Free Papers 1

Moderator: Morten Moe, Norway

ID: 110

Abstract Submission

Keywords: neovascular age-related macular degeneration; observe-and-plan regimen; treatment response; predicting response

Initial treatment response can predict one-year treatment outcomes in neovascular age-related macular degeneration treated according to the observe-and-plan regimen

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Aim: To investigate if the initial treatment response can predict the 1-year treatment outcomes in patients with neovascular age-related macular degeneration (nAMD) treated according to the observe-and-plan (O&P) regimen.

Methods: In this prospective cohort study treatment-naïve patients with nAMD treated according to the O&P regimen were enrolled and followed for 1 year. Participants were examined at the time of diagnosis, post-loading doses, and after 1 year. The treatment response was determined initially post-loading doses and after 1 year. The functional treatment response (fTR) was determined by the change in best corrected visual acuity, while the morphological treatment response (mTR) was assessed by central retinal thickness and presence of sub- and intraretinal fluid. The fTR and mTR were categorized as good, partial, and non-responsive. The relative risk (RR) of the initial treatment response for predicting 1-year treatment response was assessed.

Results: One-hundred patients were included and 88 completed the 1-year follow-up. Patients with an initial good and non-responsive fTR had an RR of 4.1 (95%CI 1.8–9.2) and 4.3 (95%CI 2.2–8.3), respectively, of remaining in the same response category at 1 year. Similarly, patients with an initial good and non-responsive mTR had an RR of 3.0 (95%CI 1.8–4.8) and 8.7 (95%CI 3.0–25.1), respectively, of remaining in the same response category at 1 year.

Conclusions: Both the anatomic and visual functional response after three loading doses are predictive of the anatomic and functional outcomes at one year in nAMD patients treated according to the O&P regimen.

ID: 148

Abstract Submission

Keywords: Age-related macular degeneration, anti-VAGF, retinal fluid, visual acuity

Longitudinal analysis of anatomical parameters and their fluctuation in a regional real-world cohort of patients with neovascular AMD. Correlation with visual outcome

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PURPOSE

To evaluate the anatomic response and visual acuity (VA) in anti-VEGF therapy in patients with neovascular age-related macular degeneration (nAMD).

METHODS

A cohort 107 patients were followed for up to 4 years. Visual acuity (VA), central foveal thickness, subretinal (SRF), intraretinal (IRF) sub-RPE (PED) fluids were recorded at all follow-up visits. Foveal thickness variation index (TCI) was calculated.

RESULTS

The mean change in VA from baseline to the last follow-up was higher in patients with smaller TCIs .

Among patients with SRF at baseline, drying or the presence of SRF at least 75% of follow-up did not change the VA outcome

The number of cycles of SRF, IRF or PED presence were not associated with VA outcome.

In regression analysis the decrease of VA from baseline was associated with the proportion of follow-up time spent with IRF. TCI, baseline age and female gender also showed a non-significant tendency of association.

CONCLUSIONS

Time spent with IRF is the most powerful determinant of VA outcome, even when corrected for TCI. Eyes with SRF at baseline had a better outcome. Eyes with persistent, predominantly persistent or disappearing SRF had similar outcomes.

ID: 108

Abstract Submission

Keywords: atrophy, degeneration, intravitreal, macula, retina

Analysis of prognostic and predictive factors in neovascular age-related macular degeneration Kuopio cohort

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Aims: The aim of the study was to explore factors affecting the progression of neovascular age-related macular degeneration (nAMD) and identify predictive factors that can estimate the duration of intravitreal treatments.

Methods: This retrospective real-world study included 421 nAMD patients treated at the Kuopio University Hospital during years 2007-2021. The collected data included background demographics, treatment history, visual acuity and retinal biomarker analysis. Impact of baseline factors to age at diagnosis, treatment duration, received treatment intensity and visual acuity gains was analyzed.
Results: Heavy smoking and high body mass index (BMI) were associated with an earlier onset, while the use of anti-coagulation and anti-aggregation medication were associated with a later onset of nAMD. A low number of injections during the first year of treatment and the presence of intraretinal fluid (IRF) at baseline were associated with shorter treatment duration. Interestingly, when IRF only patients were compared to subretinal fluid (SRF) only patients, IRF patients showed higher occurrences of subretinal drusenoid deposits (43.5 % vs. 15 %, p = 0.04). In addition, when all patients with IRF were compared to SRF only patients, more hyperreflective foci (HRF) and complete RPE and outer retinal atrophy (cRORA; 20.7 % vs. 5 %, p = 0.02) were observed in patients with IRF.

Conclusions: Our results reveal that heavy smoking and high BMI are accelerating factors for earlier emergence of nAMD, while the presence of IRF results in a fast-progressing disease. More intriguingly, the link between IRF and appearance of subretinal drusenoid deposits, HRF and increased retinal atrophy was observed.

ID: 125
Abstract Submission
Keywords: geographic atrophy, pegcetacoplan, nonsubfoveal, subfoveal, GALE

Long-Term Efficacy and Safety of Pegcetacoplan Over 36 Months: Results From 12 Months of the GALE Open-Label Extension Study

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Aims: To report the efficacy and safety of long-term pegcetacoplan treatment in patients with geographic atrophy (GA) over 36 months.

Methods: Following OAKS/DERBY, patients could enroll in the GALE 3-year open label extension. Patients in pegcetacoplan arms of OAKS/DERBY continued the same treatment regimen, pegcetacoplan monthly (PM) or pegcetacoplan every other month (PEOM). Patients on sham treatment switched from sham monthly to active PM or sham EOM to PEOM.

Results: Overall, 83% (n=782) of patients who completed OAKS and DERBY entered GALE, and 92% (n=727) enrolled in GALE completed the first 12 months. Between Months 24 and 36, pegcetacoplan reduced lesion growth vs projected sham by 35% with PM and 24% with PEOM (both p<0.0001; nominal) overall, by 42% with PM (p<0.0001; nominal) and 28% with PEOM (p=0.0015; nominal) in nonsubfoveal, and by 31% with PM and 25% with PEOM (both p<0.0001; nominal) in subfoveal. In patients with bilateral GA receiving continuous pegcetacoplan in the study eye, PM and PEOM reduced lesion growth vs the untreated fellow eye by 28% and 23%, respectively, between Months 24 and 36 (both p<0.0001; nominal). Sham crossover patients (pooled) had a reduction in lesion growth vs projected sham of 19% (p<0.0001; nominal) at 12 months (p<0.0001; nominal). The safety profile in the first 12 months was consistent with OAKS/DERBY. The estimated rate of reported post marketing events of retinal vasculitis remains ~0.01% per injection (~215,000 injections) in the real world setting.

Conclusion: Long-term efficacy and safety of pegcetacoplan were demonstrated in patients with GA.

ID: 149
Abstract Submission
Keywords: Arcuate scotoma, central retinal vein congestion, central retinal vein occlusion, retinal ischemia

Clinical investigation of unusual manifestations of central retinal vein congestion

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Aims: To identify manifestations of central retinal vein congestion beyond the common presentation of four-quadrant intraretinal hemorrhage and cystoid macular edema.

Methods and patients: Investigations included video fluorescein angiography, color and infrared fundus photography, retinal vessel oximetry, optical coherence tomography and automated perimetry. To date, the ongoing study enrolled 10 patients with patchy unilateral blurred or dark vision and ipsilateral unilateral retinal venous dilatation without cystoid edema.

Results: Ten patients had unilateral venous dilation with tortuosity, dark veins and lower oxygen saturation than in the fellow eye. Additional findings in the affected eye included mid-layer ischemic hyperreflectivity (paracentral acute middle maculopathy) with corresponding scotomata. In 3 patients, reversal of venous flow during the diastole was seen in the transient laminar angiography phase. Retinal hemorrhage was uncommon and rare when present. The course ranged from spontaneous resolution without sequels to persistent sectorial inner retinal atrophy with arcuate scotomata. In 4 eyes, ischemia was confined to the supply area of a cilioretinal artery. Some patients had multiple attacks. The patients were younger that patients with central retinal vein occlusion with cystoid macular edema.

Conclusions: Retinal ischemia appeared to be related to congestion of the central retinal vein with venous pressure ranging to the level of the diastolic arterial blood pressure. Venous congestion of such magnitude that it can reduce retinal perfusion pressure to less than one third of its maximum in healthy eyes was associated with retinal ischemia followed by inner retinal atrophy with arcuate scotomata.

ID: 118
Abstract Submission
Keywords: Doppler optical coherence tomography (OCT), retinal oximetry, autoregulation, blood flow, regional variation

Lack of regional differences in hypoxia-induced vasodilation and hyperperfusion in retinal arterioles in vivo

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Purpose:

A recent study has shown that an increase in the arterial blood pressure caused by isometric exercise leads to constriction of retinal arterioles that is sufficient to maintain the blood flow constant in the macular area, but not in the retinal periphery where the blood flow increases. However, it is unknown whether hypoxia-induced vasodilatation in the retina shows similar regional differences.

Methods:

In 10 of 30 scheduled examinations in healthy young individuals, oxygen saturation (Oxymap, Reykjavik, Iceland), vessel diameter, and blood flow (Doppler OCT, Vienna, Austria) were measured in the upper temporal peripapillary arteriole, and in branches from this vessel towards respectively the macular area and the retinal periphery. The measurements were performed before and during breathing of a hypoxic gas mixture containing 12.5% oxygen.

Results:

Hypoxia significantly reduced the systemic oxygen saturation from (mean±SD) 97.6% ± 0.8% to 86.4% ± 2.6% ($p<0.001$), and the saturation from 94.2% ± 5.0% to 85.7% ± 6.5% ($p<0.001$) in the studied arterioles. Systemic hypoxia induced significant dilatation of (mean±SD) 12.7% ± 16.2% ($p<0.001$) and increased blood flow by 39.4% ± 69.3% ($p=0.005$) in retinal arterioles, but there were no significant differences between the responses among peripapillary, peripheral and macular arterioles ($p=0.88$ for diameters and $p=0.42$ for blood flow).

Conclusions:

The preliminary results suggest that hypoxia-induced vasodilation and hyperperfusion are similar in peripapillary, peripheral and macular arterioles. This argues against regional differences in hypoxia-induced vascular responses contributing to the different manifestations of retinal vascular disease in the macular area and the retinal periphery.

Free papers 2

Moderator: Johanna Liinamaa, Finland

ID: 147

Abstract Submission

Keywords: cornea, lamellar keratoplasty, endothelial cells, cytokeratins

Mesenchymal-epithelial transformation of corneal endothelial cells: Fuchs dystrophy vs. bullous keratopathy

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Aims:

To compare presence of aberrant cytokeratin immunoreactivity in corneal endothelial cells between Fuchs dystrophy and bullous keratopathy.

Methods:

Consecutive specimens taken during Descemet membrane endothelial keratoplasty for Fuchs dystrophy from 62 eyes over 3 months and for bullous keratopathy from 20 eyes over 6 months were immunostained for vimentin and simple epithelial cytokeratins CK8, CK18, CK7 and CK19. Specimens from Fuchs dystrophy were also stained for CK5/6 typical of more complex epithelia.

Results:

Median age of the patients was 72 (range, 46-90) and 74 (range, 35-85) years for Fuchs dystrophy and bullous keratopathy, respectively. The corresponding median thicknesses of Descemet's membrane were 14 (range, 7-21) and 11 (range, 6-21) µm, and number of endothelial cell nuclei per mm were 20 (range, 2-38) and 7 (0-21), respectively. At least one, and typically all, of the antibodies to CK8, CK18, CK7 and CK19 reacted with all 62 (100%) specimens from Fuchs dystrophy, but the reactivity could be focal or regional, and essentially similarly with 18 (80%) of the 20 bullous keratoplasty specimens. CK5/6 characteristic of more complex epithelia was found only in single cells interpreted as contamination from surface epithelium when extracting the stripped Descemet membrane through the corneal wound.

Conclusions:

Mesenchymal-epithelial transformation of corneal endothelial cells, as evidenced by immunoreactivity for simple epithelial cytokeratins, is consistent with an essentially ubiquitous reactive response to stress in a rarefied corneal endothelium. It does not differentiate Fuchs dystrophy from bullous keratopathy.

ID: 121

Abstract Submission

Keywords: Cornea, Keratoconus, Biomechanics, Brillouin

Corneal Biomechanical Properties Measured with Brillouin Scanning

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To assess the corneal biomechanical properties of healthy individuals at different ages and keratoconus patients, and to relate this to the corneal thickness and other aspects of the corneal configuration.

Setting: Department of Clinical Sciences/Ophthalmology, Umeå University, Umeå, Sweden.

Methods:

This ongoing study involves healthy individuals between 10 and 45 years of age and keratoconus patients planned för corneal crosslinking between 18 and 35 years of age. Best corrected visual acuity, Pentacam Scheimpflug tomography (Oculus, Inc.) and anterior segment optical coherence tomography (AS-OCT; Casia2; Tomey, Inc.) measurements are performed in both eyes, and the corneal biomechanical properties are measured at 10 points in each cornea using the Brillouin Optical Scanner System (BOSS; Intelon Optics, Inc.).

Results:

The results show the differences in corneal biomechanical properties at different ages of healthy individuals and relate these values to the corresponding values in keratoconus. The biomechanical properties of the cornea is also related to the corneal morphological properties (thickness and curvature).

Conclusions:

The biomechanical properties of the cornea change with increasing age, and the cornea shows a reduced biomechanical stability in keratokonus. There is no direct relationship between the biomechanics of a cornea and its configuration. This demonstrates the importance of also taking the biomechanical properties of the cornea into account in the planning of, for example, corneal crosslinking in keratoconus or refractive surgery.

ID: 114

Abstract Submission

Keywords: Glaucoma, MIGS, ELT, Laser, Stent

AI-Enhanced Digital Endoscopic and OCT Guidance Systems for TM-Based MIGS

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PURPOSE: To describe 2D Endoscopic and 3D OCT based gonio-lens free guidance systems for laser based and stent based MIGS systems which enable all cataract surgeons to perform MIGS in patients with primary open angle glaucoma and cataracts.

METHODS: ELT, a validated safe and effective laser-based MIGS procedure, iStent and Hydrus all currently require a surgical gonio-lens and rely on the experience, judgement and skills of the surgeon. In guided ELT, a real-time AI-enhanced image appears in proper relationship to the target and laser probe to guide the surgeon to direct the probe toward the trabecular meshwork overlaying Schlemm's canal without a gonio-lens. 2D guided ELT involves a microscope image with a real-time display of an augmented reality endoscopic with artificial intelligence-generated images. 3D guided ELT includes microscopic OCT and fiber-optic OCT images.

RESULTS: 2D guided ELT avoids the need for a gonio-lens with real-time direct endoscopic visualization. 3D guided ELT, using OCT images, enhances guidance precision and enables consistency for every operation. Improved targeting of Schlemm's canal and collector channels enables correct placement of both ELT laser openings and stents.

CONCLUSION: Guidance systems which eliminate the need for surgical gonio-lens skills will enable significantly more surgeons to perform ELT and stent based MIGS.

ID: 140
Abstract Submission
Keywords: Adult amblyopia, amblyopia prevalence, amblyopia screening, amblyopia treatment, visual outcome

Prevalence of residual amblyopia in adulthood and its association on educational outcome and quality of life in the Northern Finland Birth Cohort

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Purpose: To evaluate the prevalence of residual amblyopia in adults in a population screened and treated in childhood. We also wanted to evaluate the association of amblyopia on school success, level of education, and quality of life.

Methods: This is a follow-up study of 2708 subjects of the Northern Finland Birth Cohort. At the age of 46, the subjects took part in ophthalmic examinations, including the measurement of best-corrected visual acuity (BCVA) and refraction. Residual amblyopia was defined as BCVA 20/30 or less (logMAR ≥0.2) in one or both eyes or a two-line interocular visual acuity difference and absence of any pathological ocular factors. The quality of life was assessed with a 15D questionnaire, and educational outcome, school success, and episodic memory with a CANTAB-PAL (paired associates learning) test were evaluated.

Results: Prevalence of amblyopia in current adult population aged 46 years was 1.3% (n = 36). At 14 years, the amblyopia subjects had had significant differences in mean spherical equivalent between the amblyopic and fellow eye and strabismus more often than controls. No significant differences were observed in the CANTAB-PAL test or in educational outcome. However, amblyopia subjects had significant difficulties in the 15D questionnaire in terms of vision (54% vs. 34%, p = 0.01).

Conclusion: Due to screening and treatment in childhood, the number of adults with residual amblyopia was low. Despite minor visual impairment and discomfort, they cope very well in life in terms of educational outcome and quality of life.

ID: 133
Abstract Submission
Keywords: Blindness, Declining vision, Societal costs, Visual impairment

Societal costs of declining visual acuity: Longitudinal results from a Finnish nationwide study with 15 years of registry data follow-up

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Aims: To examine the societal costs associated with declining visual acuity (VA).

Methods: Two population-based, nationally representative surveys with clinical examination, including VA assessment by a professional, were linked with national care registers to estimate health care service usage during 1999-2013. The clinical examinations and questionnaires were performed in 2000 and 2011, and the costs were calculated in 2019 level. The estimates were adjusted for sex, age, and multiple comorbidities. Sufficient data were available for 3 867 participants, which were included in the analyses.

Results: Decline of two or more lines in distance VA was detected in 298 (7.7%) participants between the two assessments in 2000 and 2011. Excluding only primary, occupational, and private care doctor costs, in every other cost category those with declined distance VA had higher annual costs compared to those with stable or improved VA. The total direct health care costs were 5 300 € and 3 500 € per year for those with declined VA and for those with stable or improved VA, respectively. Similarly, annual indirect costs were 33 000 € and 23 000 € for these groups, respectively.

Conclusions: Declining VA increases the societal costs remarkably and should be regarded as a target of active interventions by appropriate means for the cause already at an early stage. In addition to intensive care plans, preventive approaches would also pay themselves off with increased savings in the future, which should be kept in mind when allocating resources for health care.