expression, confirming the preservation of corneal epithelial phenotype. ZO-1 and E-Cadherin localized at intercellular junctions, indicating the formation of epithelial barrier in vitro. No evident differences were observed between native tissue, primary cultures, and subcultures. AFM analysis revealed surface topographies consistent with differentiated epithelial tissue, including microvilli-like structures. First-passage cultures exhibited a more homogeneous and continuous surface organization compared to primary cultures, suggesting a greater recovery of native epithelial architecture. **Conclusion:** Epithelial tissue obtained from ASA surgery preserves its corneal epithelial identity and capacity for cell barrier formation after subculturing, representing a reliable in vitro model for studying epithelial structure and function.

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Corneal Endothelial Cell Loss In Uncomplicated Cataract Surgery: Influence Of Phacoemulsification Energy And Time.

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Objective: To evaluate corneal endothelial cell loss caused by cataract surgery to analyze its relationship with phacoemulsification energy and time, and to compare it with previous studies of our group using a different phacoemulsification technology. **Methods:** Forty four patients were randomly selected from those receiving cataract surgery without complications with the same phacoemulsification apparatus (Alcon Centurion®). Total cumulative dissipated energy and phacoemulsification time were annotated. The densities of corneal endothelial cells was automatically measured (REM 3000) just before and one month after the surgery. Pearson correlation was used for statistical analysis. **Results:** The number of endothelial cells decreased significantly from 2379.53 to 1977.35 cells/mm², which represents a 16.98% loss. The amount of loss varied between surgeons (range: 0.04% - 21.88%), but no significant correlation was found between cumulative dissipated energy ($r = 0.093$; $p > 0.05$) or phacoemulsification time ($r = 0.097$; $p > 0.05$) and endothelial cell loss. Similarly, no significant correlations were observed between these variables and the coefficient of variation of cell size ($r = 0.10$ and $r = 0.06$, respectively; $p > 0.05$). **Conclusions:** Corneal endotelial cell loss was similar to that found in previous studies with other phacoemulsification apparatus and falls within the range reported by other authors. Because cell loss was not related to phacoemulsification energy or time, other factors such as surgeons skills or ocular characteristics may have influence it.

P. 50 – O. 28

Blepharospasm management in Schwartz-Jampel syndrome: a systematic review

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Purpose: Blepharospasm is one of the most limiting symptoms in patients with Schwartz-Jampel-syndrome and can affect early visual development, causing amblyopia and leading to disability. There is no consensus on the optimal management of blepharospasm in these patients. This systematic review aims to evaluate the current evidence for the appropriate management strategies for blepharospasm in Schwartz-Jampel-syndrome. **Methods:** This was a PROSPERO-registered (CRD42024569495), PRISMA guideline-adherent systematic review. Databases searched include Medline (PubMed), Scopus, and Web of Science from any time to February 1st, 2025. All scientific manuscripts published discussing the management of blepharospasm in patients with Schwartz-Jampel-syndrome were included. A novel therapeutic algorithm has been developed and proposed. **Results:** From an initial number of 59 articles, 15 of them were included. No clinical trials nor observational studies were found. All these 15 articles were case series or case reports (quality of evidence: 4 or 5), involving 21 patients. A great heterogeneity in how to manage blepharospasm in Schwartz-Jampel syndrome was gathered. Therapeutic options included oral drugs (such as sodium blocker channels: carbamazepine, phenytoin, and procainamide), botulinum-toxin-A, and eyelid surgery (orbicularis myectomy). The management algorithm proposal is oral sodium blocker channels as the first option and eyelid surgery as the second option treatment. Botulinum-toxin-A might be considered a therapeutic step prior to surgery. **Conclusion:** The published evidence regarding management strategies for blepharospasm in Schwartz-Jampel-syndrome is scarce and of low quality. Since this nosology is a very rare disease, efforts should be promoted to conduct clinical research and a consensus document for the management of blepharospasm.

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Simulated chronic daily administration of liposomal eye drops for glaucoma treatment

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Purpose: Chronic topical glaucoma therapies, such as latanoprost, frequently lead to ocular surface discomfort, poor treatment adherence, and dry eye disease development. This study evaluated the ocular tolerance of latanoprost-loaded (0.005%) liposomes eye drops containing hyaluronic acid (0.2%) and osmoprotectants betaine (0.4%) and leucine (0.9%) (LAT1), simulating chronic daily administration. **Methods:** Liposomes were prepared via lipid film hydration method. Physicochemical characterization of LAT1 included assessments of pH, vesicle size, osmolarity, surface tension and viscosity. Ocular tolerance was assessed *in vitro* using corneal and conjunctival cell viability assays, and *in vivo* through daily topical administration to male albino New Zealand rabbits (n=14 eyes) for 15 consecutive days, following EMA/CHMP/SWP/2145/2000 guidelines. Tear osmolarity, tear film break-up time (TBUT), Schirmer test and Oxford fluorescein staining scores were evaluated over a total of 25 days; as control, a sterile saline solution (0.9% NaCl) was used. **Results:** LAT1 demonstrated suitable physicochemical properties for topical ocular administration, showing a pH of 7.55±0.01, unimodal vesicle size distribution (195.66±4.00 nm), isotonicity (284.33±2.62mOsm/L), surface tension of 32.30±1.87mN/m, and viscosity of 2.48±0.13mPa·s. LAT1 maintained cell viability above 80% in corneal and conjunctival cells, showing no ocular surface damage in animal studies resulting similar to 0.9% NaCl solution. A significant improvement in TBUT values was observed at day 15 (7.00±0.78s vs 6.00±0.63s 0.9% NaCl; p=0.0066) that remained elevated at day 25. **Conclusion:** Results indicate that LAT1 had tolerance comparable to sterile saline solution, with improved tear film stability, suggesting potential benefits in chronic glaucoma treatment.
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Study Of Glial Phenotypes And AQP4 Regulation In The Retina And Optic Nerve Of Kidins220-Deficient Hydrocephalus Mice

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Purpose: Transmembrane protein Kinase-D interacting substrate of 220kDa (Kidins220), involved in neuronal survival, synaptic activity, and neurogenesis, regulates Aquaporin-4 (AQP4) levels, crucial for brain water homeostasis, in ependymocytes and astrocytes. Kidins220-deficient mice exhibit hydrocephalus, leading to AQP4 degradation. Given structural and functional similarities between the retina and the brain, we hypothesized that Kidins220 deficiency would impact retinal water regulation. **Methods:** Kidins220$^{f/f}$ and Wild-Type (WT) mice (C57BL/6J background) were used. Magnetic resonance imaging (MRI) measured ventricular volume. Retinas and optic nerves were analyzed. OCT and OCTA were performed. Immunoblotting quantified retinal Kidins220 levels. Immunofluorescence analyzed AQP4, Brn3a, Vimentin, Kidins220, VPS35, Caspase 3, GFAP, CD68, and Iba-1 expression. **Results:** Kidins220-deficient animals showed: i) hydrocephalus phenotype demonstrated by MRI and reduced Kidins220 levels; ii) no alterations in retinal thickness or vascular pattern; ii) no changes in retinal ganglion cells number or increased apoptosis; iii) increased retinal microglial cells and their phagocytic capacity; iv) increased retinal astrocytes GFAP expression and vimentin in Müller glia; v) increased glial AQP4 and low levels of VPS35; vi) increased GFAP expression accompanied by decreases in AQP4, Kidins220 and VPS35, in the optic nerve. **Conclusion:** Kidins220 deficiency impacts retinal water regulation differently than in the brain. Reduced expression of Kidins220 and VPS35 in the retina of Kidins220-deficient mice lead to AQP4 levels increased in Müller cells, glial phenotypic changes, and absence of neuronal damage. Conversely, AQP4 expression in optic nerve astrocytes was reduced, like to brain astrocytes, suggesting a unique adaptive response to hydrocephalus in the Kidins220-deficient Müller glia.

P. 53 – O. 30

Neuroprotective Effects of Intravitreal Human Retinal Exosomes in an animal Axotomy-Induced RGC Degeneration Model.

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Purpose: This study aimed to evaluate the safety profile and the neuroprotective effects of a single intravitreal injection of exosomes, derived from culture media of human retinal progenitor cells, in an animal model of axotomy-induced retinal ganglion cell (RGC) death. **Methods**: In adult Sprague-Dawley rats, the left optic nerve was intraorbitally transected immediately behind the optic disc. Immediately after, one group received an intravitreal injection of 5 µl containing retinal exosomes, and another group received 5 µl of phosphate-buffered saline (PBS) as vehicle. The right eyes remained untreated and served as controls. Animals were perfused 7 days after injection and both retinas were flat-mounted and immunolabeled with an anti-Brn3a antibody to detect and quantify RGCs.**Results**: No adverse reactions such as inflammation, necrosis, infection, or tumor formation were observed in treated eyes. After 7 days, compared to the control intact right eyes (n=31), 47% of Brn3a-positive RGCs survived in the PBS-treated group (n=15), whereas the exosome-treated group (n=16) showed a significantly higher survival rate (63%; $p < 0.001$).**Conclusions**: Intravitreal delivery of human-derived retinal exosomes appears to be safe and confers neuroprotection against axotomy-induced RGC loss.